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Conference Proceedings

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**INTERNATIONAL
E-CONFERENCE
ON
ADVANCES
IN
COMPUTING
SCIENCE &
TECHNOLOGY**

5-6, January 2022

2022

Edited by:

Prof. Sonu Mittal & Prof. Anupam Kumar Sharma

Mrs. Alka Das Gupta

Chairperson

BBD Group of Education

Message from Chairperson

The Department of C o m p u t e r S c i e n c e & E n g i n e e r i n g has always been the gem of the Dr. Akhilesh Das Gupta Institute of Technology and Management. The perennial zeal of the Department has never left the achievements stagnant. The Department not only gives students the exposure to the regular engineering curriculum but also to the aspirations of today's corporate world, thus inculcating a professional aptitude in them. The dedication of the faculty members has strengthened the learning process ensuring an environment of collaboration, experimentation, imagination, and creativity. It is such a prodigious delight in watching the students cutting edge in technical exploration, enhancing their analytical skills and brushing themselves up for the rapidly changing sector, and establishing themselves as entrepreneurs and engineers.

The Department has always reached new heights and I am looking forward to more wonders and achievements. I wish the very best to the Department of CSE for the publication of the proceeding of International E - Conference on Advances in Computing Science & Technology. The proceeding beautifully provides an overview of outcome of research done by faculty members and students.

Mr. Viraj Sagar Das Gupta

President, BBD Group

Message from President

I am extremely happy to witness the shaping up of the International E – Conference on Advances in Computing Science & Technology.

A special mention to the Editorial Board, who were able to capture the noteworthy proceedings of the CSE Department of Dr. Akhilesh Das Gupta Institute of Technology and Management and were also able to present it in an alluring manner. I thoroughly enjoyed myself going through the pages of this conference.

This issue of the technical magazine is an insight to what campus life truly means, the surfe it events together represent the opportunities that one can take and augment their personalities up to the brim and be glorious predominantly.

I hope students and faculty members find this Edition as sound as i did. I congratulate the Department and the Editorial Board for this achievement.

Sh. S. N. Garg
Chief Executive Officer

Message from CEO

Even after so many batches passing under my supervision, the joy and happiness remain constant. ADGITM is exemplary both from the point of view of merit as well as from the placement perspective. Our students have been placed in the best organisations of the country and we strive to maintain such decorum by which the students are benefited the most. With an aim to remain quality conscious ADGITM has put in efforts for providing the best industrial exposure along with a professionally ethical environment, where one can develop himself / herself on multiple levels. As technology is advancing at a very rapid rate, we have an experienced and well-qualified faculty panel to adjust to the market requirements and guide the students as and when required. The only way to become technically stimulated is by receiving the proper exposure to the world and that is what we inculcate in our students. Our institution is technology-friendly and we don't restrain students from experimenting new technologies and work styles, that is how we inculcate self-reliance and tech-savvy mind.

Prof. (Dr.) Sanjay Kumar

Director, ADGITM

Message from Director

"Engineering is not only the study of the technical subjects, but it is about living an intellectual life."

As the Director of Dr. Akhilesh Das Gupta Institute of Technology and Management, I strongly believe that education is not only about imparting knowledge but more about opening the individual's mind to self-expression. I have been personally encouraging students to develop an overall sensibility and awareness. Encouraging them to, not try, but make it happen. I saw an overwhelming response by the students in not only technical domain but also in the branch of sports, art, dance, photography, music and a lot more. Students are our partners in our mission to set a new benchmark in the field of engineering. I am confident that with such a positive and progressive attitude they would be able to justify the credibility of the Department as well as the college by bringing laurels and what not.

I am immensely proud to observe a team of such enthusiasts. The proceeding of International E - Conference Advances in Computing Science & Technology of the Department of Computer Science & Engineering has beenable to make a count of all the achievements, hard work and dedication of the faculty members and students alike. I wish them luck.

Vision of the Institute

To produce globally competent and socially responsible technocrats and entrepreneurs who can develop innovative solutions to meet the challenges of 21st century.

Mission of the Institute

1. To provide value-based education through multi grade teaching methodologies and modern education facilities.

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3. To conduct value-added training programme to enhance employability.

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Vision of the Department

To produce socially responsible technocrats, researchers, and entrepreneurs in the field of computer science and engineering.

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Department of
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INTERNATIONAL E-CONFERENCE

on

ADVANCES IN COMPUTING SCIENCE
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TECHNOLOGY

IECACST - 2022
Date: 5th - 6th January, 2022

ABOUT THE INSTITUTE

Dr. Akhilesh Das Gupta Institute of Technology and Management (ADGITM), formerly known as Northern India Engineering College (NIEC), was established in the year 2003 by Babu Banarasi Das Education Society. Late Dr. Akhilesh Das Gupta, an educationist, former Union Minister and philanthropist was the founder, chairman of the institute. ADGITM which is one of the premier institutions in North India has been well known for its aesthetically designed campus. The institute is located at Shastri Park, New Delhi and is spread over a lush green campus of 8 acres along with three playgrounds and five interconnected blocks exhibiting state of art infrastructure. ADGITM offers B.Tech in Computer Science & Engineering, AI & Machine Learning, AI & Data Science, Information Technology, Electronics & Communication Engineering, Mechanical Engineering and Civil Engineering also it offers Master of Business Administration. The institution is affiliated to Guru Gobind Singh Indraprastha University, New Delhi and all the courses are approved by AICTE. ADGITM is well known for its distinctive contribution in the field of research, learning and teaching process. The institute also aims to attain a global level of excellence in education and works hard to ensure that students recognise the need of sustainable and equitable society. The institute also has a dedicated Training and Placement Cell that plans, organises and coordinates the training and placement activities.

ABOUT THE CONFERENCE

The main objective of e-conference (IECACST 2022) Is to serve as an integral platform for various ideas Disciplines and technologies related to current and future trends in Computer Science & Engineering. The theme of the conference is to bring together specialists and experts from the industries, research institutes, government agencies and academics to provide a detailed understanding of various trends and advances in computer science. Authors are solicited to contribute to the conference by submitting articles that illustrate research results, projects, surveying works and industrial experiences that describe significant advances in the following areas, but are not limited to.

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IMPORTANT DATES

Full paper submission deadline: 22nd Dec, 2021
Paper acceptance notification: 26th Dec, 2021
Camera ready paper submission deadline: 30th Dec, 2021
Last date of registration: 3rd Jan,2022

REGISTRATION DETAILS

Foreign Authors (Academicians, Researchers, Students): $15

Indian Authors (Academicians, Industry delegates and Researchers): Rs. 500

Indian Authors (Students): Rs. 300

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Dr. Akhilesh Das Gupta Institute of Technology & Management	
Department of Computer Science & Engineering	
International E-Conference on Advances in Computing Science & Technology (IECACST - 2022)	
Schedule	
Day 1 (Wednesday ,5th JANUARY, 2022)	
Timing (IST)	**Event**
9:50 -10:00 am	**Joining by all delegates and participants**
10:00 - 10:10 am	Introduction of Conference
10:10 - 10:20 am	Words by Shri S N Garg, CEO, ADGITM
10:20 - 10:30 am	Words by Prof. (Dr.) Sanjay Kumar, Director, ADGITM
10:30 - 10:40 am	Words by Prof.(Dr.)Anupam Sharma, HoD - CSE Department
10:40 - 11:10 pm	Speech by Chief Guest Prof. (Dr.) S B Goyal Dean, Faculty of Information Technology , City University ,Malaysia(1:40 pm in Malaysia)
11:10 - 11:40 am	Speech by Guest of Honor Dr. Chaman Verma, Computer Research Scientist , Hungary(6:40 am in Hungary)
11:40 - 12:10 pm	Presentation by Keynote Speaker Prof.(Dr.) Laxmi Ahuja Dy. Director ,AIIT, Amity University ,Noida U.P.
12:10- 12:50 pm	Lunch Break
1:50 - 03:30 pm	Technical Session 1:Paper presentations (Session Chair Prof.(Dr.) Laxmi Ahuja Dy. Director ,AIIT, Amity University ,Noida U.P.)
Day 2 (Thursday ,6th January, 2022)	
Timing (IST)	**Event**
10:00 - 12:30 pm	Technical Session 2-Day 2 Session 1:Paper presentations (Session Chair By Pradeep Kumar Bhatia, GJUST, Hisar, Haryana)
12:30 - 1:00 pm	Lunch Break
1:00-3:20 pm	Technical Session 3_Track1:Paper presentations (Session Chair By Dr. Manju Khari, JNU, New Delhi)
1:00-3:20 pm	Technical Session 3_Track2:Paper presentations (Session Chair By Prof. Dr. Archana)
3:20-3:30 pm	Vote of Thanks by Prof. (Dr.) Sonu Mittal, Convener, IECACST 2022

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JINGLELALA: A MUSICAL APP

Nikhil Jha[1], Shivam Yadav[1], Paras Jindal[1], Deepanshu Jain[1], Shipra Varshney[1], Ms. Charul Dewan[2]

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Abstract: Jinglelala offers digital recorded music and podcasts, including more than 1000+ songs, from record labels and media companies. As a freemium service, basic features are free with advertisements and limited control, while additional features, such as offline listening and commercial-free listening, are offered via paid subscriptions. Users can search for music based on artist, album, or genre, and can create, edit, and share playlists. This application uses different algorithms to improve user experiences. This app uses artificial intelligence to create user-specific playlists. It strives to provide the best-recommended music based on our users' interests. Jinglelala allows users to add local audio files for music not in its catalog into the user's library through Jinglelala's desktop application and then allows users to synchronize those music files to Jinglelala's mobile apps or other computers over the same Wi-Fi network as the primary computer by creating a Jinglelala playlist and adding those local audio files to the playlist. Audio files must either be in the .mp3, .mp4 (.mp4 files that have video streams are not supported), or .m4p media formats. This feature is available only for Premium subscribers.

Keywords: Javascript, Restful APIs, Python, Machine Learning, Nodejs, Flutter.

1 Introduction

With the rapid increase in musical apps all around the world offering different services, this app has been designed to overcome the shortcoming of not having all the features of a good musical app within a single application. This app basically provides a unifying platform, bringing together the biggest musical apps like Spotify and Saavn and combining them with the addition of a YouTube extension.

The paper is organized as follows: Section 1 gives a basic introduction to the app. Section 2 gives a literature overview of this musical app. Section 3 gives the recent apps related to music. Section 4 introduces a brief intro about the software requirements, designed documents about the musical apps, and the methodologies for the development of apps including the main algorithms. Section 5 is about the testing of the application. Section 6 discusses the future scope of the application. Section 7 discusses the results (screenshots of main results).

Finally, the conclusion and future scope are given in the last section of the paper.

2 Overview

Our USP is to make the best playlists using Artificial Intelligence. Our main aim is to make our user's browsing experience effortless. If a user has streamed a defined number of songs, our application's recommendation system kicks in. Once you're done playing your recently searched song, our recommendation system will play the next song like the one playing before to make your music streaming experience delightful [1].

Whenever a song is uploaded on our platform, it makes use of deep learning to detect the exact genre of the song and it will also try to predict its target audience. Hence, using both genre and the target audience of that genre, it'll make a perfect playlist for our users.

To achieve the above-mentioned agendas, our app will measure the frequency, pitch, and many other properties of the uploaded song [2]. It has collected the data for many songs to recommend to our users the most similar song to be played next to the currently searched song by the user.

3   Recent musical apps

Spotify: Spotify is a Swedish Audio streaming and media services provider founded on 23 April 2006 by Daniel Ek and Martin Lorentzon. It is the world's largest music streaming service provider, with over 381 million monthly active users, including 172 million paying subscribers, as of September 2021. Apple Music: Apple Music is a music and video streaming service developed by Apple Inc. Users select music to stream to their device on-demand, or they can listen to existing playlists. Wynk: Wynk Music is the one-stop music app for the latest to the greatest songs you love plus streaming of live shows of your favorite music artists.
Saavn: Saavn is an Indian online music streaming service and a digital distributor of Bhojpuri, Bollywood, English, Bengali, Kannada, Tamil, Telugu, Malayalam, and other regional Indian music around the world.

4   Basic Requirements

To make a music application, we basically require two ends, i.e., front-end and back-end. In the front-end part, the User Interface of the application is displayed. Then whatever the user will be doing on the application, there will be a back-end part that will be constantly processing and implementing the information given by the user through the front-end. Figure 1 clearly explains the front-end and backend integration of the musical app.
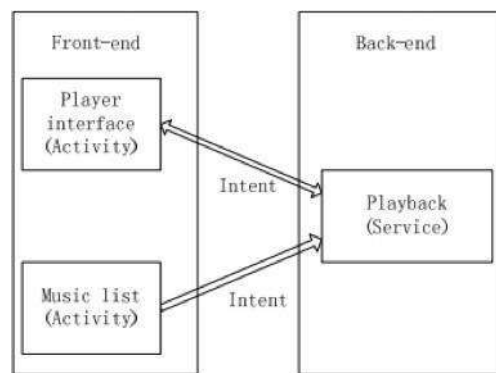
Figure 1. the architecture of music player

Fig.1. Front-end and back-end integration of the musical app.
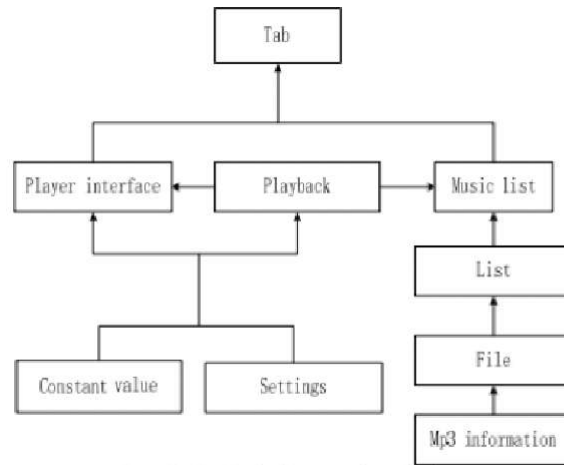
Figure 2. the block diagram of music player

Fig.2. Basic flow chart of the working of the musical app.

5 Technologies Used

Flutter:

Flutter is an open-source UI software development tool kit offered by Google. It is a cross-platform tool which means it enables one to create an application for android devices as well as ios devices. flutter uses dart language to make applications app packages and services used Dart SDK ">=2.12.0 <3.0.0" implies the version of dart sdk varies from 2.12.0 to 3.0.0

cupertino_icons: ^1.0.2 is the package which is used to get the icons present in the default section of every ios device permission_handler: ^8.1.6 s the package which is used to get the permissions from the user in order to enable particular features of the app, in our app, it is used to get the access of local storage [3].

audio_manager: ^0.8.2 is the package which is used to manipulate a song for example seeking its seebar , forwarding, playing, pausing, etc

provider: ^6.0.1 s the package which is used to handle state management, provider works on the concept of generalizing 3 categories. sender, receiver, middleware, it increases the efficiency of the state management

fluttertoast: ^8.0.8 s the package which is used to display different types of toasts like success, error, warning, and information in flutter applications.

google_nav_bar: ^5.0.5 s the package which is used to Style tab globally with GNav's attribute, iflutter_audio_query: ^0.3.5+6is a package that allows you query for audio metadata info about artists, albums, songs, audio files, and genres available on the device storage [5].

NodeJs:

Nodejs is an asynchronous event-driven javascript runtime that is built on a chrome v8 engine. Nodejs is a free opensource server environment that was introduced on 27 May 2009 by Ryan Dahl. The official definition of Nodejs is "Node.js is a platform built on Chrome's JavaScript runtime for easily building fast and scalable network applications. Node.js uses an event-driven, non- blocking I/O model that makes it lightweight and efficient, perfect for data-intensive real-time applications that run across distributed devices." Nodejs is easy to understand and implement. It comes with various library supports like Expressjs, Sailsjs, SockJs etc. This project will be using ExpressJs library to create a web server with middleware's support. It will be developing RESTful APIs (API: Application Programming Interface) with proper error handling and middleware's for authentication and authorization. Nodejs will also interact with

the MongoDB database to manage CRUD operation in APIs. It is going to follow the MVC structure without V, (M : Modal, C: Controller, V: Views). The routes will be based on two main categories: the Users requests route and Songs' request route [4].

MongoDb:

MongoDb is a free open-source NoSQL database used for high volume data storage. MongoDb was released in February 2009 by MongoDB Inc. Unlike SQL databases, which use tables and columns, MongoDb uses collections and documents. MongoDb provides support to many different languages and technologies like C, C++, Nodejs, Python, Ruby, etc. This project will be using MongoDb with Nodejs. For easy implementation of MongoDb with Nodejs the most important library is 'mongoosejs'. It makes CRUD operation with MongoDb database easier and simpler to apply. Also, there is a wide community that uses this combined tech stack which provides a lot of support for freshers. In this project, there will be a single database with two collections focused on Users' and Song's details. The NodeJs RESTful APIs will be used to interact with the database collections and documents.

Python Libraries used for Machine Learning:

Pandas-Pandas is the library used in python to interact with databases and perform various operations on databases. These operations are required to perform various data exploratory analysis which includes data preparations like null values removal, removal of outliers, removal of duplicate values, etc. Numpy- Numpy is a python library used to perform mathematical operations and for creating and editing arrays. Matplotlib-Matplotlib is a data visualization library of python which is used to achieve graphical representation of the data which can be further used in exploratory data analysis as well as to observe trends in the data which can be used to decide better models' prediction on our model. Seaborn-Seaborn is a Python data visualization library based on matplotlib only. It provides a high-level interface for drawing attractive and informative statistical graphics. Sklearn-It is a python library that contains various both supervised and unsupervised machine learning algorithms. In this, it is getting a k-means clustering algorithm from here only. Random-It is a python library that is used to generate random outputs from a fixed set. Librosa- Librosa is a python package for music and audio analysis. It provides the building blocks necessary to create music information retrieval systems. JSON-Python library used to open, create or delete JSON files. OS-Python library is used to open, create, or delete files and folders in directories. Tensorflow- TensorFlow is a free and open-source software library for machine learning and artificial intelligence. It can be used across a range of tasks but has a particular focus on the training and inference of deep neural networks. Tensorflow is a symbolic math library based on dataflow and differentiable programming. [5]

Some ML algorithms used:

1. **KMeans:**

```
from sklearn.cluster import
KMeans km = KMeans(
     n_clusters=3,   init='ran-
  dom',            n_init=10,
  max_iter=300,           ran-
  dom_state=42
  )
y_km = km.fit_predict(X)
```

2. **CNN:** Convolutional Neural Networks: A **Convolutional Neural Network (ConvNet/CNN)** is a Deep Learning algorithm that can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image, and be able to differentiate one from the other. The pre-processing required in a ConvNet is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, ConvNets can learn these filters/characteristics.

6   Test of Music Player

We tested the music player after implementing it. The music player can achieve the functions we designed, such as showing the current music name with marquee style, playing status, the current/total time, progress bar, fast forward and fast- backward, etc. the player will close if you choose the exit on the menu. The player stores the current music automatically when the player is closed and plays the music automatically when the player runs next time.

The result is shown in Figure 5.

7   Future Scope

This app will link the social media of our users to our app to gather information about the user of what kind of mood he/she is currently in and hence, recommend the best songs according to the user's mood. This app will personalize the music in a more enhanced way for the user according to his/her mood and music taste. This app will make our songs database much bigger than it is right now to provide more options to our users.

This app will also promote and give fair opportunities to small bands/artists and indie music. This app will make a separate personalized artist's portal that will be handled exclusively by the artist himself where he can give updates for his upcoming songs/albums/live events.

8   Results (Screenshots of UI)

Fig.3. Welcome Screen

Fig.4. Home Screen of the Home Screen

5
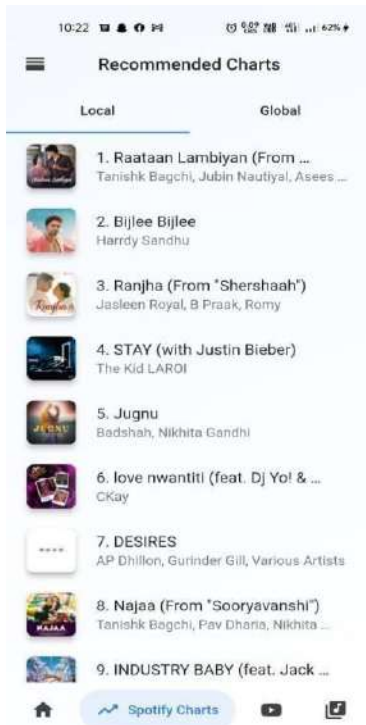
Fig.5. Recommended Playlist System
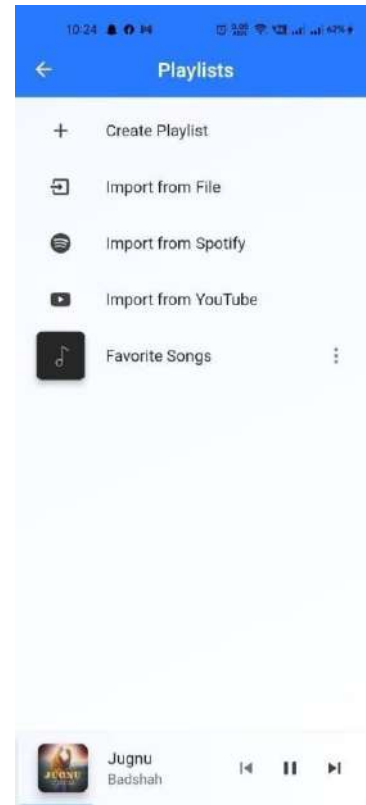
Fig.6. Sidebar with Shortcuts
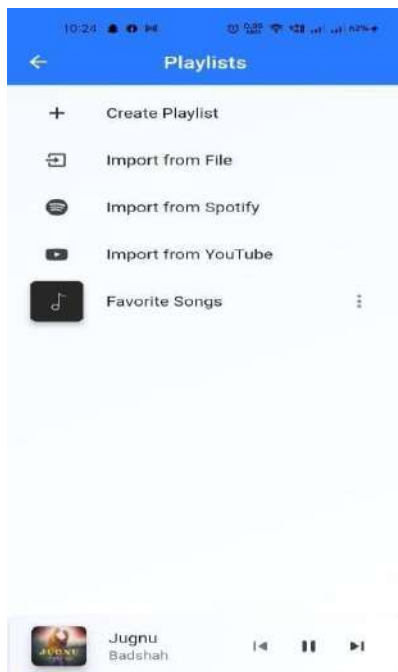
Fig.7. Sidebar With Shortcuts

Fig.8. Song Playing Upcoming Recommended Songs

9   Conclusion

Hence, this successfully completed our research on how to build a musical app using the technologies mentioned above. It was successful in recommending the music according to the user's taste in music by using Machine Learning Algorithms. It was successful in making the playlist consisting of songs according to their niche/genre through Machine Learning Algorithms. It was successful in providing a user-friendly interface to our users. It provides more exploration of new music according to the genre/niche of the recent songs played by the user. It was made to study different properties of audio and successfully exploit them in order to achieve our goals of providing the best variety of songs. It was successfully designed in such a way so that it could adapt to future changes as planned and mentioned in its future scope.

10   References

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A Review of Job Recommendation systems using Machine Learning algorithms

Meenu Ahalawat[1], Nikunj Aggarwal[1], Ashish Singh[1], Divya Maunikhiya[1] and Anupam Sharma[1]

[1]Guru Gobind Singh Indraprastha University, New Delhi, India

Abstract. In today's world the job market is becoming more and more dynamic which is why finding an appropriate opening for oneself is a tedious task especially for the beginners who don't have much experience about the various available roles. For this reason, job recommendation systems have been continuously growing their demand. There are many platforms which are using recommendations for providing personalized results to their users. In this paper we are taking into consideration various Machine learning algorithms along with recommendation algorithms by reviewing job recommendation papers. The student's resume data is matched with the job openings requirements. In recommendation system applications are analysed to extract the data like users' skills, experience, previous job history, demographic information and other necessary details. Depending upon the extracted data, the job seeker is suggested withnew jobs other than what is being searched for. From supervised machine learning classification algorithms i.e., SVM, KNN and Random Forest, we researched that Random Forest algorithm provides the best results for our application by applying collaborative filtering. The recommendation system is implemented in python.

Keywords: Machine learning, Job Recommendation, K-Nearest Neighbour, SVM, Random Forest, Collaborating filtering.

1. Introduction

Nowadays, anything we search on the internet recommends something in return. All of this is using an information filtering process to provide personalized results by predicting user's preferences to specific items. Using this interesting technique many organizations are making tremendous profit and this is also useful for an individual's growth. We researched many papers which are experimenting with their efficiency based on many aspects. We believe for the beginners who are looking for suitable job openings based upon their skills and profile, it is extremely useful to suggestthe most appropriate openings to them. This solution can ease their job hunting, which is the key problem of the job providing websites that only show requirements and job description to their users. We consider a specific recommender system domain, that of job recommendations, and propose a novel method for this domain using classification algorithms. This domain easily scales to billions of items including user resumes and job postings, as well as even more data in the form of user interactions between these items. In addition, according to Yingya Zhang et al. [1], many E-commerce websites, the most general application of recommendation algorithms, uses collaborativefiltering algorithm without considering the user's resume and item's properties in this case, that means students' resume and details of recruiting information. So, we proposed an improved

algorithm based on item-based collaborative filtering. The aim of the present paper is to give an effective method of recommendation for online job hunting using few of the famous classification algorithms. further studies on filling users' preference matrix with implicit behaviour will be summarized in our next study. Classification algorithm is the process of recognizing, understanding, and grouping ideas and objects into present categories or "sub-populations." Using pre-categorizedtraining datasets, machine learning programs use a variety of algorithms to classify future datasets into categories. This is applicable to the text analysis applications which is our research field, a widely used example of it is sentiment analysis where a properly trained model produces very accurate results.

Furthermore, in this paper we discuss in detail about which of the recommendation types we are using and why and also which of the classification algorithms provides best results to our system. This paper is divided into five sections. Section 2 talks about the related work of recommendation systems. Section 3 describes the design and algorithms which are used to find out the preferred one. Section 4 concludes our findings and contains reviews concerning the system. Thereafter, section 5 provides insights into the future work.

2. Related Work

Job Recommendation Systems

Job Recommendation Systems (JRS) are being studied from various perspectives and manydifferent technical approaches have been implemented for their development. Otaibi et al. [2] conducted a survey of distinct recommendation systems while Wenxing Hong, et al. [3] looked at the differences between traditional Recommendation System (RS) and JRS. The approach used bythe recommendation systems is user profile processing and storage of the inputs of the User followed by application of different recommendation strategies.

The Recommendation Systems types include Content-Based Filtering, Collaborative Filtering, Knowledge-Based Filtering and Hybrid Recommendation Systems which implement multiple techniques in order to converge to a more accurate recommendation but this is the complex approach. Alghieth et al. [4] proposed a collection of all the other recommendation systems and their specifications, like some of these are Casper, Proactive, Prospect, eRecruiter, iHR+ and a DNN Model for Job Matching.

The one which is simple and provides efficient results is Collaborative filtering. This review paper takes basic methods of recommendation into consideration since –

- Requires minimal knowledge engineering efforts
- Users and items are symbols without any internal structure or characteristics
- Produces good-enough results in most case

Collaborative Filtering (CF) has two basic types: User Based CF and Item Based CF.

- User-based CF: find other users whose past rating behaviour is similar to that of the current user and use their ratings on other items to predict what the current user will like.

- Item-based CF: Rather than using similarities between users' rating behaviour to predict preferences, item– based CF uses similarities between the rating patterns of items [5]. Item based approach is usually preferred over user-based approach. Item–based CF uses similarities between the rating patterns of items. Since finding similar items is easier than finding similar users, and attributes of items are more stable than users' preference, item-based methods are suitable for off- line computing [6].
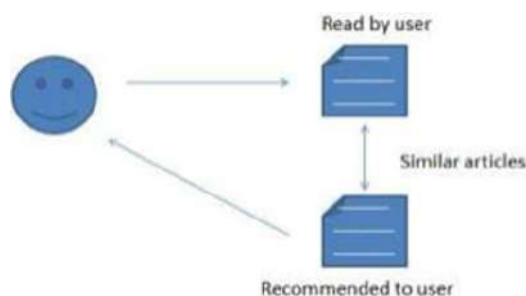
Figure 1. Content Based Filtering Method et al. [7]

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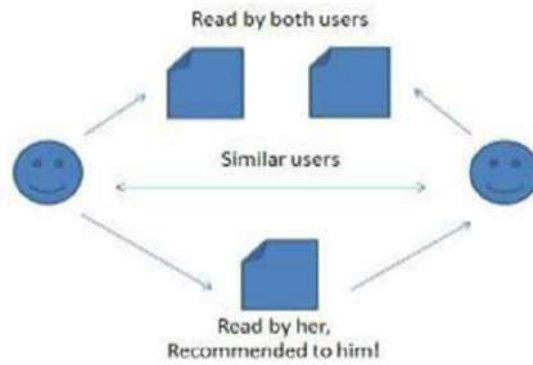
Figure 2. Collaborative Filtering Method et al. [7]

3.   Methods and Techniques

Every model comes with a different focal length. It puts certain things in focus.

This section provides an overview of the most popular types of machine learning (ML). Machine Learning is categorised into three categories mainly that are supervised, unsupervised and reinforcement. Whereas classification is an algorithm which can be used by any ML type. Classification can be performed on structured or unstructured data. Classification is a technique where we categorize data into a given number of classes. The main goal of a classification problem is to identify the category/class to which a new data will fall under.

Following are the few of the machine learning classification algorithms that are used to analyse the prediction accuracy.

K Nearest Neighbour

K-Nearest Neighbours (KNN) is one of the most basic yet essential classification algorithms in Machine Learning. It belongs to the supervised learning domain and finds intense application in pattern recognition, data mining and intrusion detection. KNN was born out of research done for the armed forces. Fix and Hodge – two officers of USAF School of Aviation Medicine – wrote a technical report in 1951 introducing the KNN algorithm.
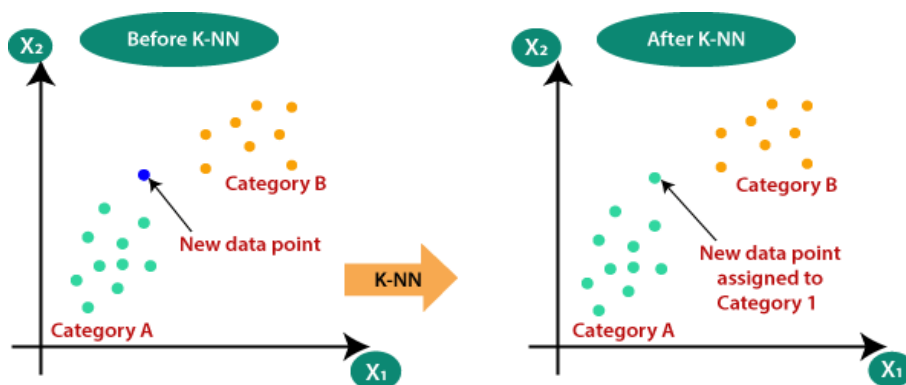
Figure 3: Classification algo approach for recommendation

This algorithm takes some prior data (also called training data), which classifies coordinates into groups identified by an attribute. It is widely integratable in real-life problems since it does not makeany underlying assumptions about the distribution of data. The KNN algorithm is used to measure the closest distance between training data and test data to produce job recommendations. KNN is amachine learning algorithm to find clusters of similar users based on common skills, and make predictions using the average skills of top-k nearest neighbours. To get the right K, you should runthe KNN algorithm several times with different values of K and select the one that has the least number of errors. For example, we first present user skills in a matrix with the matrix having one row for each item (job opening) and one column for each user (job seeker), we then group by job requirements and create a new column for total skills count. We combine the skills data with the total skills count data, this gives us exactly what we need to find out which jobs are similar and filterthem from the rest of the jobs.

Boons of KNN

- Quick calculation time
- Simple algorithm – to interpret
- Versatile – useful for regression and classification
- High accuracy – you do not need to compare with better-supervised learningmodels
- No assumptions about data – no need to make additional assumptions, tune severalparameters, or build a model. This makes it crucial in nonlinear data cases.

As proposed by Joshua Suharyadi [11], the knn algorithm provided a satisfactory outcome of 85% accuracy for their experiments which is sufficiently good enough. For their job recommendation system, it includes data cleaning, extracting, selecting and reducing to get appropriate data. Again,by Kashvi Taunk et al. [8] it is researched that since there is no training involved in KNN, it is fasterand has fewer parameters to tune. Proper scaling must be done for a proper result. KNN, with its computational simplicities, serves a number of purposes that other classification methods cannot incorporate.

Support Vector Machine

Support Vector Machines (SVM) is a classification method that separates data samples using the geometric notion of hyperplane. The SVM is an easy-to-understand algorithm if the data is alreadyclassified then we can directly use it to draw the hyperplanes and divide the data in segments, eachsegment should have only one class of data. The SVM is really accurate and beneficial inclassification primarily. This technique is used to minimize the errors in classification. The greatermargin in the divided segment by hyperplane leads to better results. The hyperplane is picked afterchecking all the possibilities and choosing best out of it.

According to Sung Hwan Min et al. [10] SVM implements the principle of Structural Risk Minimization by constructing an optimal separating hyperplane in the hidden feature space, using quadratic programming to find a unique solution.
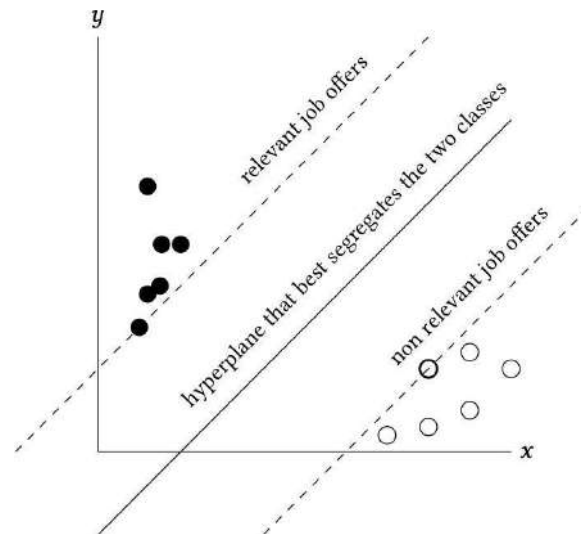
Figure 4: Example of 2-dimensional Support Vector Ma- chine. The method consists of looking for thehyperplane that maximizes the separation between the two given classes

The aim here is to find the hyperplane that best segregates the class of relevant job offers from the class of non-relevant job offers. When the new data is added then again, we try to find the hyperplane which segregates the best. According to Jorge Martinez Gil et al. [9] SVM has many advantages:

• SVM has a regularization mechanism which allows avoiding over-fitting (a.k.a. geo-metricmargin)

• SVM is defined by an optimization problem for which there is a number of existing efficientsolutions

• SVM provides an approximation to a bound on the test error, which makes it very

robustSVM also has an additional advantage that consists of using kernels.

The SVM can be optimized using Genetic Algorithm. This algorithm can optimize SVM in twoaspects:

Feature Subset Selection and Parameter Optimization.

According to Sung Hwan Min et al. [10] GA differs from conventional non-linear optimization techniques in that it searches by maintaining a population (or data base) of solutions from which better solutions are created rather than making incremental changes to a single solution to the problem

As said by Jorge Martinez Gil et al. [9] The SVM has been accurate having accuracy of 100% for salary driven profile, 75% for distance driven profile and 87.5% for highly paid hour pro-file.

Random Forest

Here, Random comes from the fact that we perform two random processes which are **boot-strappingand random feature selection**. We use *random sampling with repetition* to make dif-ferent datasets, this process is called bootstrapping and the datasets we obtain are referred to as bootstrapped datasets.
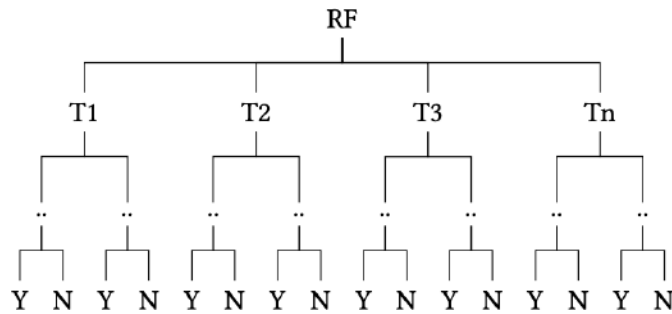
Figure 5: Example of Random Forest bagging N decisions trees. Each decision tree gives a vote fora given class. Then, the random forest chooses the classification having the most votes.

Also, we select a subset of features of each tree and use only them for training, ideally, we choose **sqrt(total_features) or log(total_features)** as size of our subset of features that we use for furtherevaluation. Similarly, word forest is used as we are using multiple decision trees to interpret the desired results. Suitable for large data sets, where interpretability isn't a concern, as these contain multiple decision trees so it becomes more difficult to interpret. In a random forest, we pass a data point through each tree and note down the prediction made by that tree, then we combine all those predictions and take the majority voting as our final prediction. *This process of combining results from multiple models is called aggregation.*

So, in a nutshell, *Random Forest is a combination of Bootstrapping and Aggregation which is collectively called Bagging.* Using these two processes this model controls over-fitting. Accuracy using Random Forest is directly proportional to the number of decision trees used. The accuracy using the given data set in the research paper by Binny Parida1 et al. [7], using Random Forest Classifier came out to be 94.54%.

Boons of Random Forest:

• In general, Random Forest has only one parameter to configure, the number of trees in theRandom Forest.

• The results obtained by Random Forest are easier to interpret than other models.

• Generally, Random Forest can be effortlessly extended to support multiple classes.

• Random Forests are based on principles of probability, i.e., probabilistic principles.

4. Conclusion

Recommendation and classification systems are acquiring much interest within the scientific community. In this section, the conclusion of the closest related works to the research proposed in this article are presented. After studying these algorithms and their results, we have concluded thatKNN takes more computational time than SVM and SVM also takes more time than RF especiallyin non-linear classification. In the job recommendation system, we do need to consider many parameters which leads to failure of KNN while SVM and RF, both perform better when parametercount is high. RF works in a more intuitive way; it understands the interactions between the differentparameters while SVM follows a more result focused approach.

In the end, we have seen that RF and SVM provide promising results for automatic job recommendation systems. SVM can be more optimized if we use Genetic Algorithm. The RF can be more precise as the number of decision trees increases.

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5.   Future Work

The Recommendation system suggests us from the massive amount of information. It recommendsthe exact item rather than an overload of information. Recommender system gained popularity in recent years due to its success over a huge amount of data. From our studies we come to the conclusion that we can do some user behaviour analysis using temporal information that we have in our impression and interactions datasets. Moreover, to make the recommendation system more dynamic in our future work we could experiment using complex algorithms like a hybrid of RF withSVM and also a hybrid of content filtering with collaboration can lead us to more accurate results.

6.   Declaration

This work was performed under the guidance and supervision of Dr. Anupam Sharma. Meenu Ahalawat and Nikunj Aggarwal contributed equally to this manuscript. Authors declare no competing interests.

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SOCIAL MEDIA PLATFORM FOR COLLEGE STUDENTS

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Abstract. Social media apps provide analysts with a wide range of data to study behavioral aspects of our every-day lives and to answer societal questions. Although social media data analysis is booming, only a handful of prominent social media apps, such as Twitter, Foursquare, Facebook, or LinkedIn are typically used for this purpose.This paper reviews 110 social media apps and assesses their potential usability in geospatial research through providing metrics on selected characteristics. About half of the apps (57 out of 110) offer an API for data access, where rate limits, fee models, and type of spatial data available for download vary strongly between the different apps. To determine the current role of social media platforms that offer an API in academic research, a search for scientific papers on Google Scholar, (ACM) Digital Library, and the Science Core Collection of the Web of Science is conducted. This search revealed that Google Scholar returns the highest number of documents (Mean = 183,512) compared to ACM (Mean = 1895) and WoS (Mean = 1495), and that data and usage patterns from prominent social media apps are more frequently analyzed in research studies than those of less known apps.Results show that among these 57 platforms, for 26 apps at least some papers evolve around geospatial discipline, such as Geography, Remote Sensing, Transportation, or Urban Planning. This analysis, therefore, connects apps with commonly used research themes, and together with tabulated API characteristics can help researchers to identify potentially suitable social media apps for their research.

Keywords:API; data access; fee models; Google Scholar; Web of Science; ACM Digital Library.

1   Introduction

Numerous social media apps have evolved in the recent years and significantly enhanced information sharing and networking capabilities among their users. Undeniably, these apps have permeated many aspects of modern life in our society.Largely aided by the proliferation of smartphones and their use today, social media apps are increasingly location-based, providing analysts with access to a wide range of shared spatial data, such as check-ins, geo- tagged images, video clips or text messages, or reviews of businesses and other localities. Based on these data, research studies provide valuable insights into spatio-temporal aspects of marketing, event detection, political campaigning, disaster management, migration, transport, natural resource management, human mobility, urban planning, tourism, epidemics, and communication.

Although hundreds of social media apps have been developed, only a handful of them are commonly used in research, including Twitter, Facebook, Flickr, Foursquare, YouTube, LinkedIn, or Yelp. The presence of user selection bias, based on age, gender, socio-economic status, etc., is a well-known phenomenon in social media use. For example, Twitter shows a bias towards male users and an under-sampling of Hispanic and African American users in certain regions of the India. User characteristics also vary between the different social media apps. For example, a survey conducted in found that Snapchat and Instagram are used primarily by young people, while YouTube and Facebook are more widely used by older generations. The same study showed thatLinkedIn is more biased towards higher-income users (>$75,000 per year) than other apps such as WhatsApp or Snapchat. Popularity also varies per region. WeChat, for example, is popular in China whereas Vkontakte is widely used in Russia . In general, the country where an app has been developed draws also a strong user base for that app. Examples include Dronestagram (France) or Mapillary (Sweden) . Different apps vary in the topical focus and therefore attract different users. For instance, Doximity is popular with medical professionals whereas Dronestagram attracts drone pilots who like to share airborne imagery. Due to these many facets of user selection bias, analysis results drawn from a single app may be biased as well. In consequence, having access to data from a wider range of social media platforms that reach different user groups in different geographic regions might, therefore, help to reduce user selection bias and its effect on analysis results, if combined in joint data analysis.

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2   Literature Review

Social media is a group of highly interactive platforms that use mobile and Web 2.0-based technologies to facilitate the creation and exchange of user-generated content. Social media apps can be classified by purpose and function, which include social networking, microblogging, blogging, photo sharing, or crowdsourcing. One of the first social media apps whose features are mirrored by today's popular social networks, such as Facebook, was SixDegrees, which was launched in 1997 and shut down in 2001. The wide reach of social media benefits businesses, emergency and disaster management, and the tracking of epidemics and diseases. Social scientists pioneered the use of social media data for ethnographic studies that give better insights about people's behaviors and opinions Currently, over 9000 tweets are sent out per second and over 1000 photos are uploaded on Instagram per second. This abundance of generated data is critical for real-time monitoring especially in emergency management and crisis mapping. Research pertaining to social media has been largely facilitated by data access through APIs. The availability of APIs in platforms such as Wikipedia, Twitter, Facebook, or Foursquare led to an increase in data services, software tools for analysis as well associal media analytics platforms. API documentation provide detailed information about the API functionality and a description of data retrieval. APIs allow third parties, such as games or productivity apps, to leverage friendship connections through regulated, programmatic access to recorded connections between registered users. Access to public data that is published on the web may require login credentials in order to be able to enforce download limits and to oversee access to data. For this purpose, social media sites have instituted authentications using keys and tokens. For example, Flickr allows up to 3600 queries per hour and Twitter has varying rules for rate limiting on its APIs, such as 15 calls every 15 min. Rate limits prevent abuse of data access and enhance security although this stifles generativity (i.e., third party use of the social graph to create innovative products or new insights into data). API rate limiting can be implemented through request queues, throttling API calls (i.e., disconnect client or reduce bandwidth), and the implementation of rate limit algorithms.

Because of the Facebook Cambridge Analytica data breach, some social media apps have deprecated certain API methods or shut them down completely to protect user data and control its use. For example, Facebook recently further restricted data accessibility and the 500px API is now available through paid subscription only.

The important role of social media for scientific research becomes evident by the sheer number of papers analyzing data from social media platforms. Various review studies and meta-analyses provide an overview of how data extracted from different social media platforms are analyzed, and how social media apps are used in different contexts and environments. For example, one paper reviews literature on the use of social media in academia. It distinguishes between several categories of social media use, including social networking, social data sharing, video, blogging, microblogging, wikis, rating, and reviewing. It reports that the percentage of scholars who use social networking apps (e.g., Facebook, LinkedIn) for professional purposes is much lower than the percentage of scholars who use it for personal reasons. It also points towards a large variability in usage of different platforms among scholars, with numbers ranging between 10% for Twitter, 46% for ResearchGate, and 55% for YouTube. Another systematic review analyzes social media use for public health communication among the general public, patients, and health professionals based on 98 original research studies. These studies included a range of social media tools and apps, with Facebook, blogs, Twitter, and YouTube being the most often reported tools. A review of 279 research papers describes the emerging role of social media in tourism and hospitality, which has only a short history. Fewer than 10 papers were published in 2007, followed by a strong increase in the annual number of papers published. Popular keywords identified in analyzed publications include marketing, consumer behavior and user-generated content. A review of 48 publications that focused on the use of social media for the assessment of nature-based tourism showed that images from Flickr were most often used (36 papers), followed by Panoramio images (10 papers), and Instagram images (6 papers). Point location data collected from social media platforms were mentioned in 40 papers and temporal data in 12 papers.

3   Data and Methods

Data from social media

Apps A total of 110 social media apps were examined for this study. We grouped them into the following nine thematic categories: general purpose, lifestyle, photo sharing, blogging, video sharing, business, reunion networks, gaming, and travel. The initial list of social media apps and categories were adapted from two sources Some of the apps listed in these sources were removed from the analysis since they were no longer active, namely 43Things, Delicious, Fotolog, Friendster, Kiwibox, Google+, Path, Sprybirds, StumbleUpon, TravBuddy, Tournac, Tout, Uplike, and Vine. New apps that were recently launched, such as Tiktok, Bumble,and Medium, were added to the list. Apps with an API are marked with an asterisk (*) in. Since the geographic prominence of an app can be ISPRS Int.

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J. Geo-Inf. 2020, 9, 526 5 of 20 influenced by the country in which it was launched, the table also provides the latter information for the listed apps.

Number of Related Research Papers

Three academic paper catalogs (Google Scholar, ACM Digital Library, WoS) were searched to (a) quantify research efforts related to the different social media platforms that provide an API and to (b) identify geospatial science topics covered in these research papers. Those three catalogs are commonly used for paper retrieval in review and meta-analysis studies.

Google Scholar is the most popular and largest search engine for scientific research books, articles, theses, abstracts, and court opinions from academic publishers, professional societies, online repositories, universities, and other web sites. ACM Digital Library gives access to journals, conference proceedings, technical magazines, newsletters, books, and conference papers that cover a wide range of research themes but generally focus on computing.WoS is a database that offers search capabilities for articles written back to 1900 and contains information gathered from thousands of scholarly journals, books, reports, and conferences. It also has the "analyze results" feature that can be used to get an overview of thematic categories of articles, conference papers, and books that are returned from a search related to a specific social media app. This "analyze results" feature provides further information about funding agencies, type of document published (articles, reviews, or proceedings paper), countries where the research was conducted, and the authors that have investigated the topic, among others.

For the search process, the names of the social media apps with APIs (57 apps in total) were used as search parameter one after another to retrieve papers whose title, abstract, or keyword sections contained those names. Only in ACM can one conduct searches by exclusively looking up title, abstract, or keywords. Google enables searches for titles or the entire article whereas in WoS one can use the "Topic" field, which looks up the title, abstract, and keyword. One challenge in this process is semantic search limitations, especially with homonyms. For example, social media app names that are also English words such as "Discord", "LINE", and "Medium" led to inflated results from all the catalogs and especially for Google Scholar. To reduce the number of irrelevant hits in search results, the search term was combined with the word "app" for "Medium", "LINE", and "Minds" for all three search catalogs.

Analysis Methods

This research involves a variety of qualitative and quantitative methods for the analysis of 110 social media apps that are related to the three research objectives mentioned earlier.

Presence and Characteristics of APIs

Social media data can be acquired through web scraping, data resellers, or APIs. Examining the presence of an API is critical as it eases the data collection and integration process. API documentation provides information about data that are accessible through different API endpoints. For this research, availability of spatial data was one of the aspects of interest examined.

Through online search and exploration of API directories such as Programmableweb , it was determined which of the 110 apps provide an API. These shortlisted apps were subsequently closely examined with regards to API characteristics, such as rate limits.

API rate limiting affects the amount of data that can be accessed within a given time or it limits the number of requests or calls a client can make, respectively. It is critical for scalability, security, and sustainment of an API.

The API documentation was also examined for presence and type of location data that were collected by the different social media apps. Geographic data provided through social media comes typically in the form of text (place names, addresses), geographic coordinates (latitude and longitude), or coordinates of the centroid of an administrative boundary (e.g., city, county, or country). This, in turn, determines the spatial resolution of the social media data set, which will subsequently affect the type of research that can be carried out.An independent samples T-test was conducted to examine whether apps with a larger user base were more likely to provide API data access. Similarly, a second T-test was conducted for apps with APIs to explore the relationship between user numbers and the availability of spatial data through the API.

Academic Research Extent and Research

Themes Social media platforms have been the subject of numerous research studies across a wide range of disciplines. Whereas especially prominent social media apps appear to have attracted the analysis of its data and users, little is known about the role of less prominent apps on research activities. To narrow this research gap and to better understand the extent and current trends in research related to these platforms, two types of analysis are conducted. First, by using the names of social media apps with APIs (see Table 1) as search criteria on Google Scholar, ACM Digital Library, and WoS, the number of published documents, as counted by these online catalogs, is retrieved and discussed. An independent 20 samples T-Test is conducted for each of the three catalogs to examine whether a larger user base of a social media app is associated with a larger number of reported research documents. Second, to get an overview of the geospatial fields that apply social media analysis, the "analyze results" feature in the WoS platform was used for each social media app that comes with an API. This feature highlight's different themes that the returned

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documents cover and illustrates, therefore, which social media app is associated with which discipline, including geospatial fields. The discovery of themes is based on title, abstract, and keywords of returned papers. The results of these two steps provide both quantitative and topical information about ongoing research related to a wide range of social media platforms with APIs. This information is meant to assist researchers with the identification of social media platforms that offer data related to their geospatial discipline (e.g., transportation) and in conveying a first idea about the abundance of research already conducted for each platform.Furthermore, using title and abstract from each returned paper on WoS, a word cloud was created for selected categories of social media apps with APIs. This step highlighted terms commonly used in papers associated with different apps.

4   Results

User Statistics

The numbers of registered users for each of the 110 apps were retrieved through online searches. User statistics for the apps are summarized in, sorted in alphabetical order, together with year and month of the count. For 12 apps the number of registered users could not be determined. Facebook has the largest user base with over 2.4 billion users, followed by YouTube with 2 billion users. We hypothesize that user numbers can be used as a proxy for the availability of an API and the abundance of research literature found in relation to a social media app, which will be subsequently explored.

Availability of APIs and Spatial Data

APIs, where available, provide a gateway to social media app data either through a REST API or through GraphQL. The latter has recently become a more widely used alternative to REST APIs. Out of the 110 apps examined for this study, 57 apps provide an API Some apps provide multiple APIs for accessing different endpoints with specific datasets

With large user numbers are more likely to provide an API than those with smaller user numbers. An independent samples T-test showed that the 53 out 57 apps with an API and known user counts had higher user numbers (Mean (M) = 345,582,491, Standard Deviation (SD) = 540,839,941) compared to the 53 apps without an API (M = 70,684,659, SD = 146,634,689), t(df) = 96, p < 0.001. Furthermore, among those apps with an API, an independent samples T-test showed that the mean number of users was higher for apps that provided spatial data in their API (M = 395,848,485, SD = 574,334,200) than for those apps that did not (M = 262,643,600, SD = 483,078,816), t(df) = 51, p = 0.015.

 All APIs require users to register their apps to obtain API access credentials, such as an ID number and API key. API access requests for most apps were immediately approved, but for apps, such as Untappd or Facebook, this process takes some time.

Fig 2: Social Media Sites with Approximate User NumbersRate limiting methods were applied to numerous APIs . For a few apps, such as DeviantArt, Discord, Last.fm, and LINE, which do not have a set rate limit, an effective rate limit varies depending on the frequency at which clients make requests and its effect of the app stability. For others, such as 23 and Me, eToro, and Goodreads, rate limitations were not disclosed. Doximity, Flickr, Imgur, Pinboard, and Pinterest have fixed API request rate limits. Besides setting rate limiting per given time, rate limits can also be implemented through fees. Most of the apps provide free access or a mix of free and paid subscriptions. For example, Twitter charges for access to its Premium and Enterprise APIs, whereas the Search and Streaming APIs are free of charge. Foursquare and Photobucket are free for noncommercial use but charge fees for commercial use of their APIs. As opposed to this, WhatsApp Business, Pinboard, and 500px APIs provide access through paid subscriptions only.

The apps that collect and share spatial data provide different types of location information, such as coordinates of the centroid of an administrative boundary. Based on information from the terms of service and privacy policies of various apps, location data was not provided in the APIs of a few apps even though it is collected in the background using IP addresses. In summary, 22 apps did not provide access to spatial data while 35 provided place name, geographic coordinates, or both through the API according to their API documentation (Table 3). Some APIs, such as that of Last.fm, allowed only running spatial queries, such as using the geo.getTopTracks or geo.getTopArtists API methods to query these endpoints using country names. Location data from several apps stems from user profiles only while a few apps, such as Twitter, Facebook, and Instagram provide spatial data affiliated with multimedia, such as pictures, videos, or text. 500px provides this information only once a paidsubscription is made. The Flickr API is the only one that reports the accuracy of the coordinates it provides. Although provides information about rate limits, costs, and location data, additional limitations as to whosedata can be downloaded may apply. In some cases, only one's own data can be accessed through the API, or those from other users who gave specific permission as specified, for example, for the Facebook Graph API or the WeChat API .

Research Papers on Google Scholar, ACM Digital Library, and Web of Science

Apps such as Facebook, Instagram, Twitter, and YouTube had the highest numbers of papers published about them, indicating that they are prominent platforms within the research community. These are also the apps with high user numbers. To quantify these results in more detail, first, the median of user numbers across social media apps in (where available) was computed as 100,000,000. Next, each app was assigned to one of two groups, namely either the one group that contained apps with user numbers below the median or the other group with user numbers above the median. An independent samples T-test showed that in Google Scholar the apps falling into the upper user group had more paper counts (M = 331,516.9, SD = 543,184.4) compared to those in the lower user group (M = 75,528.58, SD = 227,738.4), t(df) = 49, p < 0.031. Similarly, in the ACM Digital Library the apps in the upper user group had more paper counts (M = 3766.5, SD = 6928.3) than those in the lower user group (M = 283.9, SD = 640.8), t(df) = 49, p < 0.014. Furthermore, in the WoS the apps in the upper user group had more paper counts (M = 3220.3, SD = 8115.4) than those in the lower user group (M = 139.8, SD = 320.5), t(df) = 49, p = 0.059. In the case of WoS, the level of significance for the difference in means is slightly above 5%, whereas for the other two search catalogs it is below that value.

Minds, Solaborate, Kickstarter, and Mocospace APIs were among the apps with the lowest totals across the three catalogs when queried for papers. "Discord", "LINE", "Medium", which exist as English words, resulted in many irrelevant hits. XING, which is an app and a person's name, led to unrelated results as the catalogs also tallied papers that were written by authors with that name. The latter problem could be mitigated by excluding author name in the search criteria from WoS whose results were also used to create the word cloud. Mocospace, ProductHunt, Ravelry, Solaborate, and Untappd did not have any papers affiliated with these social media platforms on WoS.Reveals strong discrepancies in the number of returned papers between the three search portals. For each social media app, except for two platforms whose names also resemble an English term (Discord, Minds), Google Scholar by far outnumbers ACM and WoS search results. Google Scholar is one of the most widely used tools for researchers to search scientific information, and through parsing the entire Web its coverage is much more extensive than other multidisciplinary commercial databases like WoS or Scopus . However, only up to 1000 search results can be displayed on the Google Scholar Website, and no API is available for additional search. Results from an earlier study show that 55% of the more than 2.6 million sample documents covered by WoS from 2009 and 2014 were freely available in some form from Google Scholar, e.g., as open access documents from publisher Websites or through links to other repositories, such as researchgate or arxiv . ACM displays up to 2000 search results, where filters can be used to specify the subset of records to be displayed in cases where more than 2000 documents are returned upon a query. As opposed to this, the WoS allows to view all returned records by browsing through the result pages.

Research Themes

Research themes for papers returned from the WoS search were extracted using the "analyze results" feature. Out of the 57 apps with an API, 26 apps had spatial themes (Geography, Remote Sensing, Transportation, and Urban Planning). The frequency of the geospatial themes as found in the 3095 papers that are associated with those 26 apps are shown in . The bars are overlaid with the number of papers that were found to be associated with each spatial theme for the different apps. The apps are sorted in descending order of the total number of papers found to be associated with a spatial theme, starting with XING on top (1113 papers), followed by Twitter (674 papers) and QQ (532 papers). Several apps had only one paper with a spatial theme, such as Tumblr or Reddit. The dominating theme is Geography, which can be found in papers for all apps listed in the chart. The other spatial themes are less frequently discussed in research outlets, i.e., Transportation for 73% of the apps, Remote Sensing for 62%, and Urban Planning for 69%. Common non-spatial themes found in papers related to apps with APIs include Materials science, Chemistry, Physics applied, Biochemistry molecular biology, Engineering electrical electronic, Oncology, Nanoscience, Communication, Computer science information systems, and Environmental Sciences. These themes are not listed in though.

The overview adds to the existing body of knowledge by provision of topical research relevance for wide range of social media apps. As opposed to this, several earlier studies analyzed in-depth research activities associated with individual social media apps one at a time, such as Twitter or Facebook . These are, as can be seen in Figure 1, among the most widely analyzed social media platforms.

Shows word clouds formed by papers from WoS that are associated with social media apps that provide APIs, where apps are grouped by theme according to . No word cloud was created for the gaming category because Mocospace, which is the only app with an API in that category, did not yield any papers from WoS. The key terms for each word cloud generally align well with the theme that the set of corresponding apps was assigned to in . For example, papers on blogging revolve around networking, social media, health, and community.

Business app-related papers discuss trading, investment, decision making, and risk, whereas papers on photo sharing networks mention images, Instagram, Flickr, photo, or visual. The word clouds, therefore, demonstrate the different facets of activities and concepts that research papers discussing these apps cover in their analyses.

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5   Conclusions

The overall goal of this study was to explore the potential of less known social media apps for geospatial research by evaluating 110 social media apps, among which more than half were found to provide APIs. Among the list of 35 APIs that provide spatial data in form of place names or geographic coordinates, the spatial granularity of available data varies and, therefore, influences the type of research that it can be applied for. Spatial accuracy information from apps that provide coordinates is only given within the Flickr API. Aspects of future work include, therefore, the assessment of the quality of spatial data accessible in the 17 apps that provide location data through an API, even though they are rarely featured in geospatial research.Social media sites collect an ever-increasing amount of data from their users, but privacy concerns may render access to these datasets impossible unless it is anonymized, and personal information is removed. Even if so, ethical use of the data is required. Therefore, the future may bring more rigorous approval procedures of API access requests with even follow-up audits to ensure that data is being used as intended. Future work will closely examine the consequences of such anticipated changes in API regulations on the social media analysis.

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GPS BASED LOCATION TRACKER AND SHARING FOR ANDROID SYSTEMS

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ABSTRACT

We like to know the current location of our friends or colleagues to stay in touch at that time. For this social networking is brought into the applications. Keeping this idea in mind, this application has been created that allows users to easily locate the location of their friends using GPS (Global Positioning System). This will provide the global position of the device the user is holding himself. The application provides the ability to work with location and sensitive information. This will allow the user to login/register in the system. The application ensures that the personal and loclocation-basedformation of the user is never shared without the permission of the users. In order to access this application, the user has to be connected via internet. He can select particular friend from his user friend list with Android GPS based mobile phone and his GPS feature is activated, he can share his location through his favourite messaging app on his way to meet.

Key words: GPS (Global Positioning System), Location sensitive information, social networking.

1. INTRODUCTION

GPS tracking has many uses in today's world; So the system can be used to track property, car and people at any time. Mobile phone tracking is used to identify the location of mobile phone in static or moving position. Mobile applications are accessible through platforms that are either personal or organizational. The spread in mobile is responsible for applications such as LBS (Location Based Service), GPS (Global Positioning System), factory automation, gaming applications, mobile banking and order tracking applications. LBS and GPS are extensions of the mobile app. Localization is affected by multilateralization of radio signals between the network and the phone's (many) cell towers, or by simply using GPS. Mobile positioning is used for location-based services that reveal the actual coordinates of the phone. The system is low-cost, accurate, real-time, adaptive and uses the Google Maps API (Application Programming Interface) to display the location. It aims to develop a tracking and shared monitoring real time location tracking android application using GPS and Google Maps API.

2. LITERATURE SURVEY

Shalvi P, et al. (2014) has worked on GPS based friend tracker and online/offline smart reminder for Android, which offers by tracking the location of a friend at any time. Maintaining security during receiving and sending location. Working according to the time required to reach the target location. Also every phone has reminders but all are static, that means we have to set time to remind. They conclude that the system can perform the following operations and the future scope also depends on the performance of the system as expected. The system is able to detect a friend's location, and this information is then processed to display it on the user's phone.[1] Nurudeen K, et al.(2015) have worked on the implementation of GPS based object location and route tracking on Android devices to develop a system that will be able to trace the GPS position of the device and track its current route. Developing an algorithm that will enable end user bookmarks. Go back to that location using previous location and descriptive navigation mapping and

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draw the key concepts and developments for Location Based Service (LBS). [2]. Dalilah, H. A. A. (2014) presented in paper an accurate and reliable real time tracking system, using GPS (Global Positioning System) and GSM (Global System for Mobile Communications) services. The system allows localization of a portable tracked unit and transmits the position to the tracking centre. A GPS tracking system consists of a portable tracked device attached to a person, vehicle or any property and a tracking center where the location of the portable device can be monitored. The mobile tracked device receives its coordinates from GPS and sends these coordinates through GSM modem to the tracking center in the form of SMS, Testing shows that the system is low cost, accurate, real time and efficient for various applications. Serves its purpose of being adaptive.[3]. Chandra, A, et al. (2011) This application enables users to get their current location coordinates (latitude, longitude and altitude) and they can also view their locations on Google Maps. In addition, this application enables the user to share his location with his friends through a web server using the internet connectivity in his hands. GPS is a satellite-based navigation system made up of a network of 24 satellites placed in orbit by the United States (US) Department of Defense (DOD). GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS can show you your exact position on Earth 24 hours a day, anywhere in the world, in any weather condition[4]. Adusei, I. K., et al. (2004) have discussed the research issues involved in the development of LBS; These include highly accurate mobile positioning technology, roaming and billing issues, interoperability between operators (both national and international), and privacy or security issues associated with LBS.[5].

3. PROPOSED MODEL / METHODOLOGY

The existing models had either location tracking or some additional features. As the application progresses, features have been added to display a simple flow for the user to track live location, share location, and ask for help in an emergency. An Android application system developed to track location using object GPS device for location locating and a platform that provides the ability to share location and ask for help with advance features. The methodology used to build Android applications using the Android Software Development Kit (SDK) is the Java/Kotlin language. The Android Software Development Kit (SDK) includes various development tools. The Android SDK platform tools are downloaded separately which include command line tools like ADB and FASTBOOT. The Android Debug Bridge (ADB) is usedto run the command line on a connected Android device.
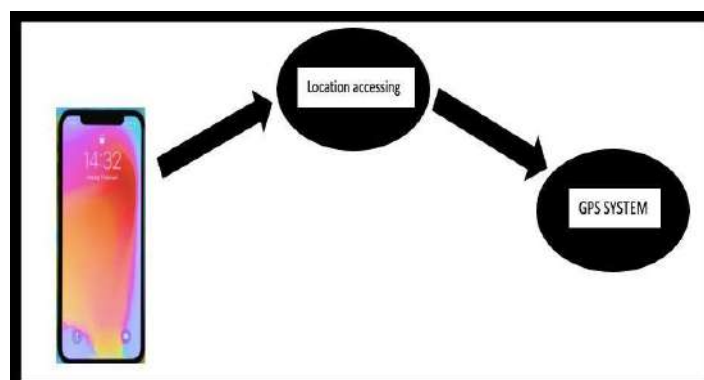
Fig 1 Location accessing system

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An important part of an Android application is the backend support that is provided by Firebase. Firebase is a Backend-as-a-Service (Bass). It provides a variety of tools and services to developers to develop quality apps, grow their user base. Firebase is built on Google's infrastructure. To access the location there are different API keys that are used to display the map in an application which are Google Maps API Key, MapmyIndia API Key etc.

4. EXPERIMENTAL SETUP

An Android application system by which Object to locate the location is developed to track the location using GPS device and a platform which provides the ability to share location and seek help for advance features. The Android Studio, Firebase, API keys, access permissions and languages required to build the application are Java/Kotlin. The application includes features such as current location tracking using GPS, searching for destination locations, getting route details on the Google Maps application linked with live tracking, sharing, and asking location and seeking assistance from other users in the friend list. Easy sharing of current location in case of any emergency.
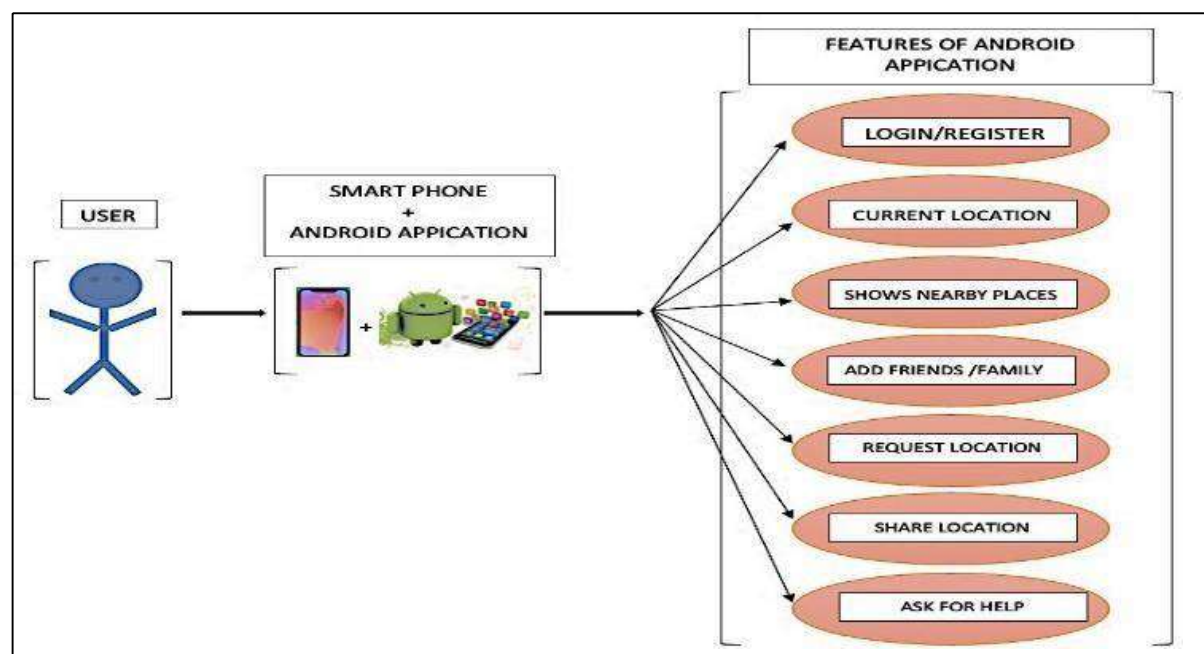
Fig. 2. Features of GPS based location tracking and sharing application.

To create an Android GPS based location tracking and sharing application, you will start with the installation of Android Studio in your PC and then download the Java version and support SDK. Once the installation is complete, you need to start coding the Java front- end and back-end for the application. After completion of android application coding, you can do application in in-built emulator and connect application to firebase, which works as backend service for application. To access the location, you need the Google services API and permissions. Once the application is complete you can export the APK file and run your application in other mobile devices which have active GPS service.

5. CONCLUSION

It is featured by GPS based mobile to tracker and android system to simplify the processes of tracking current location sharing and share it with others in case of emergency. The system provides additional features to the user such as information on nearby places and being constantly connected with friends and family. Future advancements may include more improved backend support features, API keys, and a diverse array of servers.

Acknowledgements

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Multimedia Emotional Pattern Analysis

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Abstract. Annotations play a vital role in the search and retrieval of contents in any content sharing system. Since the data on such systems increases on an exponential scale, retrieving content that appeals to a specific user base on an emotional level has become ever more challenging. The focus of this work is to make a system for affective video content tagging to perform multimedia analysis for emotional patterns.

Keywords: machine learning, artificial intelligence, valence, arousal, emotion extraction, convolutional neural network

1 Introduction

With the changing times, the way we consume content is also changing. Gone are the days of renting out DVDs at the local store or finding bootlegged copies over the Internet in hopes of getting a good print.

The sudden influx of streaming services that followed soon after the rise of Netflix such as Amazon Prime Video, Google's YouTube, HBO Max, Hotstar, Paramount+ has shifted the focus from waiting for upcoming blockbusters to keep circulating the mountain of existing content to the users (watchers) in the most effective way possible.

Today, streaming platforms are heavily dependent on standard video tagging that puts various videos into pre-existing categories based on pre-existing tags. This enables platforms such as Netflix to recommend shows based on the tags the user has already liked. However, this practice is inefficient as it heavily relies on manual tagging before the system takes over.

In most of the current generation social network-based systems, explicit tagging is used like YouTube. However, it's not the long-term solution for tagging multimedia data because:

- Creating a manual accurate glossary of the huge amount of multimedia content on the web is unambiguously impractical, a huge chunk of the entire content on the Internet remains untagged. This hinders the search process and reduces the performance of searchsystems.

- Viewers' who tag the multimedia data don't usually target at improving the efficiency of the present search systems. In fact, private and social catalysts often are the reason behind tagging: A self-need-driven tag may be worthless toothers.
- Someviewers'tagthecontentformiscellaneouspurposeslikespamtagsforadvertisement.

Hence, substitute plans must be developed to overcome these drawbacks of explicit tagging. Implicit tagging is one of the most optimalsolutions.

A lot of research has been done on exploring signs which can be discovered by noticing and examining viewers' nature like attention, interest, and emotion. Such signs could then be used in automated tagging of multimedia content.

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2 Motivation &Objective

A system that efficiently retrieves multimedia contents according to the user's current mood, can be of great interest.

Across all the data that can be generated for automatic tagging, emotional detail of such content is considered optimal. It plays a paramount role for personalized content delivery. As an example, viewers' like to view video clips that have funny contents when they are depressed or sad to improve their mood.

To analyse a given video at an impactful level, some models for emotions must be developed. Some dimensional models depict the parts of emotions and are generally illustrated in 2-D space with the emotions as coordinates - Valence (V) and Arousal (A). *Refer to Fig.2 on Page 4.*

Valence is the measure of degree of attractiveness, and it varies from negative to positive. Arousal gives information about the intensity of the emotion and ranges from excited to calm.
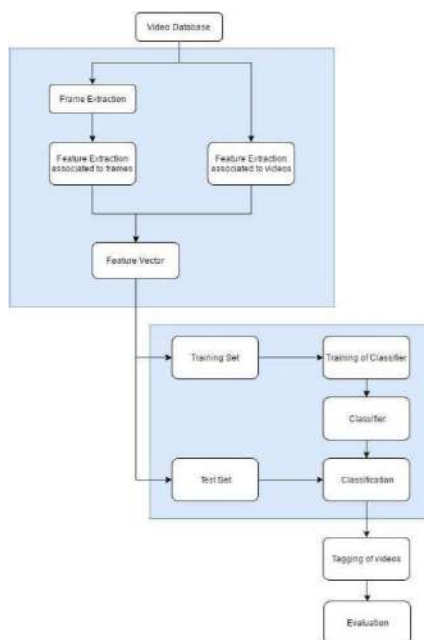
Fig.1: Feature Extraction in Multimedia Emotional Pattern Analysis Flowchart

Multimedia emotional pattern analysis aims at automatic recognition of emotions elicited by videos. We aim to implement an efficient affective video analysis system through feature extraction and using those features to create a classification model using machine learning algorithms.

It could lead to platforms such as YouTube and Netflix showing more convincing recommendations, better parental control by allowing parents to choose what their children watch by knowing the emotional content of the video.

We planned to do this through feature extraction and using those features to create a classification model using machine learning algorithms.

This model can then be used to tag online multimedia videos for better searching and indexing. The dataset used for

training the system is LIRIS-ACCEDE, which has over 9800 videos. Allowing our system to learn from such a vast array of videos helped in improving the accuracy of this project.

We'll be extracting 11 features and providing tags to the video based on those features.

1. CompositionalGeometry
2. Colourfulness
3. Number of Scene Cuts perFrame
4. HueCount
5. Lighting
6. Depth ofField
7. GlobalActivity
8. Length of scenecuts
9. Zero CrossingRate
10. SpectralFlatness
11. SpectralSlope

3 Surveys ofLiterature

We surveyed various scholarly sources (online databases, previous research papers and dissertations) related to affective video tagging to situate our contribution in the ongoing initiative.

LIRIS-ACCEDE: A Video Database for Affective Content Analysis

● It was authored by Yoann Baveye, Emmanuel Dellandrea, Christel Chamaret and Liming Chen in 2015.

● The LIRIS-ACCEDE is the main paper of our database which describes the extraction features we'll be using.

Affective Video Content Representation and Modelling

● It was authored by Alan Hanjalic and Li-Qun Xu in 2005 as a part of their research.

● The paper gives a depiction of arousal -valence model and relevant features for video analysis.

Prediction of the Interobserver Visual Congruency (IOVC) and Application to Image Ranking

● It was authored by O. Le Meur, T. Baccino, and A. Roumy.

● It gives a detailed explanation of "depth of field" and the necessary algorithms required to calculate it.

Photo and Video Quality Evaluation

● It was authored by Y. Luo and X. Tang in 2008.

- The research paper gives the algorithms for subject extraction and for calculating the compositional balance.

Measuring Colourfulness in Natural Images

- It was authored by David Haslera and Sabine Susstrunk in 2003.

- It gives the algorithm to find the colourfulness metric.

Relationship Between Colour and Emotion: A study of college students

- It was a journal written by Naz Kaya in 2004.

- It talks about the relationship between colour and emotion on valence and arousalscales.

Polynomial Expansion for Orientation and Motion Estimation

- It was written by Gunnar Farneback in 2002.

- Polynomial expansion representation of images for Gunnar Farneback algorithm.

Two-Frame Motion Estimation Based on Polynomial Expansion

- It was researched by Gunnar Farneback in 2003.

- It introduced the Gunnar Farneback algorithm for finding motion estimation and Global Activity.

Studying Aesthetics in Photographic Images Using a Computational Approach

- It was written by Ritendra Datta,Dhiraj Joshi, Jia Li and James Z. Wang in 2006.

- The paper talks about the algorithm for lighting metric.

Colour Harmonization for Videos

- It was written by Nikhil Sawant and Niloy J. Mitra in 2008.

- The paper gave the algorithm for colour harmonization needed for affective video tagging.

Affective Video Content Representation

- The paper was authored by Virginia Fernandez Arguedas in 2005.

- It studied the effect of the number of scene cuts per frame on arousal.

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4 Methodology

Refer to Fig.1 on Page 2 for the flowchart of methodology.

1. First, all the different audio and visual features are extracted from thevideo.

2. The features are then used to generate a feature vector to help train theclassifier.

3. The dataset is divided into 70% and 30% for training and testingrespectively.

4. The KNN (K Nearest Neighbors) algorithm is used for the trainingclassification.

5. Theaccuracyoftheresultisthencalculatedonvariousscalesaccordingtotheoutputoftheclassifier.

6. Further experiments are done on the arousal-valence values given in the dataset. The data is then clustered using K-means and used for classification by using the KNNalgorithm.

Valence-ArousalModel

The valence-arousal model or circumplex model of emotion was developed by James Russell. According to this model, emotions are distributed in a two-dimensional circular space.
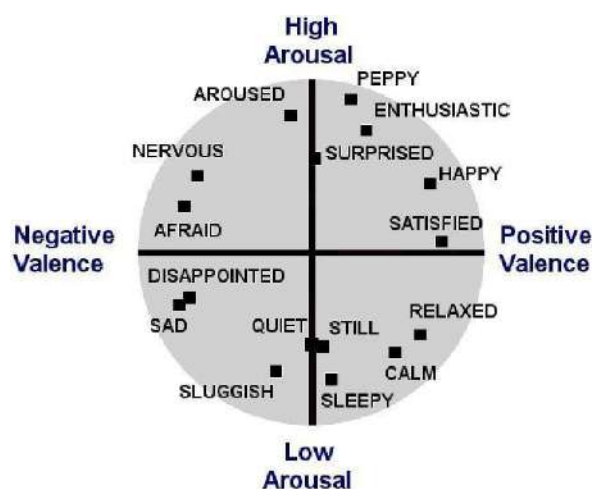
Fig.2   Valence-Arousal   Model
Source:PublicLibraryofScience-Figshare

The two dimensions of this circular space are Valence (V) and Arousal (A), here, valence represents the horizontal axis and arousal represents the vertical axis. The center of the circle i.e., origin represents a medium level of arousal and a neutral valence.

Valence: Valence represents the positive or negative affectivity orientation of the emotion. An example of a positive valence emotion is happy and that of a negative valence emotion is sadness.

Arousal: Arousal represents the intensity of the emotion. In other words, it measures how calming or exciting the emotion is.

Classification & ClusteringAlgorithms

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Classification

We have used KNN (K Nearest Neighbours) algorithm for classification. KNN is a non-parametric method used for classification and regression in which input consists of k-closest training examples in a space and output is a class membership. An object is classified by a majority vote of its neighbours, with the object being assigned to the class most common among its K-Nearest neighbours.

Clustering

We have used the K-means algorithm for clustering data based on valence arousal values. K-means aims to partition n observations into k clusters in which each observation belongs to the cluster with the nearest mean serving as a prototype of the cluster. This results in partitioning of data space into Voronoi cells.

5 Features ExtractionList

Compositional Geometry

Compositional balance is a crucial requirement for fine quality of photos. When different parts of an image get equal attention of the viewer, we say that the image is perfectly balanced in terms of composition.

The more balanced an image is, the more pleasing it will be to the eyes. We measure the compositional balance in terms of a parameter called compositional geometry.
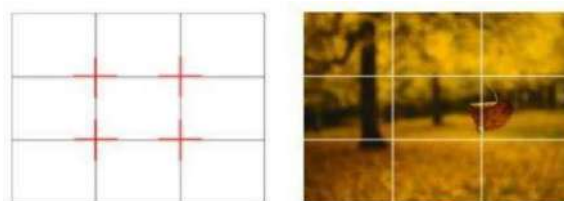
Fig.3 Compositional Geometry

Subject Extraction: Almost each photo has its lead character, called the subject, around which the image is created, and this subject is the region of interest for the viewer. Subject extraction of the given image is the first step of calculating depth of field and compositional geometry.

Colourfulness

The choice, contribution and contrast play a very important role in determining the affection conveyed by the video. The recent research in psychology validates this fact, that colour is an effective and precise non-verbal code of communication.
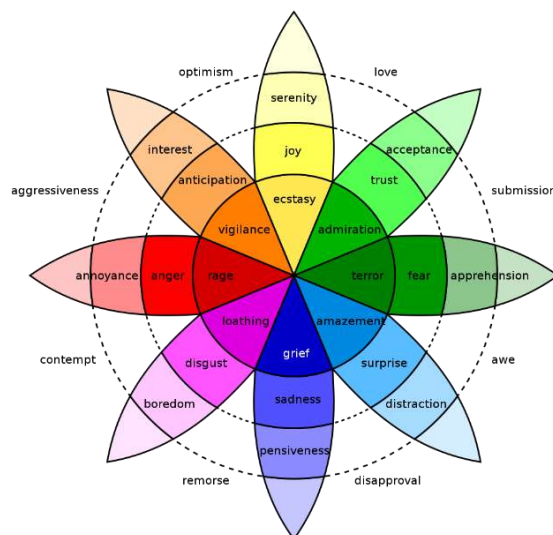
Fig.4 Plutchik's Wheel of Emotion

Each colour provokes specific subconscious reactions, thus evoking emotions. **Plutchik's wheel of emotion precisely describes the role played by colour in eliciting emotions (Figure 4).** For instance: - Orange and Red are considered as "warm" colours, and they correspond to energetic and vigorous emotions such as 'anger' or 'fright'. - Violet and Blue are "serene" colours, and they correspond to emotions related to 'comfort', 'insurance' and 'pleasure'.

Number of Scene Cuts perFrame

The number of scene cuts per frame can also be said as the shot cut rate of a video. It is one of the low-level features for arousal in video indexing along with colour and motion.

This is generally proportional to the arousal of the video. The more the scene cuts are in the video, the more will be the arousal of the video. In case two videos have the same number of scene cuts, the one having a smaller number of frames have more value for number of scene cuts perframe.

Whenever the director wants to get the viewer excited, he increases the scene cut rate. Similarly, whenever the scene cut rate is low, the arousal induced is low.

Hue Count

Hue count is a feature which counts the number of unique hues in the video. It gives a measure of colour vibrancy in the video. A higher number of hues generally implies that the video elicits a positive emotion.
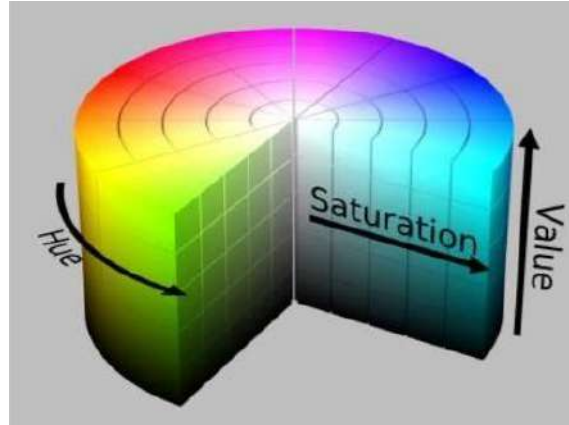
Fig.5 Hue-Saturation Value

Lighting

Lighting is a metric to measure the contrast in the luminescence of an image. It is an important feature to determine the affection of the scene.

For example, the scenes with positive emotions that involve pleasantness or joy are most often depicted with high luminescence, whereas those with negative feelings like sadness or horror contain low lighting value. It is a vital tool used by artists and film creators. Dramatic effects of scenes are enhanced by manipulating the intensity of light.

Fig.6Apositivescenewithhighluminescence.

Fig.7Anegativescenewithlowluminescence.

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Depth of Field

Theoretically depth of field is a parameter which represents the distance between the farthest and nearest objects in a normal sharp image.

We classify depth of field into two categories: shallow depth of field and deep depth of field. A scene is said to possess shallow depth of field if only a specific portion of that scene is highly focused, and the rest of the area is blurred in the scene.

Fig.8(a) Shallow Depth of Field

A scene is said to possess deep depth of field if for any two portions of image, difference in the focus magnitude is not much significant, i.e., the whole image appears equally focussed.

Fig.8(b) Deep Depth of Field

GlobalActivity

Global Activity is a feature which captures the average amount of motion in a video. The apparent motion in a video can be captured using motion vectors. These motion vectors can be approximated by calculating the optical flow in a video.

Optical flow or optic flow represents the apparent motion of objects in a visual scene which occurs due to the relative motion between an observer (the camera) and the scene.

We have used Gunnar Farneback's Algorithm to calculate the dense optical flow in the video. Dense optical flow calculates the motion in every section of the frame.

Length of Scene Cuts

Whether the scene stays on for long or ends shortly, length of a scene cut conveys something to the viewer.

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Holding LongLingering scene depicts an emotional as well as spatial meaning to the scene as well. Emotionally, this kind of lingering shot is interesting because:

- Slow pacing depicts the despondency of those who have arrived at adecision.

- Slow cutting shows that slow flickering of thatdespondency.

Longer scenes build tension, suspense, and anticipation.

Cutting Short

Length is proportional to pacing of the scene. Shorter the scene, faster the pacing. And faster the pacing, more energy is into that scene. So, anger, excitement, happiness can be judged based on thelength.

Shorter scenes break the rhythm and devoid the scene with meaning and instead give a feeling of anxiety and restlessness. Or it can depict a lot of motion in that scene, like two people arguing.

Zero CrossingRate

The zero-crossing rate is the measure of changes in sign of signal. The frequency or how fast the signal changes to and from positive to negative.

In music info extraction and speech recognition, ZCR has been used consistently. It can also be used to classify sounds. It is also used to detect whether a human is present in the scene or not.

A reasonable generalization is that if the ZCR value is high the speech signal is unvoiced. While if the ZCR is low the speech signal is voiced. This is mainly because high frequencies imply high ZCR and there is a strong correlation between ZCR and energy distribution of the signal.

Spectral Flatness

Used in digital signal processing, it is used to measure the audio or signal spectrum.

The biggest feature why we use this to quantify emotion is that it helps us in determining how tonal or noisy the sound is. Each signal has a power spectrum. And from the shape of the spectrum, we can see the peaks and crests. Or in other words, we can judge the flatness of the signal.

Now, flatter the signal, more tonal the sound is and calmer and sadder it will be perceived to be. More peaks and crests mean more noise, or excitement or anger

Spectral Slope

Spectral tilt, or spectral slope, is an important parameter in voice synthesis and voice perception. It is a measure of voice quality.

Those voice qualities include harsh, tense, breathy etc. The value of the spectral slope represents the amount of decrease of the spectral amplitude. It shows how rapidly the amplitudes of successive partials (component frequencies) decrease as the value of the frequency increases.

A less steep spectral slope represents a louder voice and when the loudness of the audio decreases, the spectral slope increases.

6 Conclusion

Based on the arousal valence values we get the following plot:
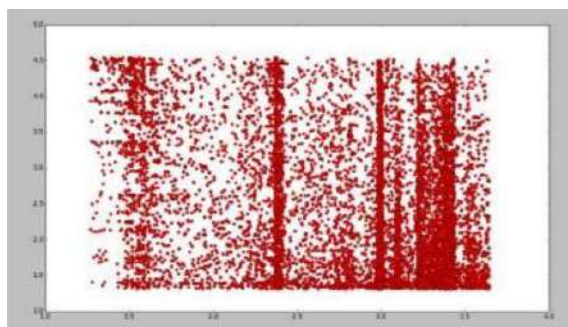
Fig.9 Valence-Arousal Plot

- Classifying based on the tagged data we get the following confusion table. **The total accuracy for this is 54.71%.**

	Happy / Excited	Sad /Tense	Upset/Distressed	Calm / Relaxed	Accuracy (%)
Happy / Excited	243	31	49	273	40.77
Sad /Tense	34	214	16	130	54.04
Upset/Distressed	36	9	229	148	54.26
Calm / Relaxed	271	91	180	846	60.95

Table.1 Confusion Table for Tagged Data

Next,to identify videos based on valenceandarousal values, we have clustered them based on arousal-valenceusing the K Means algorithm for K = 4, 6 and 8 clusters. The cluster centers for each clustering are depicted in the following pictures.

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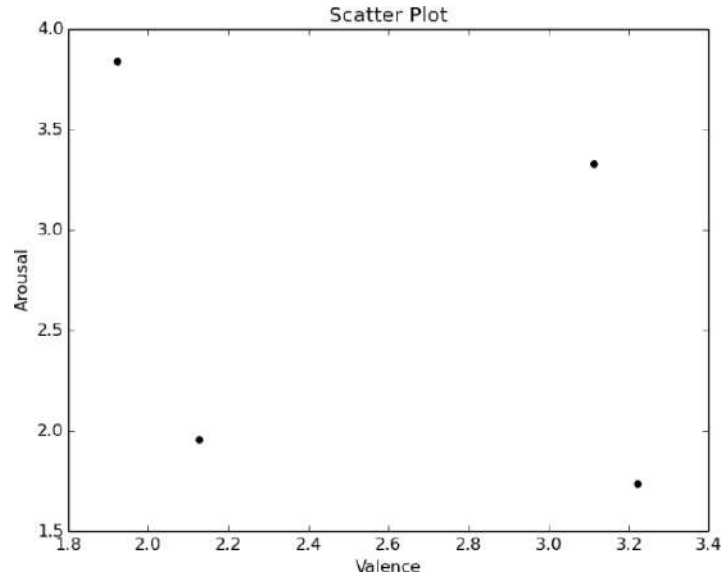
Fig.10 Valence-Arousal Scatter Plot forK=4
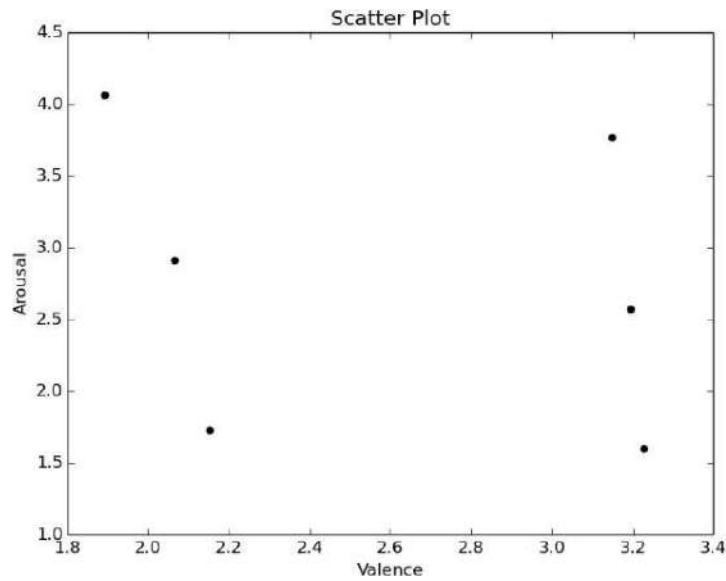
Fig.11 Valence-Arousal Scatter Plot forK=6
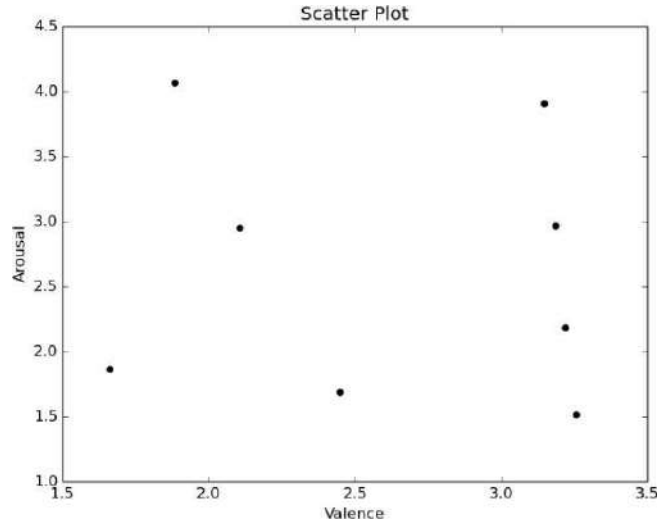
Fig.12 Valence-Arousal Scatter Plot for K=8

- After that we have classified the test videos using KNN algorithm. It generates the following three confusiontables.**The accuracies for each of these clusterings are43.14%,33.46% and 24.64%.**

	1	2	3	4	Accuracy(%)
1	452	92	103	67	63.4
2	96	178	82	48	44.05
3	278	309	384	224	32.13
4	104	54	116	194	38.95

Table.2 Confusion Table for Test Data(K=4)

	1	2	3	4	5	6	Accuracy (%)
1	166	61	34	124	96	77	29.74
2	86	394	113	98	147	93	42.31
3	113	81	106	134	93	55	18.21
4	39	60	70	42	16	43	15.55
5	27	41	49	76	37	49	13.26
6	39	61	43	27	17	192	51.23

Table.3 Confusion Table for Test Data(K=6)

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	1	2	3	4	5	6	7	8	Accuracy (%)
1	18	27	13	26	33	9	14	2	14.75
2	71	93	63	31	42	22	42	93	20.35
3	53	41	23	88	81	45	91	131	32.03
4	30	22	34	73	18	29	21	30	28.40
5	41	35	31	29	73	39	52	21	22.74
6	34	41	27	37	29	120	31	39	33.42
7	42	28	35	22	44	28	26	53	9.35
8	41	25	45	33	35	19	33	54	18.94

Table.4 Confusion Table for Test Data (K=6)

7 FutureScope

- Find the goodness of thefeatures.

- Optimise the features extracted and incorporate more features helping us improve the efficiency and accuracy.

- Apply better classification algorithms for the affective analysis of thedata.

- Develop an application based on our project for day-to-day use and develop systems to use in online video websites and search and retrievalsystems.

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Text, Colour, and Pattern-Based Graphical Password Authentication System for Minimizing Shoulder Surfing Attack

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ABSTRACT

At present, the standard strategy for User Authentication is Textual Password. This technique has been displayed to have huge disadvantages. For instance, clients will often pick passwords that can be effectively speculated. On the other hand, it is frequently challenging to recollect if a password is difficult to guess. Again, this Textual Password is additionally powerless against many Attacks like Brute Force Attack, Dictionary Attack, Guessing, and Shoulder Surfing. The Shoulder Surfing Attack is an attack that the nemesis can perform to acquire the clients' password by watching over the client's shoulder as he enters his password. So, to Overcome the problem of the existing Textual Password Scheme, the improved Text, Colour, and Pattern-Based Graphical Password Scheme to decrease Shoulder Surfing Attacks is proposed. Graphical passwords are simpler to recall since people recollect pictures better than words in the thesis. Likewise, they ought to be more impervious to brute-force attacks since the search space is limitless.

The Text, colour, and Pattern-Based Password Authentication Scheme will defeat this issue in this project. To sign in to their system, the client must enter the password in Text, colour, and Pattern ordering based on a pattern they picked during user registration. This strategy is appropriate for limiting shoulder surfing attacks as it can work on the security of clients' passwords, and they can productively sign in to the system.

Key words: Graphical Password, Textual Password, Shoulder Surfing Attacks, Pattern-Based, Color Based, Recall-Based, Recognition Based, Grid Selection.

1. INTRODUCTION

The most common approach of computer identity verification is the use of alphanumeric user credentials. This process has been shown to have massive shortcomings. Users, for example, frequently end up choosing login details that are easy to guess. On the other hand, if a password is hard to guess, it is often hard to remember. Some studies have discovered multifactor authentication methods that use pictures as passwords to tackle this issue.[1] In this paper, we conduct a comprehensive survey of the existing graphical password techniques and test the combination of text, color, and image pattern-based graphical password authentication system.

Shoulder surfing is an attack that an unlicensed client can perform to get the licensed client's password by looking after the client's shoulder when he enters his password. Shoulder surfing is wildly successful in jam-packed spots since it is generally simple to notice somebody as they enter their details in a form, enter their PIN at an ATM, enter a password at a cyber cafe, public and university libraries, or air terminal stands.[13] Shoulder surfing can also be done at a distance using binoculars or other vision-enhancing devices. Authentication is the process where the identity of an individual is checked. It is additionally the way for affirming the truth whether the trait of information claimed by an entity is legitimate or not. Some also characterize authentication as a cycle in which the evidence of identity furnished is compared with the document stored in the clients' database's data set inside a computer network.

During authentication, the system compares the stored credential that clients enter during the registration with the credential they enter during the login session.[4] If the entered credentials match with the one stored in the client information database, the process completes, and the client gains the approval to access the system. To tackle the issue of the existing textual password scheme, an improved text, color, and pattern-based graphical password scheme is proposed to minimize shoulder surfing attacks. To login to the system in this authentication scheme, the visitor must register/log in using three levels of security: Text, Colour (RGB), and Image Pattern. The suggested methodology

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minimizes the Shoulder surfing attack, thereby enhancing the security of existing applications. Users can effectively access the system by using this Scheme.[6]

The objective of the proposed scheme:

1. Usability, the proposed system will be accessible at any location and at any time, with a low false-positive rate and a quicker authorization result.
2. The system will provide clients with creative and concise training. They will not invest a lot of time to learn how to use the system.
3. The suggested methodology that produces the best utilization of human memory will profit from the assertion that people are better at recognizing images. As a result, image patterns should be easy to recall.
4. The proposed scheme is secure as it will provide a strong layer of protection against shoulder surfing brute force, intersection, and educated guess attacks.

The proposed system's process is convenient and user-friendly. The system is simple and easy to use for users who are already familiar with the existing Textual password scheme. Using this framework, users can access the system efficiently and simply without needing a physical keyboard or an on-screen keyboard.[8]

2. THEORETICAL SURVEY

Human factors are typically considered the bottleneck in a computer security system. Human-computer interaction is vital in three significant areas: authentication, security operations, and developing secure systems. The authentication concern is the focus of this section.[10] User authentication is a critical element in the majority of cybersecurity scenarios. As per research findings, Since users can only recall a relatively small number of passwords, they tend to write them down or use the same password for multiple accounts. According to a recent Computerworld news article, the security staff at a large company ran a network password cracker and identified approximately 80% of the passwords within 30 seconds.

Passwords that are difficult to guess or break, on the other hand, are frequently difficult to remember.[2] According to studies, users can only remember a limited number of passwords, so they tend to write them down or use the same password for multiple accounts.

The most potential threat nowadays that demands a passcode for the user's account is a shoulder surfing attack. Shoulder surfing is an attack that an unauthorized party can use to obtain the password of an authenticated person by watching over the user's shoulder as he enters his passcode.[3]

This attack is usually effective in crowded areas because it would be easy to monitor somebody or something when they fill out their user name and password without being sceptical.

Shoulder surfing attacks can occur when users enter their PIN at an ATM or a password at a cybercafé, public or university libraries. Furthermore, shoulder surfing can be done from a range using tools, including binoculars or other vision-enhancing equipment. In addition, some inexpensive and simple devices, such as an illegitimately installed small camera to observe data entry, can also be used to carry out this attack.[5]

Shoulder Surfing Attacks can be minimized using the combination of text, color, and image pattern-based graphical password authentication scheme. For several years, many experts in the field of cyber security have been attempting to strengthen the Text-based password scheme (by making some factors (for example, uppercase letter [A-Z], lowercase letter [a-z], number [0-9], and unique character set [! @ #, etc.] mandatory), which increased system security but significantly reduced user usability.[9]

Alternative authentication methods, such as biometrics, have addressed the problems with traditional username-password authentication. However, in this paper, we will look at another option: using text (first phase), color (RGB - second phase), and images (third phase) as authentication factors.

This paper will be beneficial for researchers who want to create new graphical password algorithms and industry practitioners who want to use graphical password techniques.[15] Our primary aim is to obtain this goal while also preserving the system's usability and security so that we do not have to compromise on either of these constraints.
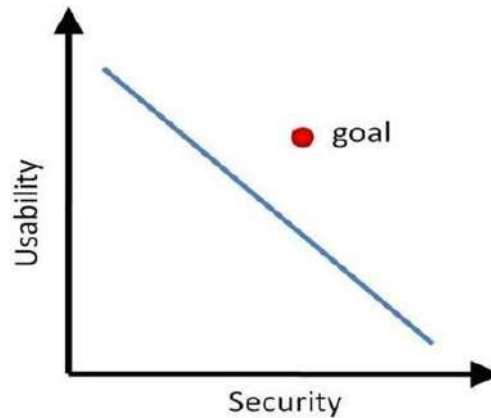
Fig.2. Graph depicting the goal i.e. Usability vs Security

3. GRAPHICAL PASSWORD

With increasing technological developments, the world is rapidly becoming digital, with everything taking place online. Users prefer to pay online for everything, from bills to tickets to paying the person sitting next to them. Not only payments, but all activities, such as communication via e-mail and messaging apps, storing documents in a digital locker, and so on, take place online.

As more and more things move online, the risk of cybercrime and privacy breaches rises. Passwords play an essential role in keeping your data secure on both online and offline platforms.[14] Passwords are the default method of gaining access to user accounts. Users can secure their accounts using a variety of authentication methods.Graphical passwords refer to using colors and image patterns as passwords.

In theory, graphical passwords are more accessible to comprehend than text passwords because humans recall pictures faster than words. Moreover, because the search space is nearly limitless, they should be more resistant to brute-force attacks. In general, graphical password techniques are divided into two categories: recognition-based graphical techniques and recall-based graphical techniques.[17]

Recognition-Based Authentication

A user is verified using recognition-based techniques by questioning them to recognize one or more pictures they chose during the registration phase. Recognition-based systems, also known as cognometric systems or searchmetric systems, generally require users to remember a portfolio of images when generating a password. To sign in, they must identify their own images amongst lookouts.[6]

Humans have an exemplary capacity to comprehend previously seen images, even if they were only seen briefly. Face recognition, random art, everyday objects, and icons have all been proposed as images for recognition-based systems.

Recall-Based Authentication

Recall-based techniques require users to replicate something they created or selected earlier in the registration process. Because users recall and replicate a secret drawing, recall-based graphical password systems are also called draw metric systems. Users in these systems typically draw their credentials on a piece of canvas or a grid (which may arguably act as a mild memory cue).

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To log in to the system in this authentication scheme, the user must register/log in using three security levels: text, color (RGB), and image pattern. The proposed scheme minimizes the Shoulder surfing attack, thereby enhancing the safety of existing systems. Users can efficiently access the system by using this Scheme.[20]

4. IMPLEMENTATION DETAIL

In this proposed scheme, we will describe and test a simple and effective way to minimize the Shoulder Surfing Attack by using an improved version of the text, color (RGB), and image pattern-based graphical password. The proposed system is implemented using HTML, CSS, PHP, JavaScript, Node.js, and Macromedia Flash (Action Script 2).

There are various techniques to secure your password in a graphical authentication system. Here we are proposing a new algorithm of authentication using colors and images. We used a grid-based approach to authenticate by using images as a reference. The suggested scheme includes 4 phases, including 3 phases during registration and one login phase.

Authentication Registration Phase 1

The user registers themselves by clicking on the register button. The first level is the conventional username and password authentication. The user must enter a password K of length L in this phase. The minimum length of the username is at least 3 characters, and the password must be at least 6 characters long. The registration process in this scheme should establish an environment free of shoulder surfing.

Furthermore, a secure channel should be established between the system and the user during the registration phase using SSL/TLS or any other secure transmission mechanism. The system stores the user's textual password in the user's password table entry, which should be encrypted with a system key.

Fig.2. User Interface of Authentication Registration Phase 1

Authentication Registration Phase 2

After phase 1, the user will be directed to the color-based authentication level in the next phase. The second level is a random red, green, and blue pattern that the user specifies. Users need to enter a specific pattern of RGB colors that they can recall easily at the time of login.

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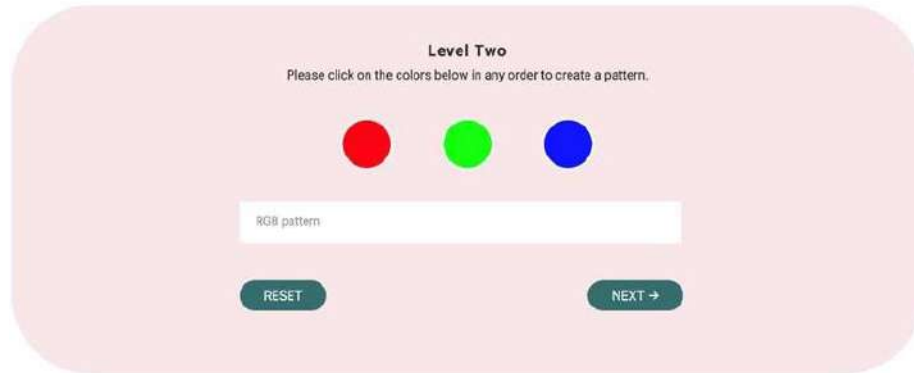
Fig.3. User Interface of Authentication Registration Phase 2

Authentication Registration Phase 3

After phase 2, the user will be directed to the next and last phase, the pattern-based authentication level. The third level is a 4x4 grid where the user is presented with four images that can be dragged and dropped anywhere on the grid. In this phase, the user needs to enter a specific pattern and position of the image in a given grid that they can recall at the time of the login phase.
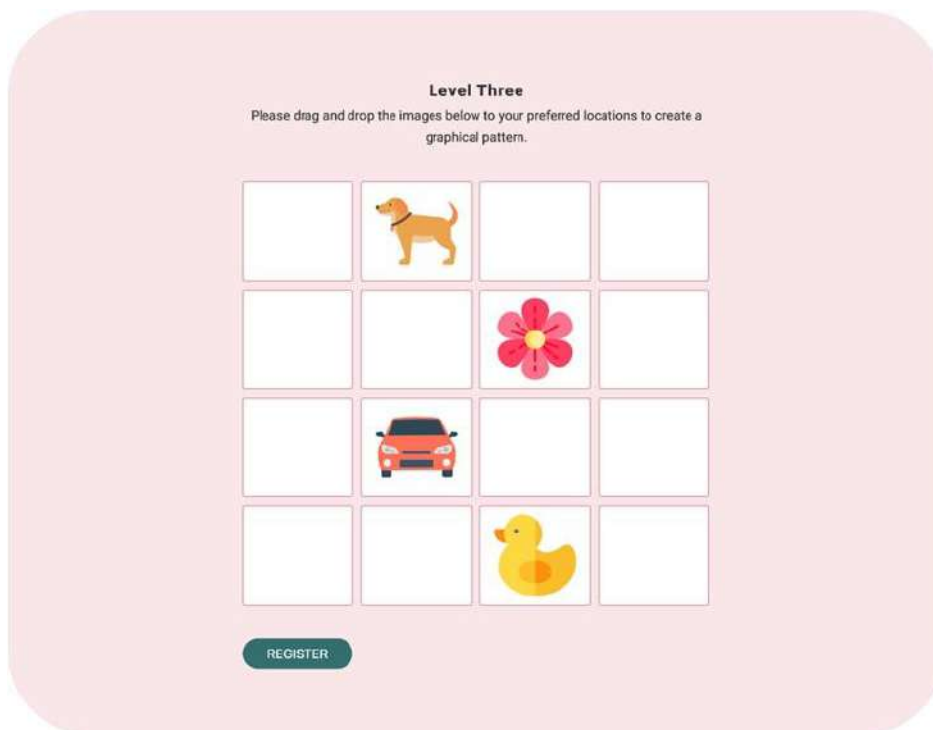
Fig.4. User Interface of Authentication Registration Phase 3

Authentication Login Phase

When users log in, they are again presented with text fields, a color combination interface, and the same four images placed in random locations within the grid. The user has to drag and drop the images to the exact locations they chose during the registration stage. When all the combinations are entered correctly during the login phase, the user will access the system. The user must remember the combinations they entered at registration for subsequent use.

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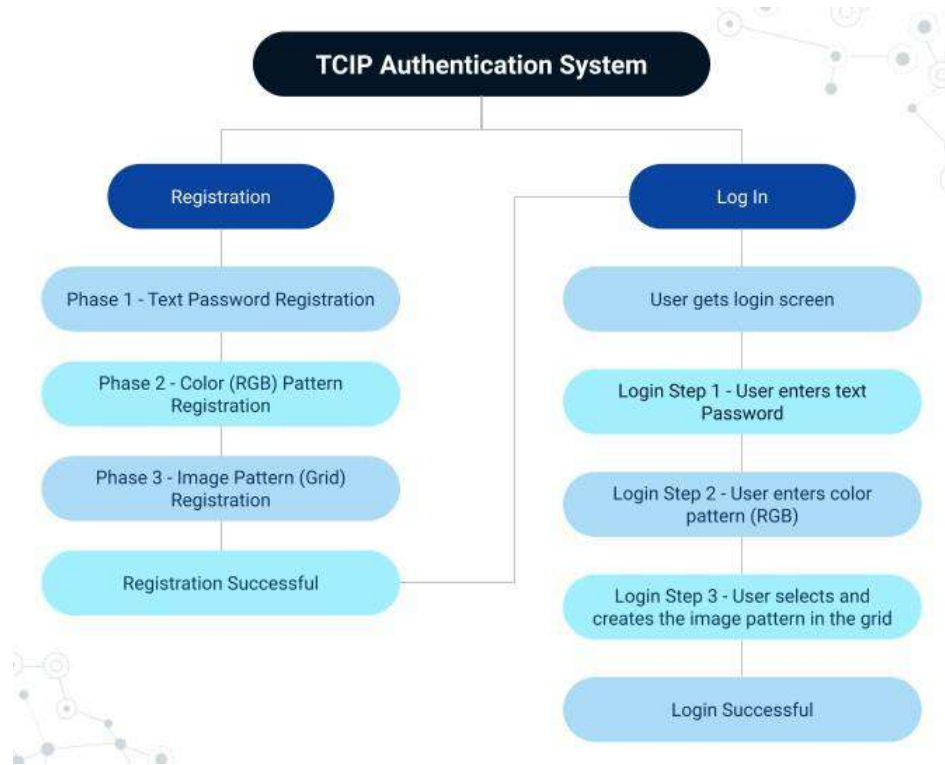
Fig.5. TCIP Authentication System process flow chart

Technicalities of the project

- The project uses the local storage property of the window object to store user information.
- User information is hashed using the "crypto" Node.js module. The user has to make sure that Node.js LTS version 10 or later has been installed in their system.
- The bundle.js file located in /dist/js is bundled using Webpack module bundler. The unbundled source code is located in /src/js.
- The CSS code is compiled using the node-sass npm package. The source code is located in /src/sass.
- A 'Reset All Users' button is added to the header of the UI, which removes the information saved by the project in the browser's local storage.
- Upon running the cmd file, the user is directed to this port http://localhost:8080/.

5. RESULT ANALYSIS

The proposed system's security and usability will be as follows:

Password Space

Suppose that the length password is L, i.e., $6 < L < 15$, so now there is $6*36^L$ password available for use; therefore, the password space of the proposed scheme is:

$$\sum_{L=6}^{15} 6 * 36^L \approx 1.006 * 10^{28}$$

Resistance to accidental login

Accidental Login refers to the possibility of inadvertently entering a password. Because the probability of entering a password is 6/64, or 1/8, the probability of an accidental login is $(1/8)^L$. Consider the various L values shown in the graph.
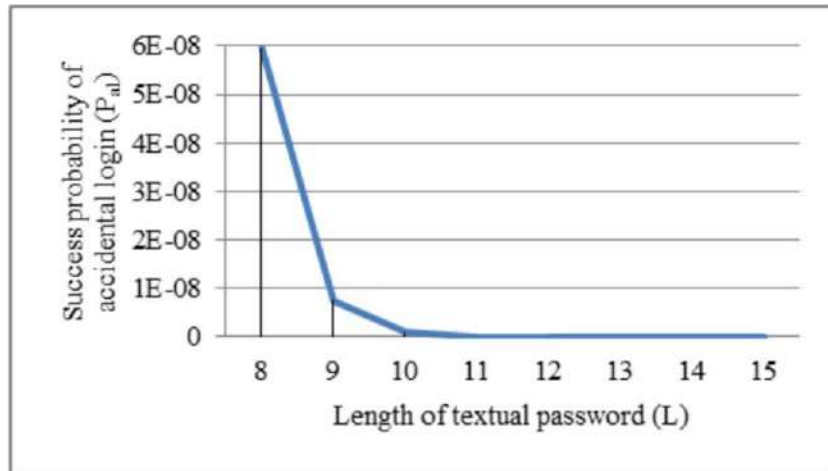
Fig.6. Probability of Accidental Login

To ensure security, the user can only enter the wrong password three times in a row. If the account is not successfully authenticated three times in a row, the account will be disabled, and the system will send a link to the registered email address that can be used by authorized and correct persons to login and re-enable the disabled account.[11] As a result, the likelihood of an accidental login is extremely low.

Resistance to Shoulder Surfing

As the user has only three chances to enter the password, and if he enters the wrong password, the account will be disabled, and to log in to the account, the user must first select a specific color and image pattern they chose at the time of registration phase. As a result, Shoulder Surfing resistance is provided.
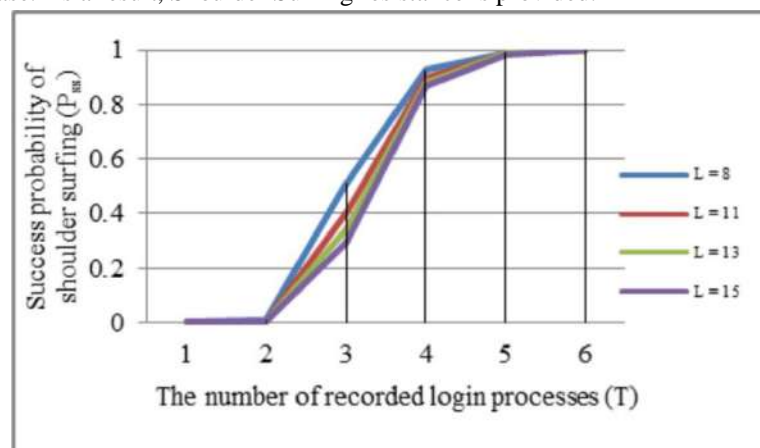
Fig.7. Probability of Shoulder Surfing

Usability

As we know that users are more familiar with the traditional textual password, it is suggested to give character set freedom to the user in which they can enter any (minimum 6) characters (for example, uppercase letter [A-Z], lower-case letter [a-z], number [0-9], and unique character set [! @ #, etc.]) from the character set present on the given keyboard. Because of this feature, users can quickly and efficiently find their password characters. Hence, the operation of the proposed scheme is simple and easy to learn.[18]

6. CONCLUSION AND FUTURE SCOPE

Validation is an essential component of security. Authentication will significantly raise the customer's network security. In this paper, we designed a methodology for minimizing shoulder surfing attacks that uses text, color, and image pattern-based graphical passwords. With this authentication method, the user can log in to the system without constantly worrying about shoulder surfing. This method employs textual passwords, color-based graphical passwords, and image pattern-based graphical passwords, and because the user is familiar with both of these password schemes, the user can easily and efficiently log in to the system. We may be able to use this system in a high-security application in the future.

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Uses of Dynamic Features of Face in Lie detection

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Abstract

As one of the most successful applications of image analysis and understanding, face recognition has recently received significant attention, especially during the past few years. It can be used in better manner for different applications where identification is needed. There are mainly two reasons for this trend; the first is the wide range of commercial and law enforcement applications and the second is the availability of feasible technologies after 30 years of research. A general statement of problem can be given as follows: Given still images of a scene, identify or verify one or more persons in the scene using a stored database of faces. Available collateral information such as age, gender, facial expression, eye color, facial structure helps in narrowing the search. The other factors effect face recognition are physical changes (such as facial expression changes, aging, personal appearance (make-up, glasses, hair style etc.)), acquisition geometry changes (change in scale, location and in-plane, rotation of face as well as rotation in depth the camera obliquely) and imaging changes (lighting variation, camera variation, channel characteristics).

Keywords:
Facial Recognition System, Verification, Lie detection, Linear Discriminant Analysis, SVM.

1. Introduction

Facial expressions can be detected by various methods of biometrics and is useful for the lie detection purpose that is also known as deception detection. There are various general techniques that are used for deception detection on the basis of responses to the questions, body language or the gestures and postures of the person during answering the questions. Facial expressions techniques are much more useful and proved to be more accurate for deception detection. Facial expressions, and other gestures, convey non-verbal communication cues in facial-to-facial interactions. This technique can operate in two different ways [4] according to the requirement, these are:

- **Face Verification (or Authentication):** in this, problem image is matches to only one image in the database (one to one matching), if image features matched then authentication is given else not.

- **Face Identification (or Recognition):** if the aim is to identify the face then image is compared to several images (one to many matching) in the database one by one and scores are given to each matching. The image that got highest scores is decided to be the closest to the problem face.

For the facial recognition, various landmarks on the human face are used. These are:
- Smiles
- Depth of the eye socket
- Anger
- Gap between words
- Movement of lips
- Movement of eyes

Lie detection using Face recognition system is becoming more popular because these are not only cost effective but also they don't require any corporation from the user side, hence these are easy. It uses three types of sets i.e. training set, gallery set and probe set. The training set is used to make the algorithm capable of characterizing the whole human face. The gallery and probe set are used in testing stage. The gallery set contains the known identities and probe set contains unknown identities. The algorithm identifies the probe images by comparing with gallery images. Image can be taken at any time even not disturbing the user in other words there is no need to make contact with the user, image can be taken from a distance. A good quality of image can also be taken from distance by using some good quality cameras. In 2007 US National Institute of Standards and Technology announced that their FRVT (face

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Recognition Vendor Test) performed same or better as a human for the images that are taken in the varying light conditions. But in the latest research the best automated systems achieved a FRR (False Reject Rate) of 0.01 i.e. 1 in 100.

2. FacialExpression Recognition Techniques for Lie Detection

Face recognition system have multiple techniques till the time that can be divided further into multiple categories or schemas, among the various techniques, each technique has its own merits and demerits which will be discussed here. FRT is a task that contains further sub-tasks in it like face detection, face segmentation and then face recognition. The major techniques in FRT are:

PCA (PrincipalComponent Analysis)

It is a linear transformation in which a training set of faces is created and Eigen faces are calculated i.e. a database is created first, then the new image is projected onto the Eigen faces and closeness to one of the known faces is checked. Again unknown faces are added to the training set and Eigen value is re-calculated until goal is achieved.

Creating training sets

[3]Take face image $I(x,y)$ be 2 dimensional N by N array of intensity values where image may also be considered as a vector of dimension N^2, also each training face differ from average by vector ϕ. The procedure for creating sets is shown in figures below.

Training Set Faces:
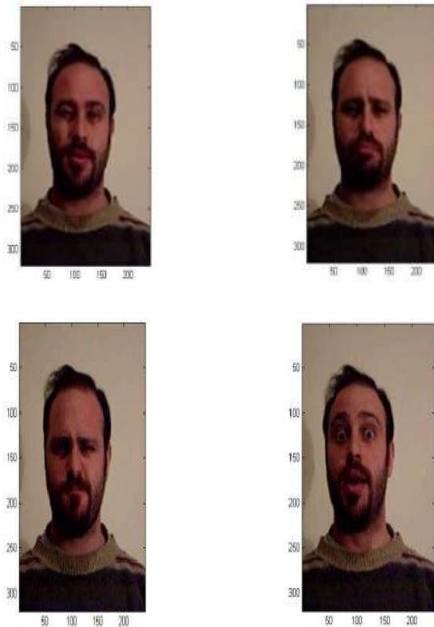
(Figure 2.1.1)

Average Face:

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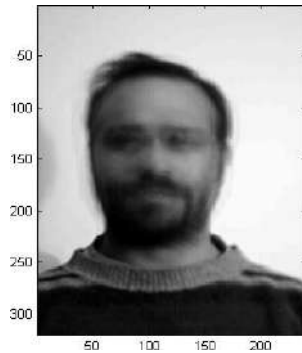
(Figure 2.1.2)

Average face is subtracted from the training set face and the result is known as Eigen face that is stored in the database along with the training set images.

According to **Rabia Jafri and Hamid R. Arabnia** in their research paper on **"A Survey of Face Recognition Techniques",** PCA performs well in reducing the dimensionality but there is a greater error rate as compared to other methods, so in general it is used mainly to reduce size and then other methods like ICA, PCA etc. are used for the feature selection purpose.

LDA (Linear Discriminant Analysis)

[1]This method was developed in 1997 by P. Belhumeuret. al, which is based on Fisher's LDA. This approach is used for classifying samples of unknown classes based on training data into known classes. The main goal this technique is to maximize between-class variance and minimize within-class variance. This method proved to be very efficient in facial feature extraction, however it also given some problems like small sample size also known as "SSS" problem. According to **Aamir Khan, Hasan Farooq** in their paper "**Principal Component Analysis-Linear Discriminant Analysis Feature Extractor for Pattern Recognition**" the problem of small sample size can be solved by making use of PCA+LDA, but recent experiments shown that bidirectional PCA+LDA gives better results and need less memory and computational, also it shows greater recognition accuracy.

(Figure 2.2.1)

Many of the linear discriminant analysis algorithms make use of PCA for the purpose of reducing dimensions that is to solve the problem of size and after that LDA is used to maximize the discriminant power of extracting features. From this it can be concluded that if LDA is implemented directly without using PCA, it will results in poor feature selection.

This technique has lower error rates as compared to Eigen faces method. This technique works well even if different illumination conditions appear while taking the image sample.

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EBGM (Elastic Bunch Graph Matching)

[8]In this technique each face is represented by a set of feature vectors positioned on the nodes of a coarse 2D grid placed on a face. Each vector is comprised of a set of responses of 2 dimensional Gabor wavelets that differs in orientation and scale which transforms a dynamic link architecture which projects the face onto elastic grid [6].
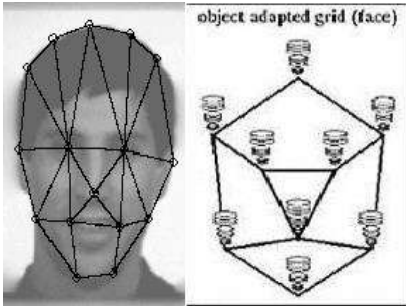
(Figure 2.3.1) (Figure 2.3.2)

The node of the grid is called Gabor jet. Comparing of the two faces is done by matching and adapting the grid of a test image to the reference image. Number of nodes in both of the grids is same, where the quality of match is checked by using a distance function. As written by **LaurenzWiskott, Jean-Marc Fellous**, in their paper "Face Recognition by Elastic Bunch Graph Matching", this technology performs quiet better in general but it requires image of large size, for example: 128 X 128, therefore it will create some problem in the video sources where image size is very small.
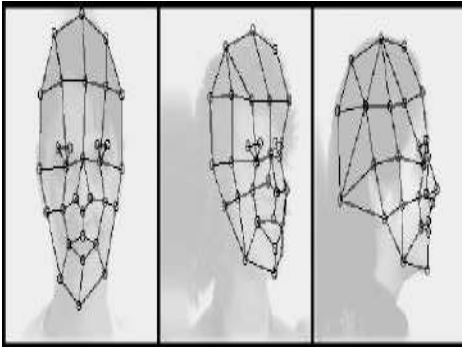
(Figure 2.3.3)

AAM (Active Appearance Model)

This technique was introduced in 1998by Cootes et.al, who creates a model of face to interpret the images of the face and is a powerful statistical model. The changes[11] that can appear on the face are broadly divided in two parts mainly- texture and shape. Different numbers of iterations are performed to calculate and cover a whole face.

The goal of this technique is to reduce the effect of challenging conditions on the performance of FRS (Face Recognition System). Active appearance models are creative models that generate the unseen images of the sample object. Once specific and compact basis are calculated then unseen images can be formed by adjusting the parameters.

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(Figure 2.4.1)

AAM[5] makes use of principal component analysis in the process so that differences in the shape and texture can be modeled and also an image could be represented by making use of a small set of parameters. After representing the image illumination and normalization processes are applied on it to reduce illumination effects and to increase the accuracy.

AAM models are fitted for the front face images and also they are much useful in the area where the purpose is face tracking, recognition and synthesis. However, there are some drawbacks in AAM models like they are unable to isolate a pose from the face image and also not useful in identity and expression changes.

3 D Morphable Model

[10]This idea of 3 D Morphable Model was generated by Vetter. The idea is based on a vector space representation of faces such that any combination of shape and texture describes a realistic human face. It makes use of 3 dimensional representations so that it can accurately model illumination, pose and expressions.
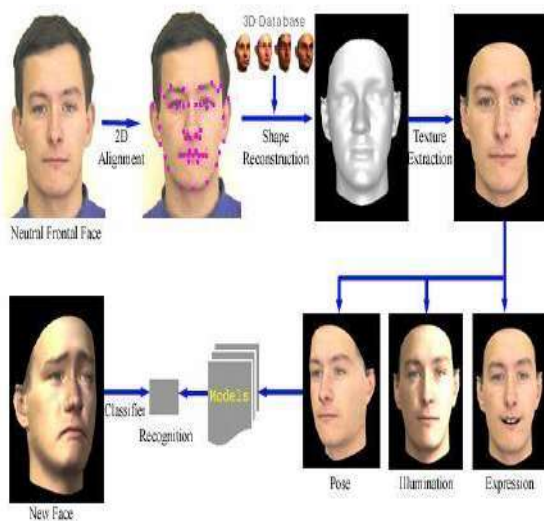
(Figure 2.5.1)

According to latest research by**Volker Blanz** these methods are very useful in various areas like in pose-variant, age-variant facial recognition, 3 D gaming, 3 D movie characters etc. but there are few drawbacks of these models. These models need to preprocess of the image and also needs camera calibration, also computational costs of these models is high and there is problem of head pose variations.

3. Why FacialExpressions over another biometrics?

- It requires no any physical interaction on behalf of the user.
- It does not require any expert to interpret the comparison result.
- It can identify a person from the large crowd.
- It can be used for the verification of credit cards, personal ID, passport and other security purposes.
- There is no need to make contact with the person whose image is to be taken.
- No any harm to the body of the human.

4. Recent Developments

- Face recognition based on Gabor image and SVM.
- Race recognition based on Fuzzy rough set.
- Face recognition based on least square support vector machine with improved algorithms.
- ISVM for face recognition.
- Face recognition based on DWT/DCT and SVM.
- Face recognition based on principal component analysis and SVM.
- Immigration-US-VISIT- United State Visitor & immigration status Indicator.
- Banks-ATM &check cashing security.
- Airport –Detected for registered traveler to verify the traveler.
- Classification of face by Gender, Age, attributes.

New face reader with LCD Access control into banks

5. Limitations of Facial Expression System

The condition where Face Recognition does not work well includes:
- Poor lightening
- Sun glasses
- Long hair
- Other objects that partially covering the subject's face
- Low resolution images

6. Comparison of all techniques

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The errors rates FRR and FAR are interrelated and together they define the recognition rate or accuracy of a verification system.

$$Accuracy = \frac{(1 - FRR) + s(1 - FAR)}{1 + s}$$

Where, s is a scalar skew parameter which is common between authorized and unauthorized users. Here the skew parameter taken is the number of input images given. The FAR and FRR can be adjusted by altering a threshold on the confidence scores. Using this here is a comparison of all techniques according to their accuracy.

Method	Recognition rate	Given By
PCA	77%	ven Fernandes and JoseminBala-"Performance Analysis of PCA-based and LDAbased Algorithms for Face Recognition"
LDA	93.57%	'a Abdul-Ameer Abdul-Jabba-"Image Processing for Face Recognition Rate Enhancement"
EBGM	75.29%	himehRouhi, MehranAmiri and BehzadIrannejad-"Areview on feature extraction techniques in face recognition"
AAM	76.2%	ro Martins, Joana Sampaio, Jorge Batista-"Facial expression recognition using active appearance models"
3D Morphable model	88%	Weyrauch, J. Huang, B. Heisele, V. Blanz-"Component-based Face Recognition with 3D Morphable Models"

7. Conclusion

Lie Detection using Face recognition technology become most useful secures, cost-saving and convenience tool for different authorities. Here different efficient techniques for processing and recognizing face objects, which can be used in different identification applications, are described. There are also some limitations of face recognition method. But ignoring these limitations, this becomes the most popular method for identifying and verifying the truth or lie of the   person.

8. Future Work

As there are limitations in the various techniques of lie detection using facial expression recognition so still there is need to do work in various areas. A new algorithm will be generated using facial expressions so that result can be enhanced by making use of techniques like PCA, LDA, and AAM for improved accuracy rate of the facial expression lie detection process. The algorithm should be usable in a simple and easily adaptable setup. This implies a single camera setup, preferably a webcam, and no use of specialized equipment.

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Scope, Challenges and Optimization in Data Analytics

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Abstract. Nowadays, Big data, Cloud computing, Fog Computing, Internet of Things, Wireless Sensor Networks are emerging technologies that resultsin generation of large amount of data. The collected data have valuable insights and analytics techniques are used to get this additional value from the data. But, the properties of data have changed that creates severalchallenges in the analytics process. To have an efficient and reliable analytics on data, these challenges are needed to be overcame. In this paper,a review of importance and scope of data analytics in current and new emerging technologies are given. Then, the paper discusses some of the challenges in analytics that arises with these technologies. In the end, optimization techniques used in data analytics to overcome these challengeshave been presented.

Keywords: Data analytics, High dimensionality, Meta-heuristics, Optimization.

1   Introduction

In the recent decade, data is identified important tool in various business domains. The data can support business processes including decision making, marketing, sales and many more. Organizations collect and maintain the data to get valuable insight that is used in various business activities. New emerging technologies, Big data, Internet of Things, Cloud computing have advanced the process of data collection and maintenance. Now, data analytics applied on the current applications need to overcome the challenges arise with these newer technologies. The size, variety and complexity of data has changed that increase the challenges in extraction of insights from the data. Moreover, complexity of problems also get increased that raises other issues. Text analytics, network analytics, sentiment analysis are techniques used in different problem domains. The problem domain iswider that creates the need of advanced and optimized analytics techniques [1-3].

Data Analytics

Data analytics has been used in industries and organizations from several decades.Statistical methods are used to get a detailed description and inferences from the data. Classification, clustering are data mining methods that can be used for description and prediction of future values. Now, data analytics has evolved that machine learning and agile methodologies are used in the process. These advancedanalytics are useful for applications with high volume and various types of data. Business Intelligence and Analytics, Information Systems, Social Media, Marketing, Learning and Big Data are some of the current applications of the data analytics [4-8].

There are several types of data analytics that are used to form a model which represents a particular aspect of the data. Descriptive analytics deal with thecurrent aspect, while predictive analytics is more concerned about the futureaspects. Nowadays, the other analytics called as prescriptive analtics is getting more popular. On the basis of predictive values

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optimized guidelines can be prepared under prescriptive analytics [9].

In this paper, the various concepts of data analytics are studied. It includes the scope, challenges and optimization in data analytics. Section II discusses the scopeof data analytics in current and future applications. In next section, various challenges in data anaytics, existed due to the limitations of data and methods have been discussed. To handle the given challenges, usage of optimization techniques are discussed in the section IV. Section V concluded the role of data analytics with emerged technologies and the need of optimization in data analytics.

2.   Scope of Data Analytics

Data analytics provides more confidence in the decision making by providing related knowledge from the data. In the current era of advancement, with the largeamount of data, various analytics techniques are used in several applications. It leads to wide the scope of data analytics into various business domains. Some of them are discussed in this section.

Learning Analytics Learning analytics is widely used in education domain. The purpose is to improve the learning process with learning environment. Data analytics is used to determine the factors affecting the learning in current learning environment. There is an increase in online learners due to availability of online resources. The analytics activities have their importance in online learning. Moreover, there is another analytics called as academic analytics that focuses on the whole academic activities [10-12].

Forensic and Crime Analysis It includes analysis of crime scene to search the patterns in the crime. Objects used in crime and other field related information are used to find potential suspects. Analytic activities have their implications in prediction of possible crime scene in future [13-14]. With rapid growth of digitization and social media, cyber crime is also increasing. Analytics are used tracking and analysis of these cyber crimes [15].

Analytics in IoT, Cloud Computing and Fog Computing There are several emerging technology such as Internet of Things, Cloud Computing, fog computingetc. These technologies are generating and collecting a large amount of data. These emerging technologies are collaborated with data analytics to emerge value for the business. However, new challenges arise with this collaboration that leads to use of advanced and optimized analytics techniques [16-18].

Traffic and Accident Data Analytics Nowadays, analytics is widely used in the traffic analysis such that appropriate actions can be taken to reduce the traffic fromhigh congested area. Analysis is also performed on the accident data to determine the various factors involved in accident. Impact of these factors is analysed and actions are taken to reduce the impact of these factors [19-20].

Behavioural Analytics There are several social media platforms that engage a huge amount of users. Social media data varies from text, images to videos. The data is analysed for different purposes in several applications. Analytics techniques are used to get knowledge about the users and influencing their actions.Statistical techniques are applied on the data to get some descriptive information about the users. Various machine learning techniques are used to predict the futurebehaviour of users towards new services [21-22].

Determining customer's intentions for purchasing products is a complex and beneficial task in sale. The data is analysed to categorize customer into a particulargroup. Previous purchase records of customers are used in formation of a model, that is used for predicting future purchases of customers. The analytics process is very useful for applications where suggestions are given to the customer forservices [23-24].

Healthcare Analytics Healthcare field have a wide range of data. The data quantity and quality are changed with the usage of advanced techniques and tools in healthcare. The analytics process has a wider scope in the healthcare and

different types of analytics can be used in the respective area [25].

Business Analytics Analytics is used in business to have insights that support decision making. It is used in various business tasks. A competency is developed by marketing analytics. Various techniques of visualization, grouping and prediction can be used in marketing analytics [26-28]. Risk analysis is another sensitive task in business. A descriptive analytics can be used for better understanding of risk factors along-with their effects. Moreover, analytics can be used in prediction of outcome of risk handling process [29].

Banking Analytics It is used to determine whether a particular customer is worthy of a particular service or not. Based on the data collected for the customer, analytics are used for the prediction. This analysis when used in banking applications such as loan Approval and credit card assignment have positiveimpact in final decision making [30-32].

3   Challenges in Data Analytics

Data analytics has wider scope and used in variety of domains. Due to this, severalchallenges exist at different phases of the analytics process. Limitations existswith the variety of data, method used for modelling and many more. Some of the challenges in use of data analytics are discussed in this section.

Data collection There are several data collection techniques used in collection of data from various data sources. Data sources vary from traditional sources to current online platform. Conventional data collection techniques are more time consuming and may not be feasible in current applications. Online platforms are collecting enormous amount of data each day. Also, with the rapid growth in useof digital data, online data collection techniques are becoming more popular. Theyrequire less human intervention, provide fast data collection with help of various devices and collect large amount of data in different formats. These techniques areused in collecting data for real time applications. However, some new challenges arise with these new data collection techniques [33-34]. To have better insights from the data, collected data must represent the actual state of the problem. So, thedata collection techniques must be able to collect all ranges of the data with less specificity.

Data complexity In most of the current applications, available data is more complex than conventional applications. There is a huge increase in the size of data. Handling of this data is difficult with traditional data handling techniques. A large number of current applications have data which exists in different formats. All these formats may not be processable and transformed into another format for processing. Furthermore, all the available data may not be homogeneous in nature and different techniques are needed to gain particular insight from the data. Most of the traditional techniques deal with structured data. For the processing of semi- structured and unstructured data different techniques are required. Also, the result of the analytics are visualized differently. For the same type of data, domain of their attributes can have large variations. So, additional techniques are needed to handle to all these complexities [22],[35-36].
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Data dimensionality Dimensionality [37] of currently available data is much higher than the traditional data. These higher dimensions can add new knowledge and also generate new challenges in data processing. Not all dimensions can be used in all applications, then techniques are used to reduce dimension. For example, in clustering only certain attributes are to be selected to form specific clusters [38-39]. Here, dimensionality of data has to be reduced to get the appropriate number of attributes. Several techniques are used for handling dimensionality of data. Selecting and extracting appropriate number of attributes from the large set of attributes are some methods used to reduce thedimensionality of the data. But when the dimensionality of the data is reduced, there is a loss of information. This loss can affect the reliability and accuracy ofthe results [35].

Data integration Data is collected from the different sources with the use of different platforms. To process this data, it must be integrated to form a single dataset that represents the actual state of the data. There are variation in the qualityof

the data collected from different sources as they can have different representation for the same data. Data can also vary in size. Data from a particular data source can be biased in nature. Results of analytical activities are dependent on these characteristics of the data. While handling these issues, there can be loss of information from the data [35-36].

Data pre-processing Data collected may not be directly used for analysing. There can be several difficulties with the data. Some instances of data either donot have values for some attributes or the available value in not valid in the attribute domain. If this data is used, it may generate results that are less reliable and less accurate. Several techniques are used to handle these difficulties in the pre-processing phase which is performed before modelling the data. In this phase, collected data is processed so that all these uncertainties in data can be handled. Also, relevant attributes of data can be selected depending on the problem. Severalmethods are used for selecting these attributes [40-41].

Data modelling There is a significant role of methods used in analytics process in accuracy of the final model. Conventionally, statistical and machine learning methods are used for data modelling. It includes hypothesis testing, correlation, regression, classification, clustering and many more. In current applications, where characteristics of data has changed, modelling of data with these methods may not be as accurate as traditionally. For the current problems, new approaches are developed by researchers. Some of them are hybrid approaches that combine the conventional methods with other optimization techniques [36],[42-43]. This hybridization of two or more methods is applied on many levels.

Data processing Data size has increased exponentially and can not be handled with traditional databases. It requires non-traditional databases for this data. Furthermore, processing requirements of data has also been increased. There is a need to accommodate this scalable nature of the data. It may be possible that different data analysed differently for efficient analytics [4],[17],[39].

4   Optimization in Data Analytics

Optimization techniques are used in the different phases of the analytics process. The optimization techniques are used in pre-processing of the data. Here, data is processed to prepare for the final modelling. It includes processing of different characteristics of the data. Optimized modelling approaches are also used in the formation of model for the respective problem. This section discussed about some of these optimized analytics approaches.

In current real world applications, the dimensions of data is large that makes the analysis of data more difficult. There are several optimization techniques that are suitable for the high dimension problem. Genetic Algorithm (GA), Particle Swarm Optimization (PSO), Differential Evolution (DE) are some optimization techniques that are being used in these applications. High dimensions can be handled more effectively with these optimization techniques [44-45].

Clustering is used in data analytics to group data based on some measures, the group can be used in analysis and decision making. In current applications, optimization based clustering approaches are used to have more accurate and efficient outcome. Differential Evolution (DE), Particle Swarm Optimization(PSO), Artificial Bee Colony (ABC), Evolutionary Algorithms (EAs) are being used for both fuzzy and crisp type of clustering. These algorithms are found to have good performance with large size data as well as with complex problems [46-48].

Two types of model are used for classification of data for prediction. Regression isone such model that establishes a relationship between the variables. An optimizedregression approach is used that minimizes the measured error [49]. ParticleSwarm Optimization (PSO) is a meta-heuristic algorithm used for feature selectionand applied in simple, binary and fuzzy classification [50-52].

Nowadays, applications use cloud to store their data that can be processed on the cloud. Cloud data analytics has used the optimization techniques to overcome the generated issues such as scheduling [53]. Optimization techniques used in big dataanalytics, handle the various challenges throughout the analytics processassociated with the big data. Evolutionary Algorithms and swarm based algorithms are used for feature selection, dimensionality and other issues in big data [54-56]. The problem of multi-objectivity is also existed in the big data, the optimization techniques are found to be more effective in the multi-objective problems [57].

5   Conclusion

This paper provides a brief study on scope and challenges in data analytics with current technologies. The scope of data analytics has increased with emergence of more advanced technologies. It also leads to generation of new issues in application of analytics techniques in different domains. Several optimizations techniques has been used to handle all these issues and to improve the accuracy of solutions. Many improved solutions have used evolutionary and bio-inspired algorithms at different levels. Usage of these algorithms increase the applicability of the analytics process to the problem with complex data characteristics. Incurrent problems, there is a need of processing data before final modelling. Optimized pre-processing techniques are used for these problems. Moreover several optimization techniques have improved the accuracy of final solution of decision making process. As the properties of data and problems have changed, more and more optimized techniques are been developed and used. There are hybrid algorithms that can be used to tackle these types of problems.

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Crop Yield Prediction using Machine Learning and Deep Learning Techniques:A Review

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Abstract - Crop Yield prediction is very essential in Agriculture domain. Revenue generated from a crop is completely depend on the total yield.The crop yield is dependent on the nutrient contents and drastically affects the health of the crop. Thus, nutrient deficiency analysis is much important for better yield.It will be helpful for farmers to utilize the yield prediction results for their management and financial decision. Machine Learning could be a best solution to the crop yield issues. Machine Learning is the automated process in which models learn by themselves, identify patterns and make decision. The primary aim of this study is to review different Machine Learning and Deep Learning Techniques used in Crop Yield prediction. This literature review indicates that Machine Learning and Deep Learning techniques can help us to predictaccurate yield of crop as compared to traditional methodsby using several datasets of soil, crop, weather etc.

Keywords: CNN-RNN, Random Forest, Neural Network

1.Introduction

Agriculture sector plays a predominantrole in development of the country. It is not only an enormous aspect of the growing economy, but it's essential for us to survive. It'sa crucial sector for Indian economy and also human future(Venugopal et al., 2021).

The yield is a measurement of the amount of crop grown per unit area of land. Crop yield isaffected by many factors such as crop genotype, environment, and management practices. (Khaki et al., 2020) Variation in crop yield happened due to change in environment, bothspatial and temporal.Achieving maximum crop yield at minimum cost with a healthyecosystem is one of the main goals of agricultural production. Earlydetection and management of problems associated with crop yield restrictionscan help increase yield and subsequent profit, and estimatingyield is important to numerous crop management and business decisions.(Chlingaryan et al., 2018)In such circumstances, accurate yield prediction plays a very important role in food management.

Machine Learning and Deep Learning, the branches of Artificial Intelligence focusing on learning and prediction provides a practical approach of prediction based on several features. ML Techniques are prominent in solving large non-linear problems. The performance of ML model is measured by performance metric. These models provide sharp accuracy on deriving features using datasets from multiple sources.Machine Learning is generally classified in three parts: -

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning

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This purpose of this research study is to provide an overview of the different Machine Learning and Deep Learning techniques that have been used in Crop Yieldprediction.

2. Literature Review

(Venugopal et al., 2021)had predicted the yield of crop based on weather, yield, humidity, windspeed and rainfall dataset. Several Machine Learning Algorithms like Logistic Regression, Naïve Bayes and Random Forest algorithms were used for making decision based on input features. The results indicated that Random Forest outperformed with 92.81% of accuracy.

(Ravi & Baranidharan, 2020)had predicted the Crop Yield based on cultivation area, rainfall and maximum and minimum temperature.Various Machine Learning Algorithms like Linear Regression, Support Vector Regression, Decision Tree, Random Forest and XG Boost were used. It was found that the XG Boost performed well with R2 is 0.9391 as compared to other techniques.

A Crop Yield Prediction was performed by(Khaki et al., 2020)based on yield performance, management, weather, soil using a deep learning framework using CNNs (Convolution Neural Network) and RNNs (Recurrent Neural networks) for yield prediction based on environmental data. Random Forest (RF), deep fully connected neural networks (DFNN) and Lasso were also used for predicting Yield of Crops. The proposed hybrid model CNN-RNN outperformed.

A Crop Yield Prediction was performed by (Chaudhary, 2018)based on Soil, Weather and Crop dataset. An Artificial Neural Network (ANN) was used for prediction yield prediction based on past year prediction data. It was found that, Neural Network is the best solution for agriculture problems such as prediction of crop yields.

(Bhanumathi et al., 2019)had predicted the Crop Yield and deliver proper recommendations about required fertilizer ratio based on atmospheric and soil parameters of a land. The features taken into consideration were state, district, crop, area, season, production and soil data. The Machine Learning Algorithms like Random Forest and Back Propagation were used and the result showed that Random Forest Algorithm performed well.

The Soybean Yield prediction was performed by (Terliksiz & Altylar, 2019)using satellite images and soybean labels. 3D CNN was used for the same and it worked well as compared to Histogram CNN. But choosing input data frames to a model is very important.

A two-tiered Machine Learning model was built by (Shidnal et al., 2019)to identify nutrient deficiency of a paddy crop. Random images of the crop lands were taken as features. Neural network and K-means Clustering were used. In the first level, neural networks were used to identify the nutrient deficiency which indicated satisfactory results. In the second level the application of K-means Clustering method was used to quantify the intensity of presence of the particular deficiency and corresponding yield value.

(Nigam et al., 2021)had predicted the yield of crop based on temperature, rainfall, area, season. Several Machine Learning Techniques like Logistic Regression, XGBoost Classifier, KNN Classifier, Random Forest Classifier, Artificial Neural Network were used. Among all the techniques, Random Forest Classifier outperformed with 67.80% of accuracy.

(Venkat et al., 2019)had predicted the crop yield and recommended suitable fertilizers to gain high yield of crops using pH dataset, Crop dataset, fertilizer dataset. Artificial Neural Networks (ANN) and Backpropagation Neural Network were used and Neural Networks performed well to predict the soil quality and crop yield.

The prediction of wheat, barley and canola crop yield using on-farm data was performed by (Filippi & Jones, 2020)using Yield monitor data of wheat, barley and canola crop and rainfall dataset. Random Forest model performed well for all three seasons.

The prediction of crop yield and suggestion of the optimal climatic factors to maximize crop yield was performedby (Shah et al., 2018)using humidity, yield, temperature and rainfall datasets.The Machine Learning Techniques such as Multivariate Polynomial Regression, Random Forest and Support Vector Machine (SVM)

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were used to solve the problem. The result indicated that Support Vector Machine outperformed compared to other two models.

The prediction of crop yield and to study impact of climate change in agriculture was performed by (Crane-Droesch, 2018)using Corn yield datasets. Algorithms used in this prediction was Semiparametric neural networks (SNN) and OLS Regression. The Result showed that Semiparametric Neural Networks (SNN) was more accurate than OLS Regression.

The below table tabulates the various Machine learning and Deep Learning techniques used for Crop Yield prediction with different set of parameters.

Title	Objective	Parameter	Technique	Result
(Venugopal et al., 2021)	To predictcrop yield by applying various machine learningalgorithms	Weather, humidity, temperature, windspeed, rainfall dataset	Logistic Regression, Naïve Bayes and Random Forest.	Random Forest outperformed with 92.81% of accuracy.
(Ravi & Baranidharan, 2020)	To predict crop yields based on environmental conditions.	cultivation area, rainfall and maximum and minimum temperature	Linear regression, Support Vector Regression, Decision Tree and Random Forest, XGBoost	XGBoost performed well with R^2 is 0.9391.
(Khaki et al., 2020)	To forecast corn and soyabean yield	yield performance, management, weather, soil,	CNN-RNN, Random Forest (RF), deep fully connected neural networks (DFNN), and LASSO	The hybrid model CNN-RNN outperformed.
(Chaudhary, 2018)	To predict crop and crop yield based on the existing data by Artificial Neural Network.	Soil data, weather data, crop data	Artificial Neural Network	Neural Network is best solution for agriculture problems such as prediction of crop yields.

(Bhanum athi et al., 2019)	To predict crop yield and to deliver proper recommendations about required fertilizer ratio based on atmospheric and soil parameters of a land.	state, district, crop, area, season, production, soil data	Random Forest, Backpropagation algorithm.	Random Forest performed well.
(Terliksiz & Altylar, 2019)	To predict soybean yield.	Satellite images, soybean labels	3D CNN	3D CNN worked well as compared to Histogram CNN. But choosing input data frames to a model is very important.
(Shidnal et al., 2019)	To identify nutrient deficiency of a paddy crop.	Crop images	Neural network, K-means Clustering	In the first level, neural networks were used to identify the nutrient deficiency which indicated satisfactory results. In the second level the application of K-means Clustering method was used to quantify the intensity of presence of the particular deficiency and corresponding yield value.
(Nigam et al., 2021)	To predict the yield of the crop by applying various machine learning techniques.	temperature, rainfall, area, season	Logistic Regression, XGBoost Classifier , KNN Classifier ,Random Forest Classifier, Artificial Neural Network	Random Forest Classifier outperformed.
(Venkat et al., 2019)	To predict the crop yield and recommends suitable fertilizers to gain high yield of crops.	pH dataset, Crop dataset, fertilizer dataset	Artificial Neural Networks (ANN), Backpropagation Network	Neural Networks performed well to predict the soil quality and crop yield.

(Filippi & Jones, 2020)	To predict wheat, barley and canola crop yield using on-farm data.	Yield monitor data of wheat, barley and canola crop, rainfall dataset	Random Forest	Random Forest model performed well for all three seasons.
(Shah et al., 2018)	To predict crop yield and suggest the optimal climatic factors to maximize crop yield.	humidity, yield, temperature and rainfall	Multivariate Polynomial Regression, Random Forest, Support Vector Machine (SVM)	Support Vector Machine outperformed compared to other two models.
(Crane-Droesch, 2018)	To predict crop yield and to study impact of climate change in sgriculture.	Corn yield dataset	Semiparametric Neural Networks (SNN), OLS Regression	Semiparametric Neural Networks (SNN) is more accurate than OLS Regression.

3. Conclusion

Crop Yield prediction plays a vital role in Agricultural sector. Machine Learning and Deep Learning Techniques can help farmers to solve yield issues and helps to increase revenue. However, Machine Learning cannot solve the yield issues completely due to the complexity of the problem domain. This literature review takes into consideration the data related to soil fertility, weather, crop and past year production and several Machine Learning algorithms like Random Forest, CNN-RNN, SVM and so on. Neural Network could be a better solution to solve the yield issues. Random Forest also worked well.

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Extractive Text Summarization using NLP

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Abstract. In today's world, when data is of utmost importance, it becomes very important for us to retrieve information quickly and accurately. We cannot spend large amount of time to gothrough all the texts to extract meaningful information and spend a lot of time and effort. Instead, we formulated an automatic version of extracting useful information from enormous lines of text which works just like humans but saves us lot of time and effort. It is very quick too. Automatic Text Summarization is the one in which the contents of the text are reduced but the informational content of the text is preserved. There are two types of summarizations: - extractive and abstractive. In Extractive summarization involves extracting important sentencesfrom the whole text provided as input and then putting them together to input the summary hence formed. In Abstractive summarization, the original sentences of the text are not preserved. It uses different terms to construct new sentences which convey the same meaning. In this paper, we have introduced extractive method of text summarization. Among many models, we chose word frequency as the indicator to define the importance of the word and hence the importance of sentence to be included in the summary.

Keywords: Machine Learning , Natural Language Processing , Python

1. Introduction

Text Summarization refers to extracting significant data from a large volume of data.The amount of data available on the internet grows every day, making it a matter of space and time to cope with such massive amounts of data. As a result, handling sucha massive volume of data poses a significant challenge in a variety of real-world datamanagement applications. The Automatic Text Summarization project makes it easierfor users to use Natural Language applications such as data recovery, question answering, and content reduction. Automatic Text Summarization plays an unavoidable role in extracting relevant and unique material from a large amount of data.

Filtering through a mountain of reports can be difficult and time-consuming. It can take minutes to make sense of what people will discuss in a paper or report without asummary or breakdown. As a result, the Automatic Text Summarization extracts a sentence from a content record, determines which are the most crucial, and returns them in a comprehensible and structured manner.Automatic Text Summarization is a

subset of natural language processing, which is the process by which computers decipher and interpret human speech.

Automatic Text Summarization that looks through a large number of reports using theclassifier structure and its rundown modules and delivers the phrases that are useful for constructing a summary. The most overlapping sentences are deemed high score words in the programmed outline of content, which uses overlapping sentences and synonyms or senses. The terms with the highest recurrence are given the most weight.And the most valuable terms are extracted from the content, ordered by frequency, and a summary is generated.

Natural language processing

Natural Language Processing is a branch of Artificial Intelligence (AI). It provides thecomputers the ability to understand text and spoken words just as human beings can. NLP focuses on interaction between data science

and human language.

NLP Tools and Approaches - Python programming language provides various libraries and tools for performing NLP specific tasks. Many of these libraries and tools are found in NLTK (Natural Language Toolkit). NLTK includes libraries whichare used to perform tasks such as word segmentation, sentence parsing, stemming, lemmatization, tokenization, semantic reasoning etc.

Following are the steps/phases involved in Natural Language Processing - *Morphological Processing* - This phase involves breaking chunks of input data intosets of tokens such as words, sentences and paragraph.
Syntax Analysis - In this phase two functions are performed. Firstly, the sentences arechecked whether they are well formed or not. Secondly, these sentences are broken upinto a structure that shows syntactic relationships between the different words.
Semantic Analysis - This phase involves extracting exact meaning or dictionary meaning from the text and also the text is checked for meaningfulness.
Pragmatic Analysis - If a sentence has two semantic interpretations, then pragmatic analyzer will choose between these two possibilities.

Advantages of natural language processing

1) Provides objective and accurate analysis
While performing tasks like reading, analyzing text data etc., humans are prone to mistakes. NLP powered tools can be trained to the language and according the business criteria. And if once they are trained and set for running, they can perform much more efficiently than humans ever could.

2) Performs large scale analysis

NLP can process large amounts of data in just few seconds or minutes, that would takedays or weeks of manual analysis. NLP tools can scale up or down according to our needs, so very little computation power is required.

3) Improves customer satisfaction
NLP enables us to analyze and sort customer service tickets by intent, sentiment, topicetc., and route them to the proper department. By analyzing customer satisfaction surveys, we can quickly know how happy customers are at every stage.

4) Streamlines processes and reduces cost
NLP tools can work at any scale according to our needs. To accomplish manual data analysis, a couple of employees are required to work full time. But, by using NLP SaaS tools, we can keep number of employees to minimum.

5) It helps in better understanding of market

NLP is having a huge impact on marketing. It provides you with better understandingof market segmentation , helps you to be better equipped to target the customers and also decreases customer churn.

6) Provides real and actionable insights
An extra level of analysis is required to analyze unstructured data such as open-endedsurvey responses, online reviews and comments etc. But NLP tools can make this analysis easier. NLP enables us to really dig into unstructured text for data driven, realworld, and immediately actionable insights.

Advantages

1)   Manual Text summarization is a tedious task which requires a lot of human effort of reading the whole document, extracting the important points from large amount of information and then presenting the same to the

user. Whereas, automatic text summarizers can do the same amount of work, even more in few seconds.

2)   Automatic text summarizers are not biased like human text summarizer.

3)   They also improve the efficacy of indexing.

4)   They can also summarize large texts in any language.

5)   It also helps in increasing the productivity of the user by reducing the time required for doing the summarization manually.

2 . Literature Review

An overview

In the big data era, there has been an explosion in the amount of text data from a variety of sources. This volume of text is an inestimable source of information and knowledge which needs to be effectively summarized to be useful. This increasing availability of documents has demanded exhaustive research in the NLP area for automatic text summarization. Automatic text summarization is the task of producing a concise and fluent summary without any human help while preserving the meaning of the original text document. It is very challenging, because when we as humans summarize a piece of text, we usually read it entirely to develop our understanding, and then write a summary highlighting its main points. Since computers lack human knowledge and language capability, it makes automatic text summarization a very difficult and non-trivial task.

Technologies used

a) Python
b) Machine Learning
c) Natural Language Processingd) JavaScript
e) Html and Css

3.   Extractive summarization

The process of extractive summarization includes picking out salient sections of the text and generating them line by line resulting in subset of sentences from the originaltext.

Following are the three independent tasks which are performed by an extractive summarizer –

Formation of an intermediate representation of the input text

Indicator representation and topic representation are the two types of representation-based approaches. In topic representation process, the text is transformed into an intermediate representation and the topics present in the text are interpreted. The techniques used for this process are divided into topic word approaches, frequency driven approaches, Bayesian topic models and latent semanticanalysis. In indication representation process, every sentence is described as a list of formal features such as position in the document, having certain phrases, sentence length etc.

Scoring the sentences based on the representation

An importance score is assigned to each sentence after the intermediate representationof the text. In topic representation process, score is assigned to a sentence based on how well it demonstrates important topics of the text. In indicator representation process, the score is calculated by aggregating the evidences from various weighted indicators.

Selection of a summary

The top k most important sentences are selected by the summarizer system in order toproduce a summary. To select the important sentences, some approaches use greedy algorithms while some approaches convert the process of sentence selection into an optimization problem in which sentences are selected, considering the criteria that these sentences should maximize coherency and overall importance minimize the redundancy.

4.   Approach

Text preprocessing

First step is removing stop words, special characters and numbers and then storing them into a separate array of words.
Stop words are the words that have no role in adding value to the meaning of a sentence. For Example - the, a, for, an, is etc. We can reduce the number of words and still can preserve the meaning of the sentence after removing the stop words.

Create frequency table

Next, we create a dictionary for the word frequency table from the text. For this, we only use the words that are not part of the stop words array.

Tokenize the sentences

Now, we split the text string in a set of sentences. For this, we will use the inbuilt method from the nltk.

Sentence scoring

We use the Term Frequency method to score each sentence. In this method we scoreasentence by its words, adding the frequency of every non-stop word in a sentence.

Threshold

Here, we are considering the average score of the sentences as a threshold. You can use other methods to calculate the threshold.

Summary generation

Finally, the summary is generated by only selecting the sentences whose score is greater than the threshold value.

5.   Implementation

Step 1: Importing required libraries.

In order to build an efficient text summarizer, we need to import two NLTK libraries.from nltk.corpus import

stopwords

from nltk.tokenize import word_tokenizefrom nltk.stem import

PorterStemmer

Corpus - corpus is a collection of text. It can be anything such as writings by anauthor, poems by a particular poetetc.

Tokenizer - Tokenizer divides a text into a series of tokens. Word, sentence and regextokenizer are the three main tokens in a tokenizer. But we will be using only the sentence and the word tokenizer.

PorterStemmer - Its function is to separate the common endings from words in English.

Step 2: Text Tokenizing and Preprocessing – In this step, we perform word_tokenize(text) which returns a list of syllables by applying Legality Principle incombination with Onset Maximization. Then, we inputour stream of tokenized wordsinto the stemmer i.e., PorterStemmer.

After which, we remove the stop words from the output stem. Stop words are the words that have no role in adding value to the meaning of a sentence. For e.g. - the, a,for, an, is etc. We can reduce the number of words and still can preserve the meaningof the sentence after removing the stop words.

Step 3: Creating a frequency table of the words.
In order to keep a record of number of times a word appears in the text, a python dictionary is used. Then this dictionary is used over each stemmed word to store the resulting words left after removing stop words. sentence to know which sentences have the most overallcontent in the overall text.

Step 4: Finding Sentence score - The text is provided as input in sent_tokenize (), which further divides the sentences into more fragments. A score is assigned to each sentence depending on the words it contains and the frequency table A dictionary is also used to keep track of the score of each sentence. Later, this dictionary is used tocreate a summary.

Step 5: Comparison of sentences within the text
To compare the scores, average score of a particular sentence is calculated. This average score is a good threshold. After applying this threshold value, the sentences are stored in an order into the summary.

6.   Output

Step 1: Run Text-sum-core.py file. Then, ignite the TextSummarizer Web application i.e., onhttp://localhost:5000/text-summarizer.

Step 2: Copy the content that you wish to summarize from any website and paste iton the app (shown in Fig1).

Step 3: Summarized document will be given as output. It can be viewed after saving it on local computer.
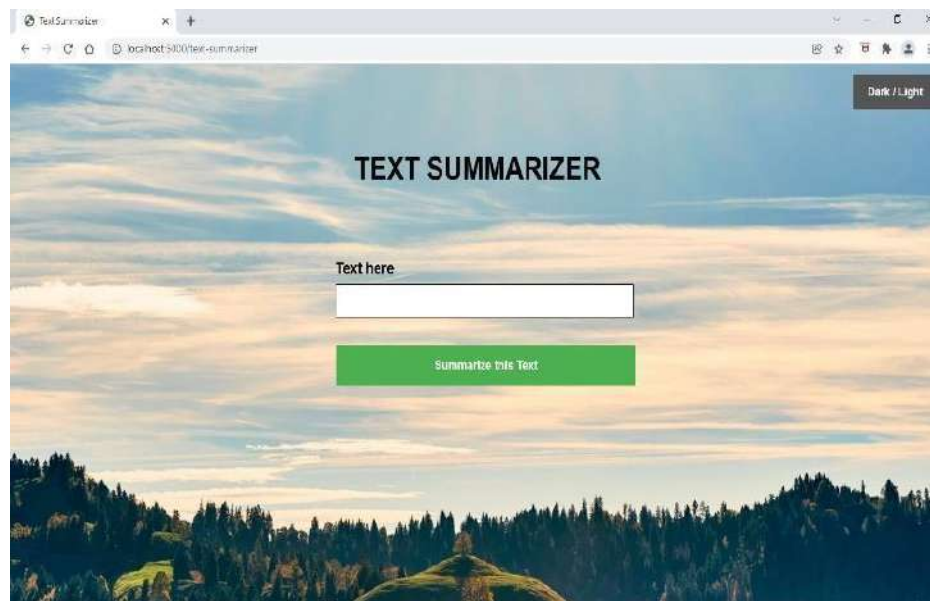
Fig 1. Text summarizer
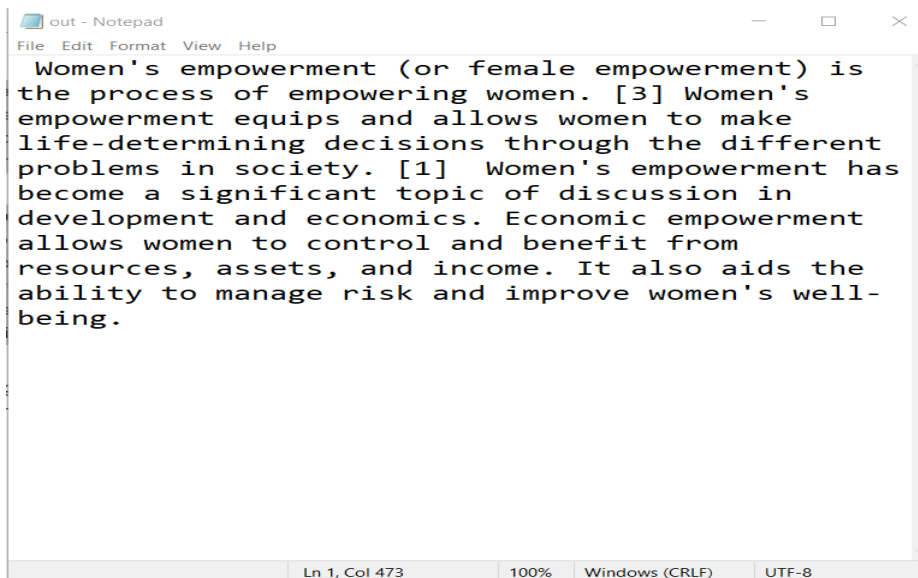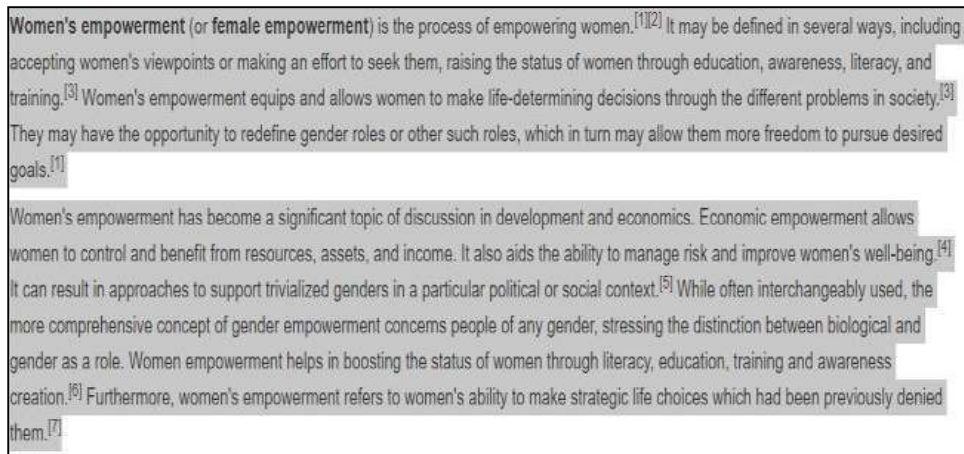
Fig 2. Input to Text summarizer

Fig 3. Output from Text summarizer

7. Conclusion and Result

In this paper, we presented an extractive text summarizer that can help condense largereports or paragraphs into easily understandable chunks with key points. This model is made up of two maincomponents i.e., sentence ranking and finding sentence score.In sentence ranking, we constructed a frequency table to keep the count of importantwords. In the second phase, we performed key points extraction based on the calculated average score of each sentence from the original text. Since text summarization when done by humans is a tedious task which is why this laborious task of reading the whole text to extract just the key points is done by machines with the help of NLP. Further research is required to incorporate it into a larger system witha valuable user interface. Some functionalities like summarizing the whole pdf or website will be much more demanding in the future due to the explosion inthe size ofdata.

8. Future aspects

Some functionalities like summarizing the whole pdf or website will be much moredemanding in the futuredue to the explosion in the size of data.

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Dynamic Traffic Management System

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ABSTRACT

Traffic congestion is becoming a major issue as there are a lot of vehicles on the roads. The length of the queue for traffic at intersections is increasing dramatically with increasing traffic flow, and standard traffic lights are not able to adjust it properly. Real-time traffic light control algorithm based on traffic flow is suggested in this paper. We would be using computer vision and machine learning to have competing traffic flow features at intersected intersections. This is made possible by the discovery of a modern, real-time object based on in-depth Convolutional Neural Networks called You Only Look Once (YOLO). Then traffic signal phases are optimized according to the datacollected which are mainly the queue length and the waiting time per vehicle, to enable as many vehicles as possible to pass safely with minimum waiting time. YOLO makes it possible to create a Deep Neural Network for limited hardware resources as it can be deployed on an embedded controller using the Transfer Learning technique.

Keywords: YOLO, Deep Neural Network, Computer vision, Convolutional Neural network.

1. INTRODUCTION

Problem Definition andObjective

Traffic congestion is a major problem in many cities, and concentrated cycle signal controls do not solve the high waiting time at intersections. Most of the time we see a police officer in charge of a movement instead of a traffic light. He detects road conditions and determines the approximate length of each route. This human achievement inspires us to build a smart traffic light controller that takes into account real-time traffic conditions and wisely manages crossroads. In order to use such a system, we need two things: eyes to watch the real-time road condition and a brain to process. The traffic signal system has two main functions: move as many people across the intersection as possible with as little conflict between them as possible.

Video is a powerful way to transfer information and data is abundant in the presence of cameras. From dashboard, body, and street cameras, to YouTube and other social media sites, there is no shortage of video data. Interesting apps that use this are ready to upgrade. An international analysis of 28 studies concluded that such programs reduced the crash by 8% to 50%. The primary response to France's implementation in their automatic speed enhancement program (ASEP) was a 21% reduction in fatal car accidents along with a 26% reduction in non-fatal car accidents, according to the demonstration by Carnis and Blais.

The proposed method is to calculate the number of vehicles and give them time accordingly. The application will be installed on the traffic signals. The process begins with taking live images from the camera and sending them to a local server. On the server side, the YOLO library is used to determine the number of vehicles and the minimum amount used to allocate time to show traffic on that route.

Literature Review

In January 2014, Gianfranco Scata, TizianaCampisi, Mario Collotta, Giovanni Pau presented a research paper on Dynamic Traffic Light Management System Based on Wireless Sensor Networks to reduce the Red-Light Running Phenomenon. The authors of the paper proposed a way to differentiate the flow of the traffic based on Fourier's explicit transformation using a data integration algorithm to reduce the cost of communication between wireless network nodes to monitor urban traffic. The authors show a WSN program integrated with video surveillance cameras. They describe the structure of a novel network in which surveillance cameras are randomly enabled or disabled with a vague control based on information collected by sensors located on the side of the road.

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In May 2016, Nam Bui KhacHoai, O-Joun Lee, David Camacho presented a research paper on the Dynamic Traffic Light Control System Based on Synchronization Process Between Connected Vehicles. In the concept of a connected car, cars can be identified by their id (car number plate). Vehicle connects to infrastructure (V2I) and other vehicles (V2V) under id as address. Each vehicle is equipped with a positioning system (VPS) to determine its location. In this regard, a crossroads vehicle management system can obtain vehicle information on location and directions as they enter the intersection. shows the formation of a vehicle connected to traffic at intersections. Sensors are developed in each direction to detect vehicles moving in the simulation following a random distribution. Wireless communication devices (Cellular Base Station) are designed at intersections to allow communication between vehicles and others. We assume that the range of wireless devices transmission can cover the entire intersection area. In addition, the wireless station is a FIFO station, meaning that the traffic management system will receive a request on vehicles as a FIFO model.

The convolution neural network is recommended for in-depth learning approach and uses well-studied text and key facts to extract features. The deep clustering method is used in the provision of temporary Traffic throughout the board. In Feature Release a combination of CNN and Triplet loss is used. The fully Convolutional network is used for the separation of traffic signals and the Fast neural network network is used for output element. In-depth learning methods are used to measure traffic congestion on an unmanned aerial vehicle. It is used to identify, locate and classify vehicles. Advanced learning methods such as SSD, Faster R-CNN, YOLO-v3, R-FCN are used to obtain an object based on collected data. Both in-depth reinforcement learning algorithms such as in-depth gradient agent and value-based agent are used to control traffic at crossroads. Traffic delays are controlled using the enhancement learning algorithm associated with CNN. Labeled data is protected by cycleGAN networks. Convolutional neural network based visual attention is used to differentiate vehicles and are supported by enhanced learning. CNN is used to predict multiclass problems and congestion conditions.

Methodology

The number of vehicles is constantly increasing in cities and towns. Accidents in robots happen for a number of reasons, including a lack of care and abuse of robots. We have collected data on cameras installed on road signals.

Live feeds from the cameras will serve as the data set of the machine learning model. The model only focuses on existing vehicles on the road, other items such as pedestrians will not be ignored. Details will be collected from the city traffic department.

Basically, data collection will only be needed to make a prototype. But a complete integrated app will not require data to be collected. It can be integrated with the city department's traffic monitoring program and our ML model.

The machine learning model used in this project is called YOLO. This is a real-time acquisition model. Therefore, Data analysis will be performed on the basis of the types and number of vehicles that will be detected by the critical model in calculating the time of the signal strength of the traffic.

2. PROPOSED SYSTEM TECHNIQUE'S
YOLO Real-time Object Tracking inVideo

YOLO is a reference to a quick, accurate article, in which First, a picture is taken and calculated for YOLO. In our model, the image is divided into 3x3 grid frames. We can split a picture into any number matrices, depending on the complexity of the image. Once the image is separated, the entire lattice goes through the process and blocking of the article. Troubles or definite points for all lattices are available. In the unlikely event that there is no official article found in the framework, then the ratio of the opposing and runoff box of the network will be zero or in the event something is found in the matrix, then the opposition will be zero. be 1 and the number of the jump box will be its comparison to the jumping value of the object obtained. The location of the object is one of the problems of the classic style in the PC view where you work to see what and where - obviously what elements are inside the given image and moreover where they are in the image. The subject of identification is more predictable than order, which may also see protests but does not indicate where the article is in the picture. In addition, the order does not end with images containing more than one item. YOLO uses a completely unexpected approach. YOLO is a vigorous convolutional neural organization (CNN) to create a platform for continuous protest. The figure uses the organization of emotions alone in the full picture, and then later divides the image into regions and predicts the jumping boxes and opportunities for all regions. These jump boxes are heavy for

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the expected chances.

YOLO is mainstream as it achieves high accuracy while also having the option of continuous use. It has 24 convolutional layers followed by 2 layers that are completelyassociated. Instead of the startup modules used by Google Net, we use 1×1 decrease layers followed by 3×3 conversion layers. Fast YOLO uses a neural organization with smaller convolutional layers (9 rather than 24) and less channels in those layers. Regardless of the size of the organization, all preparation and testing parameters are equal between YOLO and Fast YOLO.
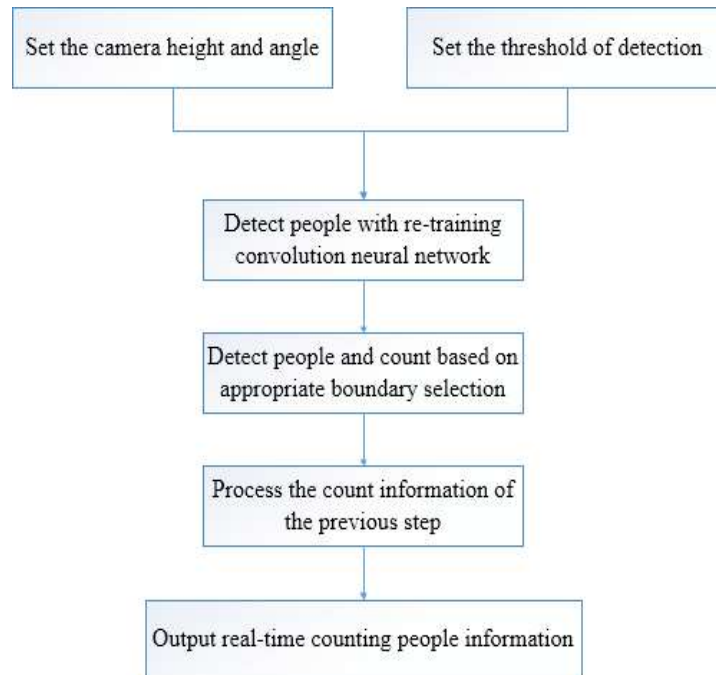
Fig 1. Classification of YOLO
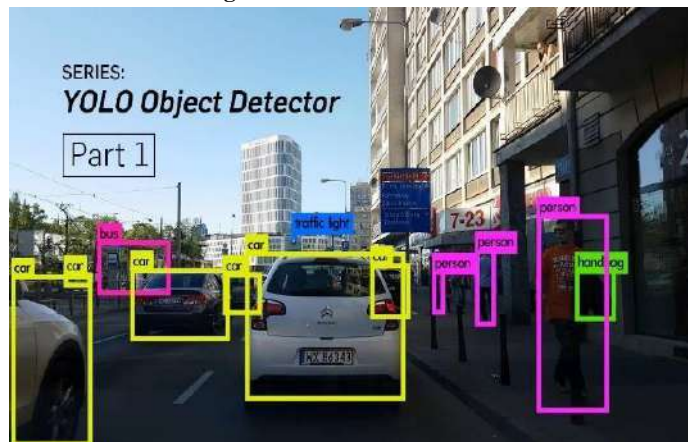
Fig 2. Yolo Detector

YOLO vs other detectors

Some algorithms divide the object detectionprocessinto two categories. They are called Two-phase object detection algorithms.
1. Identify potential areas/regions.

2. Divide the image into those regions by classes or categories.

Popular two-step algorithms such as Fast-RCNN and Faster-RCNN typically use a Regional Proposal Network that proposes interesting regions that can contain objects.
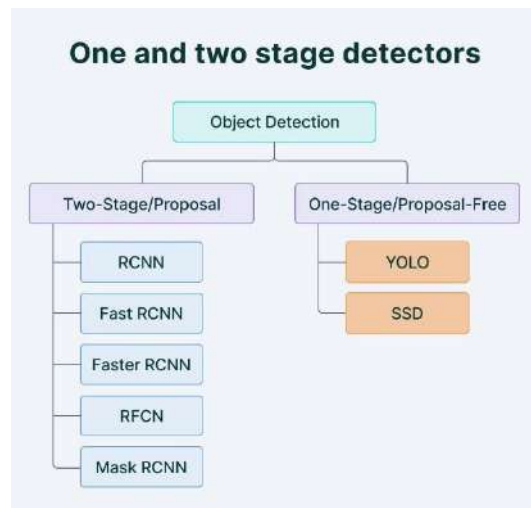
Output from the RPN is provided by the division that divides the regions into categories.

Although this provides accurate results in object detection with a high average accuracy (mAP), it results in multiple duplicates occurring in the same image, thereby reducing algorithm detection speed and preventing real-time detection.

Compared to the pre-YOLO object acquisition algorithms, which also use class dividers to obtain acquisition, YOLO proposes the use of a neural end-to-end network that generates binding box predictions and class opportunities all at once. Following a very different approach to object acquisition, YOLO achieves modern results overcoming other real-time acquisition algorithms with large margins. In addition to the increased accuracy of the forecast and the better Crossroads over the Union in the binding boxes (compared to real-time receivers), YOLO has the natural advantage of speed. YOLO is a much faster algorithm than its counterparts, operating at up to 45 FPS.

Although algorithms such as Faster RCNN work by finding potential regions that use the Regional Proposal Network and make recognition of those regions separately, YOLO makes all its predictions with the help of a fully integrated layer. Methods that use Regional Proposal Networks thus end up making multiple duplicates of the same image, while YOLO avoids duplicate single.

The higher the AP, the more accurate it is at that variable.YOLO was found to be slightly inaccurate while detecting small objects, so it couldn't be compared to other algorithms.

Table 1: YOLOv3 comparison for different object sizes showing the average precision (AP) for AP-S (small object size), AP-M (medium object size), AP-L (large object size)

	backbone	AP	AP$_{50}$	AP$_{75}$	AP$_S$	AP$_M$	AP$_L$
Two-stage methods							
Faster R-CNN+++	ResNet-101-C4	34.9	55.7	37.4	15.6	38.7	50.9
Faster R-CNN w FPN	ResNet-101-FPN	36.2	59.1	39.0	18.2	39.0	48.2
Faster R-CNN by G-RMI	Inception-ResNet-v2	34.7	55.5	36.7	13.5	38.1	52.0
Faster R-CNN w TDM	Inception-ResNet-v2-TDM	36.8	57.7	39.2	16.2	39.8	**52.1**
One-stage methods							
YOLOv2	DarkNet-19	21.6	44.0	19.2	5.0	22.4	35.5
SSD513	ResNet-101-SSD	31.2	50.4	33.3	10.2	34.5	49.8
DSSD513	ResNet-101-DSSD	33.2	53.3	35.2	13.0	35.4	51.1
RetinaNet	ResNet-101-FPN	39.1	59.1	42.3	21.8	42.7	50.2
RetinaNet	ResNeXt-101-FPN	**40.8**	**61.1**	**44.1**	**24.1**	**44.2**	51.2
YOLOv3 608 × 608	Darknet-53	33.0	57.9	34.4	18.3	35.4	41.9

Linear Regression

Linear regression is used to find the direct link between the target and at least one target. There are two types of Linear regression Simple and Multiple.

Simple linear regressionis important to get the connection between two fixed objects. One is indicator which is an autonomous variable and the other is a reaction or ward variable. It's basically used for searching for factual relationships and not fixed relationships. The connection between the two should be decisive in the event that one variant is accurately represented by the other. For example, using a temperature of Celsius it is possible to predict Fahrenheit. Real relationships are not accurate in determining the connection between two things. For example, a connection somewhere in the distance in length and weight.

An explanation for the reasons of that relapse has been around for a long time (over 200 years). It is centered on each place you can think of and usually each point has a different name. Straight relapse is a straightforward model, for example a model that expects a direct interaction between information elements (x) and a single yield variant (y). Moreover, obviously, that y can be determined from the direct combination of information elements (x).

If there is a variation of the same information (x), the process is referred to as a straightforward direct relapse. When there are various aspects of information, writing from estimates often refers to the system as a more direct return. Various methods can be used to plan or adjust the specific regression model from information, more commonly known as Small Regular Squares. It is entirely expected to refer to a model designed this method as the Ordinary Least Squares Linear Regression.
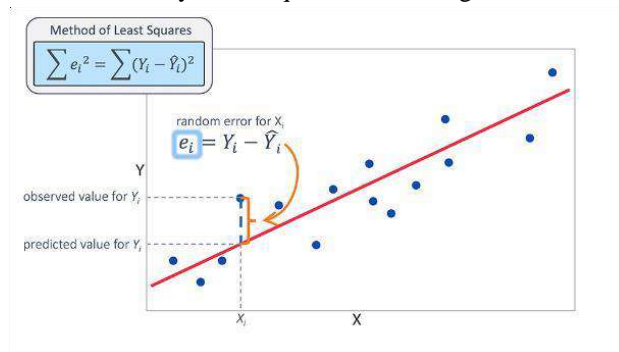
Fig 3. Fitting the multiple linear regression model

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CNN

CNN basically focuses on the premise that information will be included with images. Such structures can help to control different types of data using different data sets. Figure 1 shows the flow diagram of all the layers how each process works step by step. The main difference is that the neurons present within the CNN model are involved in neurons grouped into three dimensions, spatial size (length and width) and size. Maximum does not refer to the total number of layers within the ANN, yet a third of the launch volume. Unlike normal ANNS, the neurons within the random layer will automatically be associated with a small layer of layer that goes in front of it. CNN contains three types of layers. These are the layers that cover and the layers that fit perfectly. In the event that these layers are stacked, the CNN method is self-contained. The performance of the CNN model is divided into four key categories as given below:
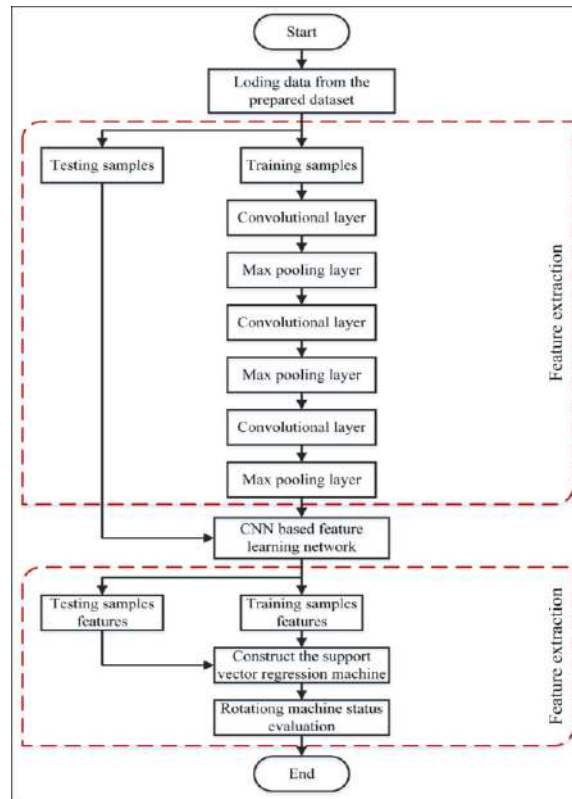
Fig.4. Flowchart of CNN Model

1. First, there is an input layer used to hold the pixel values of an image.

2. Then, a convolution layer is present that helps determine the output of several neurons and these neurons are connected to local regions. Then, further calculations were performed with the product scalar between their weights and the regions connected to the input volume. After this the Adjusted Line Unit (ReLu) is there with the task of utilizing the activation function performed as intelligently as a sigmoid function in the output produced by opening the previous layer.

3. Then, a composite layer is used which is used to reduce the sample size of the input area and reduce the various parameters and shorten the image sometimes to half of it within that opening.

4. The fully integrated layers help to produce the various points obtained in the configuration. The main purpose of this layer is to take the effects from the convolution layer or compound and then subtract the image into a label type. They then transmit the resulting result to the output layer, where each neuron will represent a differentiation label.

The flowchart above shows mainly the flow path of how images are processed. Therefore, this method of converting embedded image into various low-sample elements and applying a few filters to the image will improve the accuracy of the sections to a great extent.

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Convolutional Neural Network Architecture

CNN structures are inspired by the organization and function of the visual cortex and are designed to mimic the connecting pattern of neurons within the human brain.

The neurons within CNN are divided into three-dimensional structure, with each set of neurons analyzing a sub-region or image element. In other words, each group of neurons works specifically to identify one part of the image. CNN uses layout predictions to generate final output that reflects the vector of possible points to represent the probability that a particular feature belongs to a particular category.

CNN is made up of several layers:

- **Convolutional Layer**– It creates a feature map to predict the class possibilities for each feature using a filter that scans the whole image, a few pixels at a time.
- **Pooling layer (down sample)**- Reduces the amount of information the layer of convolution produces for each element and retains the most important information (the process of layers of addition and subtraction usually repeats several times).
- **Fully connected input layer –** It "flattens" output generated by the previous layers so that one vector can be used as the next layer input.
- **Fully connected layout**-Puts weights on the input produced to analyse the feature to predict an accurate label.
- **Fully connected output layer** -Creates the final probabilities to determine the image category.
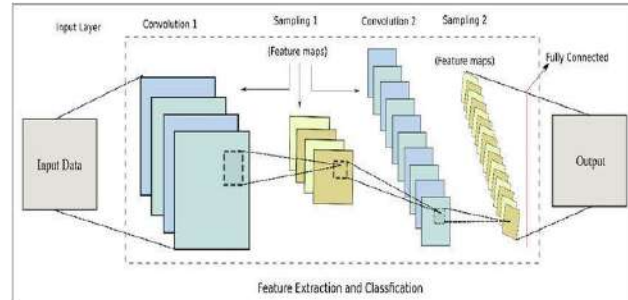
Fig 5. Architecture of CNN

3. **Proposed System Architecture**
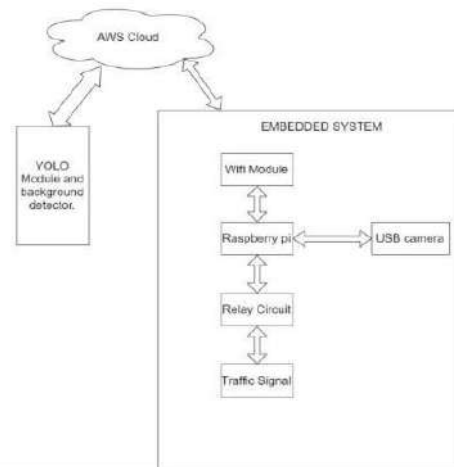
Fig 6. System Architecture

The above figure refers to the operation of the module using a cloud, cut off and installed framework. The base identifier takes the help of the YOLO site architecture. In our case we control YOLO by simply classifying cars of different categories for example Truck Car Bike and so on. The founder of the foundation includes calculations with the YOLO module to make the path of the path. It's a sharp approach with an amazing state of the art YOLO architecture to deal with traffic control.

4. Proposed System Control flow

Initially the video will be real-time on each of the four lanes of the cycle. Qualities will be learned in a frame in a real-time video of these roads. The camera sends all the captured recordings to the cloud hosting engine. When a video is found in the clouds the basis for calculating a video channel is to apply the intensity of traffic in each direction. At that point depending on the limit the whole system is in order and from now on the clock is set correctly. Yolo helps to install the car slowly at 24fps and integrate it with the calculation base. Congestion is relied on based on the category of transport vehicles and the owners will have greater durability compared to the vehicle. Here the full thickness is mentioned for each method. There is an edge view based on two rules one is the size of the path and the other is the need for that path.

Consider the paths L1, L2, L3, L4. Each path will have the same time Tmax which means that until the maximum time the green signal of a particular path will be illuminated. Signs will turn green along the way so that there will be no longer lasting stability which is a good chance for any road with a thin layer. In the case of a low density, chances are that the road is empty, so no green light will be turned on that road until the check for its strength has reached its limit. The video of the red-marked routes will be recorded and sent out to the clouds to be prepared, first the video is designed with the S x S. size standard. In this way it will work effectively with traffic-generated traffic signals using the raspberry pi for deep learning.
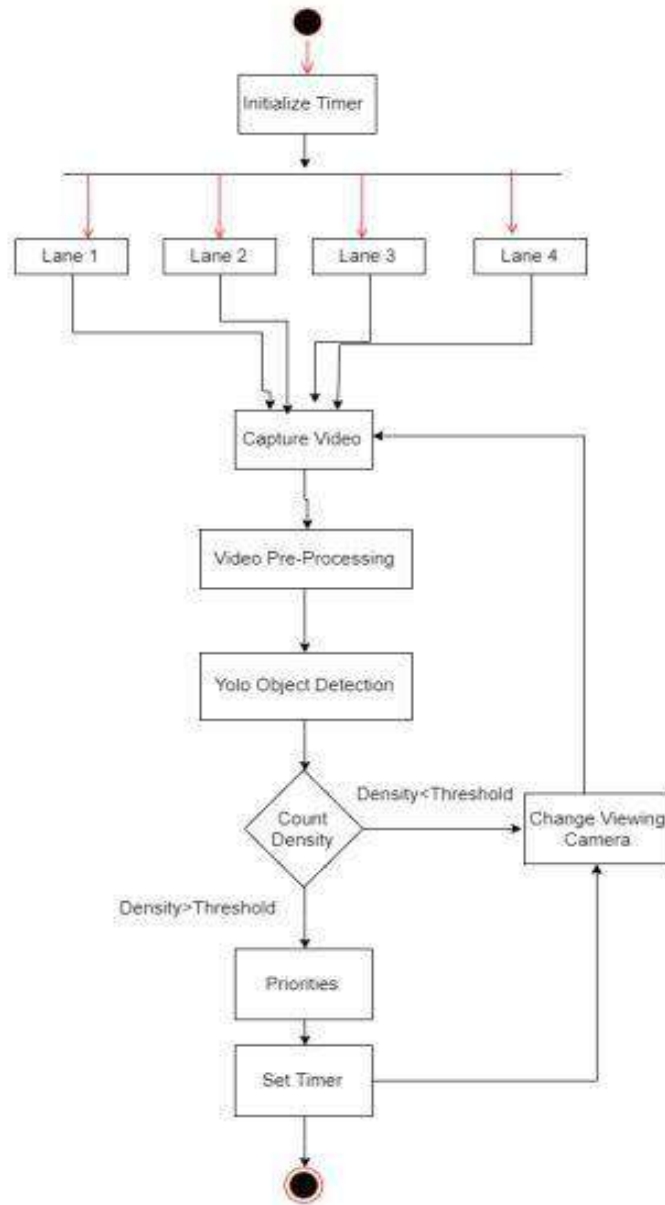
Fig 7. Proposed System Control Flow

5. Result

Experiments were performed using a convolutional neural network, Yolo etc. Accuracy is increased through Yolo and complete testing is performed and results are obtained. YOLO has given us the opportunity to fill the vacancy of a police officer in road control, due to its accuracy and real-time efficiency. Hardware launches can be done to have a real test of the solution.

Our system might not be limited to cameras. Additional sensors can be used to eliminate camera weakness such as due to the negative impact caused by bad weather. The sensor assembly method will be used for sensors such as radar, magnetometers. Our Smart Transport System can also use automotive network technology to collect data and prevent traffic congestion.

6. Conclusion

The aim of this project is to develop intelligent car models by creating flexible calculations to control road traffic based on in-depth learning. This new framework promotes vehicle development at cross-border sites, bringing clog reduction, low CO2 emissions, and so on. There has been a steady stream of image recognition methods starting with highlight descriptors such as HOG and, especially as more recently, deeper organization-based methods such as Faster R-CNN and YOLO.YOLO provide faster speeds with less accurate trading, especially on low and moderate goals.

While further speculation may be possible, applications that use edge gadgets actually require enhancements to the developer program or advanced gadget machines. At last, we have proposed a new calculation that takes this consistent information from YOLO and the development stages to reduce traffic delays.
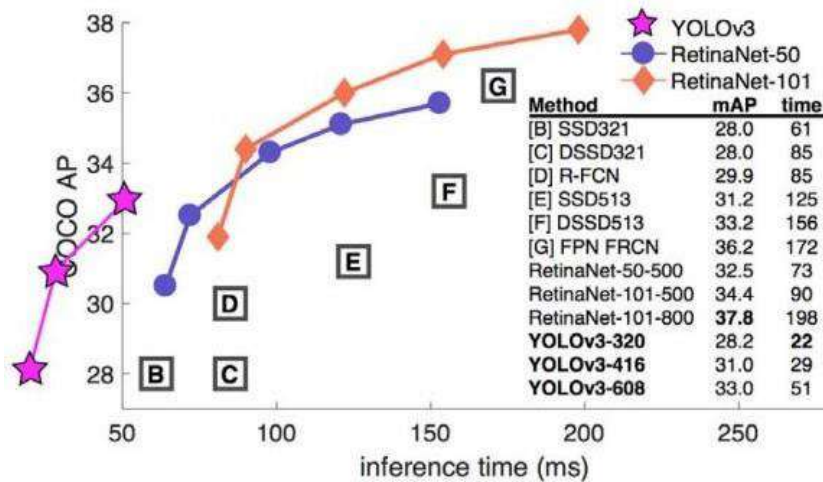
Fig 8. Performance of YOLOv3 in comparison to other techniques

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Heart Disease Prediction using Machine Learning

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Abstract

In recent times, Heart Disease vatication is one of the most complicated tasks in the medical field. In the ultramodern period, roughly one person dies per nanosecond due to heart complaints. Data wisdom plays a pivotal part in processing huge quantities of data in the field of healthcare. As heart complaint vatication is a complex task, there's a need to automate the vatication process to avoid pitfalls associated with it and warn the case well in advance. This paper makes use of heart complaint dataset available in UCI machine literacy depository. The proposed work predicts the chances of Heart Disease and classifies the case's threat position by enforcing different data mining ways similar as Naive Bayes, Decision Tree, Logistic Retrogression and Random Timber. Therefore, this paper presents a relative study by analyzing the performance of different machine learning algorithms. The trial results corroborate that the Random Forest algorithm has achieved the loftiest delicacy of 90.16% compared to other ML algorithms enforced.

Keywords: Decision Tree, Naive Bayes, Logistic Regression, Random Forest, Heart Disease Prediction

1. Introduction

The work proposed in this paper focuses substantially on colourful data mining practices that are employed in heart complaint vatication. Mortal heart is the top part of the mortal body. Principally, it regulates blood inflow throughout our body. How to bring in cash online all over the world? Assume you're bringing in cash online on the earth. All effects considered, you need delicate work not to turn into a national and constantly attempt in the event that you lose you again essay, lose attempt quit fussing about one day you'll arrive at the achievement you're one man of the world which is the achievement you're trying to comprehend mortal is the biggest automated machine. All effects considered, we aren't genuine about our work. On the off chance that we're significant in our work, we arrive at progress naturally and recollect web grounded earning is clearly not a simple strategy.

Any irregularity to heart can beget torture in other corridor of body. Any kind of disturbance to normal functioning of the heart can be classified as a Heart complaint. In moment's contemporary world, heart complaint is one of the primary. All effects considered, he's the ideal fashion he allows an occasion to further develop our life we imagined that we aren't coming to progress really we will feel that achievement came to our home and say I'm sorry I was not right you're the man of the world which I like I dazed you. All effects considered, we're saying to progress, sorry you come to the wrong spot. I'm a despicable fortunate man on the earth.

You recall, in the event that you bring in cash on the web, you're an extremely delicate work man and expert in the circumstance of utmost deaths. Heart complaints may be due to unhealthy life, smoking, alcohol and high input of fat which may beget hypertension. According to the World Health Organization more than 10 million die due. In the event that you have any capacities, kindly do not burn through your time and get results for the world to use your moxie and bring in cash. In the event that you don't have any capacities so not come woeful; you're mortal. Humans are able touse the mechanical machine you come paid for the composition and find a new line of work and further develop your life paid for the composition is one of the world spots that means is the ideal point that's given

our positions and gives cash.

A healthy life and foremost discovery are only ways to help the heart related conditions.

The main challenge in moment's healthcare is provision of stylish Online bring in cash is a dangerous game. On the off chance that you play this game, you're dead, so no life, no cash, no pleasure, and no anything. I trust you comprehend that what I say to you does not count and constantly attempts to arrive at progress.

It's a realization that online bringing in cash is the calling and the ideal decision to realize that we're clever and intellectually poor quality services and effective accurate opinion [1].

Operation of a complaint lies on the proper time of discovery of that complaint. The proposed work makes an attempt to describe these heart conditions at an early stage to avoid disastrous consequences. Every one in the world realizes that bringing in cash is worrisome. In any case, they do not realize that web grounded bringing in cash is commodity parlous that kills the man and burns through his time, so you're keeping down from the phony point and discover genuine spots that are paying your cash, not eat your cash.

You do not feel woeful in the event that you don't have any capacities you come paid for the composition and start your work. I trust you'll be glad to bring in cash. We're splendid;still we use our smarts in wrong studies. Records of large sets of medical data created by medical experts are available for analysing and rooting precious knowledge from it. Data booby-trapping ways are the means of rooting precious and retired information from the large continuous attempt and attempt; also, at that point you do not arrive at progress. Quantum of data is available. Substantially the medical database consists of separate information. Hence, decision making using separate data becomes a complex and tough task.

Machine Literacy (ML) which is a subfield of data mining handles large scale well-formatted datasets efficiently. In the medical field, machine literacy can be used for opinion, discovery and vaticination of colourfulconditions. The main purpose of this paper is to give a tool for croakers to describe heart complaints at an early stage [5].

This in turn will help to give effective treatment to cases and avoid severe consequences. ML plays a veritably important part to describe the retired separate patterns and thereby assay the given data. After analysis of data ML ways help in heart complaint vaticination and early opinion. This paper presents performance analysis of colourful ML ways similar as Naïve Bayes, Decision Tree, Logistic Retrogression and Random Forest for prognosticating heart complaint at an early stage[3].

2. Related Work

Lot of work has been carried out to prognosticate heart complaints using UCI Machine Learning dataset. Different situations of delicacy have been attained using colourful data mining ways which are explained as follows.

Avinash Golande etalstudies colourful different algorithms that can be used for bracket of heart complaints.

Exploration was carried out to study Decision Tree; KNN andK-Means algorithms that can be used for brackets and their delicacy were compared. This exploration concludes that delicacy attained by Decision Tree was loftiest; further it was inferred that it can be made effective by combination of different ways and parameter tuning [1]. T.Nagamanietal. have proposed a system [2] which stationed data mining ways along with the MapReducealgorithm. The delicacy attained according to this paper for the 45 cases of testing set, was lesser than the delicacy attained using conventional fuzzy artificial neural network. Then, the delicacy of algorithm used was better due touse of dynamic schema and direct scaling. Fahd Saleh Alotaibi has designed a ML model comparing five different algorithms [3]. Rapid Miner tool was used which resulted in advanced delicacy compared to Matlab and Weka tools. In this exploration the delicacy of Decision Tree, Logistic Retrogression, Random timber, Naive Bayes and SVM bracket algorithms were compared. Decision tree algorithm had the loftiest delicacy.

Anjan Nikhil Repaka, eatl., proposed a system in [4] that uses NB (Naïve Bayesian) ways for bracket of dataset and AES (Advanced Encryption Standard) algorithm for secure data transfer for vaticination of complaint. Theresa Princy. R, et al, executed a check including a different Bracket algorithm used for prognosticatingheart complaints. The bracket ways used were Naive Bayes, KNN (KNearest Neighbour), Decision tree, Neural network and delicacy of the classifiers was anatomized for different number of attributes [5].

Nagaraj M Lutimath, etal., has performed the heart complaint vaticination using Naive bayes bracket and SVM(Support Vector Machine). The performance measures used in analysis are Mean Absolute Error, Sum of Squared Error and Root Mean Squared Error, it's established that SVM was the superior algorithm in terms of delicacy over Naive Bayes [6]. The main idea behind the proposed system after reviewing the below papers was to produce a heart complaint vaticination system grounded on the inputs as shown in Table 1.Wehave analysed the bracket algorithms videlicet Decision Tree, Random Forest, Logistic Regression and Naive Bayes

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grounded on their Accuracy, Precision, Recall and f- measure scores and linked the stylish bracket algorithm which can be used in the heart complaint vaticination.

3. Proposed Model / Methodology

The proposed work predicts heart complaint by exploring the above mentioned four bracket algorithms and does performance analysis. The ideal of this study is to effectively prognosticate if the case suffers from heart complaint. The health professional enters the input values from the case's health report. The data is fed into a model which predicts the probability of having heart complaint. Fig. 1 shows the entire process involved.
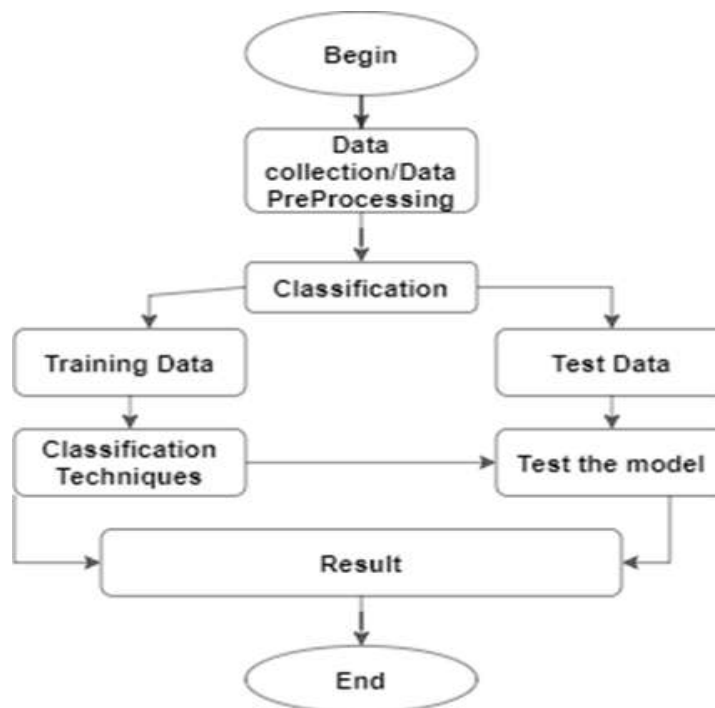
Fig.1. Generic model predicting heart disease

Data Collection and Pre-processing

The dataset used was the Heart complaint Dataset which is a combination of 4 different databases, but only the UCI. Cleveland dataset was used. This database consists of a total of 76 attributes but all published trials relate to using a subset of only 14 features [9]. Thus, we've used the Formerly reused UCI Cleveland dataset available in the Kaggle website for our analysis. The complete description of the 14 attributes used in the proposed work is mentioned in Table 1 shown below.

Table 1. Features selected from the dataset

Sl.No.	Attribute Description	Distinct Values Of Attribute
1.	*Age-* represent the age of a person	Multiple values between 29 & 71
2.	*Sex-* describe the gender of person (0- Female, 1-Male)	0,1
3.	*CP-* represents the severity of chest pain a patient is suffering.	0,1,2,3
4.	*RestBP-*It represents the patient's BP.	Multiple values between 94& 200
5.	*Chol-*It shows the cholesterol level of the patient.	Multiplevalues between 126 & 564
6.	*FBS-*It represents the fasting blood sugar in the patient.	0,1
7.	*Resting ECG-*It shows the result of ECG	0,1,2
8.	*Heartbeat-* shows the max heart beat of patient	Multiple values from 71 to 202
9.	*Exang -* used to identify if there is an exercise induced angina. If yes=1 or else no=0	0,1

10.	*Old Peak-* describes pa-tient's depression level.	Multiple values between 0 to 6.2.
11.	*Slope-* describes patient condition dur-ing peak exercise. It is divided into three segments(Unsloping, Flat, Down sloping)	1,2,3.
12.	*CA-* Result of fluoroscopy.	0,1,2,3
13.	*Thal-* test required for patients suffer-ing from pain in chest or difficulty in breathing. There are 4 kinds of values which represent the Thallium test.	0,1,2,3
14.	*Target-*It is the final column of the da-taset. It is a class or label Column. It rep-resents the number of classes in the da-taset. This dataset has binary classification i.e. two classes (0,1).In class "0" represent there is less possibility of heart disease whereas "1" represent high chances of heart disease. The value "0" Or "1" de-pends on other 13 attribute.	0,1

The attributes mentioned in Table 1 are handed as input to the different ML algorithms similar as Random Forest, Decision Tree, Logistic Retrogression and Naive Bayes bracket Ways [12]. The input dataset is resolved into 80 of the training dataset and the remaining 20 into the test dataset. Training dataset is the dataset which is used to train a model. Testing dataset is used to check the performance of the trained model. For each of the algorithms the performance is reckoned and analysed grounded on different criteria used similar as delicacy, perfection, recall and F- measure scores as described further. The different algorithms explored in this paper are listed as below.

Random Forest -

Random Forest algorithms are used for brackets as well as retrogression. It creates a tree for the data and makes vaticination grounded on that. Random Forest algorithm can be used on large datasets and can produce the same result indeed when large sets record values are missing. The generated samples from the decision tree can be saved so that it can be used on other data. In arbitrary timber there are two stages, originally producing arbitrary timber also make a vaticination using an arbitrary timber classifier created in the first stage.

Decision Tree -

The Decision Tree algorithm is in the form of a flowchart where the inner knot represents the dataset attributes and the external

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branches are the outgrowth. Decision Tree is chosen because they are

Gormandize, dependable, easy to interpret and veritably little data medication is needed. IN Decision Tree, the Vaticination of class markers originates from the root of the tree. The value of the root trait is compared to the record's trait. On the result of comparison, the corresponding branch is followed to that value and jump is made to the coming node.

Logistic Retrogression -

Logistic Retrogression is a bracket algorithm substantially used for double bracket problems.InLogistic Retrogression rather than fitting a straight line or hyperactive aeroplane, the Logistic Retrogression algorithm uses the logistic function to squeeze the affair of a direct equation between 0 and 1. There are 13 independent variables which makes Logistic Retrogression good for brackets.

Naive Bayes -

The Naïve Bayes algorithm is grounded on the Bayes rule.The independence between the attributes of the dataset is the main supposition and the most important in making a bracket. It's easy andpresto to prognosticate and holds best when the supposition of independence holds. Bayes Theorem calculates the posterior probability of an event (A) given some previous probability of event B represented by P (A/ B) [10] as shown in equation

$P(A|B) = (P(B|A)P(A)) / P(B)$ [1]

4. Result and Analysis

The results attained by applying Random Forest, Decision Tree, Naive Bayes and Logistic Regression are shown in this section. The criteria used to carry out performance analysis of the algorithm are Delicacy score, Precision (P), Recall (R) and F- measure. Precision (mentioned in equation [2]metric provides the measure of positive analysis that's correct. Recall(mentioned in equation [3]defines the measure of factual cons that are correct. F- measure (mentioned in equation [4]tests delicacy.

Precision = (TP) / (TP +FP) [2]

Recall = (TP) / (TP+FN) [3]

F– Measure =(2 * Precision * Recall) / (Precision +Recall) [4]

• TP True positive the case has the complaint and the test is positive.

•FP False positive the case doesn't have the complaint but the test is positive.

•TN True negative the case doesn't have the complaint and the test is negative.

•FN False negative the case has the complaint but the test is negative.

In the trial the pre-processed dataset is used to carry out the trials and the over mentioned algorithms are explored and applied. The below mentioned performance Criteria are attained using the confusion matrix. Confusion Matrix describes the performance of the model. The confusion matrix obtained by the proposed model for different algorithms is shown below in Table 2.The delicacy score Attained for Random Forest, Decision Tree, Logistic Retrogression and Naive Bayes bracket ways [12] is shown below in Table3.

Table 2. Values obtained for confusion matrix using a different algorithm.

Algorithm	True Positive	False Positive	False Negative	True Negative
Logistic Regression	22	5	4	30
Naive Bayes	21	6	3	31

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Ran-dom For-est	22	5	6	28
Decision Tree	25	2	4	30

TABLE III. Analysis of machine learning algorithm.

Algo-rithm	Preci-sion	Recall	F-meas-ure	Accu-racy
Deci-sion Tree	0.845	0.823	0.835	81.97%
Logistic Regression	0.857	0.882	0.869	85.25%
Ran-dom For-est	0.937	0.882	0.909	90.16%
Naive Bayes	0.837	0.911	0.873	85.25%

5. Conclusion

With the increasing number of deaths due to heart conditions, it has become obligatory to develop a system to prognosticate heart conditions effectively and directly. The provocation for the study was to find the most effective ML algorithm for Discovery of heart conditions. This study compares the delicacy score of Decision Tree, Logistic Retrogression, Random Forest and Naive Bayes algorithms for prognosticating heart complaints using UCI machine literacy depository dataset. The result of this study indicates that the Random Forest algorithm is the most effective algorithm with a delicacy score of 90.16 for vaticination of heart complaints. In future the work can be enhanced by developing a web operation grounded on the Random Forest algorithm as well as using a larger dataset as compared to the one used in this analysis which will help to give better results and help health professionals in prognosticating the heart complaint effectively and efficiently.

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A Comprehensive System for Detecting Profound Tiredness for Automobile Drivers using a CNN

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Abstract. The Sleeping is a found naturally condition of body and mind that is characterized by changed awareness, somewhat suppressed perceptual activity, decreased muscular activity and suppression of almost all muscle fibers, and decreased relationship with the environment. Whenever it comes to dangerous sleepiness, the car driver and those around him's safety is solely dependent on their judgments. The said review shows a drowsiness detection & identification and continuing to drive behavior concealer methodology based on a communicative associate agent capable of distinguishing and attempting to avoid motorist drowsiness behind the rear axle, using a webcam to obtain actual pictures of the driver's face, and a representative displayed on the lcd, observes the driver's picture in order to heat of drowsiness and avoid a potential mishap. A revised yolov5 (YOLOv4)-based neural net is developed in this study to identify motorist sleepiness.

Keywords: Convolutional Neural Network (CNN), Driver Drowsiness Detection, Human Machine Interface, OpenCV, YOLO.

1   Introduction

The capability of Major Highways to handle transport (both passengers and freight) must maintain up with the economic expansion. With around 62.16 lakh kilometers of highway, India does have the second - fastest - growing transit system. Regional Highways, Interstate Express ways, State Roads, Major District Roads, Many District Roads, and Rural Roadways are all included. In 2018, 1,51,417 people have been killed and 469,418 have been injured in road accidents in India, as per government stats. Nevertheless, this is likely an underestimation of fatalities because not all accidents are brought to court. As per the Public Security Advisory board (NSC), driver drowsiness causes approximately 1200,000 crash risk, 72,000 concussions, and 900 deaths each year [1]. As according AAA, having trouble sleeping drivers directly relates to an approximate 9.5 percent of all accidents. Motorists' heads start to wobble as they grow sleepy, as well as the car may slip away from of the center of the lane. All stated previously vehicular and eyesight countermeasures become visible only when the driver begins to slumber, which really is frequently too early to avoid a crash [2]. This study is organized into 4 segments: following this introductory, section 2 is linked publications, third section is methodology, section 4 is experimentation and achieved findings, and fifth section is the conclusions and a prediction of future horizons.

2   Related Work

Numerous studies have considered the very next physiological data to identify tiredness: electromyogram (EMG), electrocardiogram (ECG) electro-oculogram (EoG), electroencephalogram (EEG). A few really scientists use the Recorded EEG signal to detect driver fatigue through nystagmus. This same membrane potential between the ocular surface and the photoreceptors creates an electromagnetic current that takes into account the direction of the eye sockets; this electrostatic force is the evaluated EoG indication [3]. The possible methods are much more concerned with the identification of tiredness than with its evolvement or management. The main objective of an Interpersonal Interaction scheme is to maximize the efficiency of human-automated operative collaboration.
To accomplish the above, the scheme must be easily interpreted by the motorist, boost his/her knowledge of the problem, and (greatest importantly) be believed [4]. The HMI discussed in this chapter is intended to capitalize on the Advisor Assistant's window of opportunity, i.e., to quickly portray its conceptual framework in order to: 1. Offer effective information and explanation whenever the scheme makes a decision. 2. Promote teamwork once sentient and done by robot's representatives start sharing actions and decisions. 3. Avoid providing irrelevant details when delegating actions and decisions to the car pilot in order to prevent perceptual and project environment overabundance [5].

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The HMI is installed in a filled bidirectional instrument panel. It incorporates all essential driving instruction (e.g., present velocity, gearing, automated mode, etc.) and also evidence concerning the driver's state (e.g., if he/she is preoccupied) and the actions necessary to achieve optimum driving performance (i.e., the suggested behavior). The HMI was created using concepts connected to the negotiated settlement interaction method. This implies that the HMI's primary objective is to "understand instead of alarm," collaborating the with driver to achieve a pleasurable, pleasant, and safe journey [6]. The HMI will notify the motorist on what the driver anticipates of him and offer additional especially true to the factors that led to the invitation for interplay, based on decisions made by the supervisor representative.

Diagrammatical interpretations are supplied through with a 3d interactive portrayal at the center of the HMI, in which the road climate and surrounding road actors are recreated (e.g., regarding map data plus vehicular detectors) and showcased through with an expressionistic portrayal. Communications delivered via acoustic input and message [7].

3 Proposed Work

The graphic below, for instance, depicts a scenario in which the driving and mechanization are exchanging control of the vehicle, and the automobile alerts the user that they are nearing an automobile which will be tracked (Fig.1).
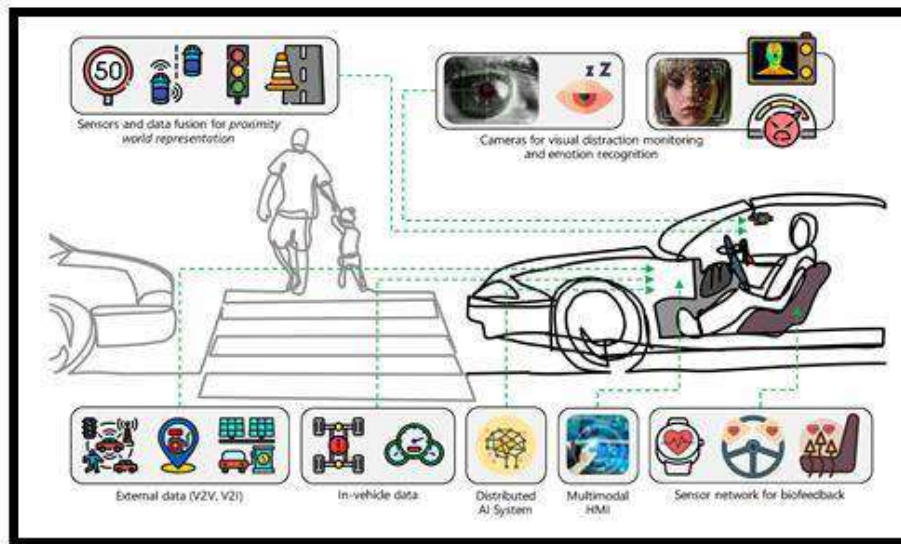
Figure 1 shows a drawing of an HMI for regulate sharing between such a car driver as well as a computer process.

The diagram below illustrates a scenario in which the mechanization is involved and, as a result of a combination of sensorimotor limitations (i.e., dearth of clarity) and the application of a careful behaviors, it truly notifies the motorist that "vehicle going to follow" (CF) would then occur, unless motorist purposefully overrides the system that performs a conventional mechanical overtake. In just this case, this same 3D depiction is more concerned with identifying the rationale for the behaviors (i.e., the accessibility restriction) than with the real action demanded of the motorist, which is consigned to a tiny text in the top hand corner of the window. Because it is directed at cultivating behaviors instead of expressly pressuring a response, this design needs to rely on implied conversations (Fig.2) [8].
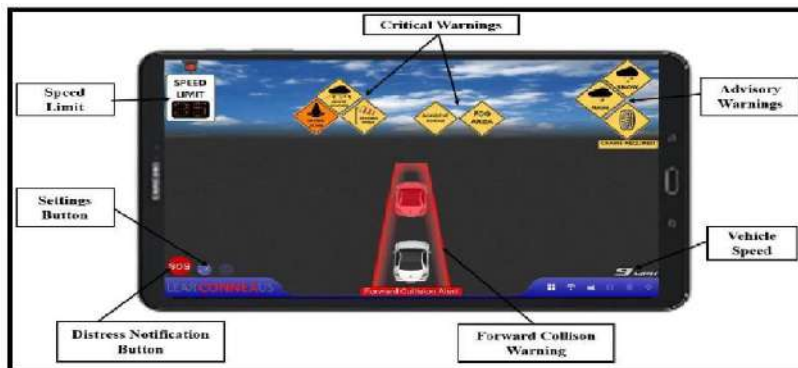
Figure 2 depicts an HMI notifying the motorist of the system-selected action (CF man oeuvre in this case).

Eventually, the statistic below depicts the specific instance where the driver initiates an emergency warning man oeuvre; in this case, the explanation is given prior to the car's real stop, allowing the driver to regain control prior to the car's stop. The collaboration is supplied here to demonstrate the forthcoming decision/behavior of the automated processes, namely, to stop in the exit lane (Fig.3) [9].

Figure 3 is a design of a HMI that notifies the operator of the rationale for an urgent maneuver's activation.

4   Experimental Setup & Results

The model has been implemented using Notepad++ (anaconda 3). As illustrated in Fig.4, the model can recognize photos of driving vehicles, people, and other things such as pens, ties, cups, and so on.
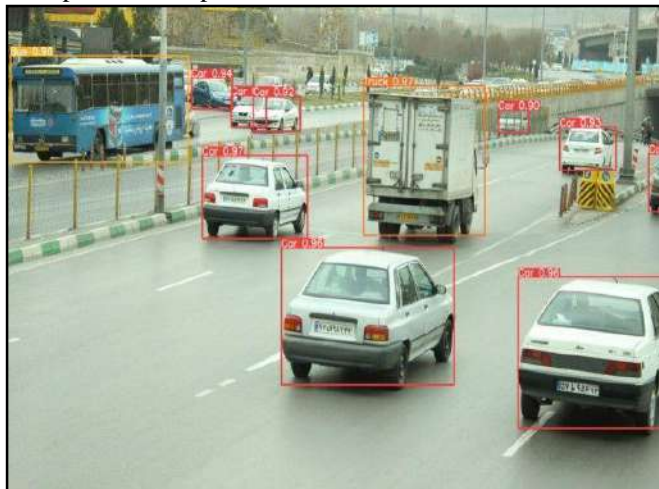
Fig.4 The model identifying the objects from the video.

The dataset for the pictures is ultra-lytics, as well as the data types of MS-COCO courses are in detectrondict order. 91 thing classes n I COCO-Stuff has (1-91), 91 stuff classes (92-182) and 1 category "unmarked" to be consistent with COCO (0). It is worth noting that 11 of COCO's item courses lack categorization comments (desk, blender, eye glasses, door, hat, mirror, plate, hair brush, shoe, window, street sign).
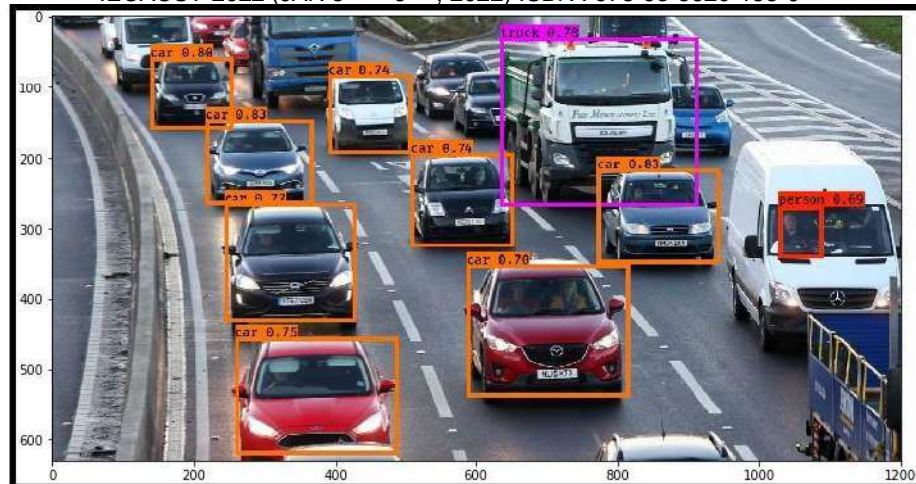
Fig. 5 The model identifying the several objects in the frame.

The output from running results XYXY is as follows:

● X min

● Y min

● X max

● Y max

● Confidence

● class

To use an OpenCV circuit, we can connect the picture first from web camera and use the model approach to connect the web camera, capable of making detection systems in live time, as seen in Fig.6.

Fig.6 The model identifying the objects from the open webcam.

5   Conclusion.

This paper provides a comparatively study On papers related to driver drowsiness detection and alert system in order to provide a solution to the problem of detecting the state of drowsiness and arithmetic based method is used the system used is moment in order to detect fatigue eye movement is detected using the camera this is done to recognize the symptoms of fatigue in order to avoid

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accident it is based on the concept of eye tracking in order to obtain final result 150 images of different people have been used if the state of it has been identified and alarm system is turned on computer vision with embedded systems are used a software algorithm is developed it was partly tested and found to be effective there is much scope for further improvements the proposed system detects frozen as if the eyes have been closed for a period of 4 or more frames the detection system differentiate the normal eye blink from drowsiness the developed system is a noninvasive system can be further developed by adding various types of sensors system is based on computer vision in order to detect a certain facial features for identifying the system uses the concept of video Processing and the live webcam with the help of open CV. It also maintains certain disadvantages of the proposed system and methods to overcome those disadvantages.

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Cloud Computing Based Web Application Through Amazon Web Services using Serverless Architecture

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Abstract. In this Web Application, we are going to deploy a website using Angular framework and DynamoDB through Amazon Web Services (AWS). The project mainly consists of Amazon Cloud Services based serverless architecture. The main aim of this project is to develop a Movie web app for movie lovers in which we can see information about different movie like their cast, release date and also a brief about the plot of the movies. This application differs from other similar application as it uses serverless architecture, we are comparing serverless to traditional EC2, as we have not found any application that uses serverless architecture till date. We have used the technologies—AWS, Angular,DynamoDB Service, Aws Lambda.

Keywords:AWS, Cloud Computing, Serverless Architecture, Web Application, Angular, Cloud.

1   Introduction

Cloud computing is the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet to offer faster innovation, flexible resources, and economies of scale.[1] You typically pay only for cloud services you use, helping lower your operating costs, run your infrastructure more efficiently and scale as your business needs change. Advantages of cloud computing are speed, cost, productivity, performance, global scale, reliability etc.[4]

Organizations of every type, size, and industry are using the cloud for a wide variety of use cases, such as data backup, disaster recovery, email, virtual desktops, software development and testing, big data analytics, and customer-facing web applications.[6] For example, healthcare companies are using the cloud to develop more personalized treatments for patients. Financial services companies are using the cloud to power real-time fraud detection and prevention. And video game makers are using the cloud to deliver online games to millions of players around the world.[5]

Amazon Web Services (AWS) is the world's most comprehensive and broadly adopted cloud platform, offering over 200 fully featured services from data centers globally. Millions of customers are using AWS to lower costs, become more agile, and innovate faster. Serverless is a way to describe the services, practices, and strategies that enable you to build more agile applications so you can innovate and respond to change faster. With serverless computing, infrastructure management tasks like capacity provisioning and patching are handled by AWS, so you can focus on only writing code that serves your customers.

In the project a Movie web app for movie lovers is developed in which we can see information about different movie like their cast, release dates and also a brief about the plot of the movies. We can search and also see similar movies for the selected movie. We can also maintain a database in which we can store movies as Wishlist and watched list and we can remove data from the same. If a movie is on Wishlist and we watched it then we can also send data of that movie to watched list. For a new user there is a registration page, and for existing user they can simply enter with login credentials i.e., is username and password. This movie web app will be based on serverless architecture, the backend API will be deployed on lambda AWS services. There will be several lambdas functions which will serve the purpose of API, which will communicate with our AWS DynamoDB service. The API gateway will act as a routing orchestrator that will route to different APIs. Some other movie APIs will be use to fetch movie information which user will request.

The main aim of this research is to find and prove the efficiency of serverless architecture using AWS. The benefits of using serverless services like lambda, API gateway, DynamoDB is that we don't have to worry about maintaining the servers. [2] For example, if amount of load increases AWS will automatically create many instances of lambda or if some server will go down then lambda automatically run on some other servers. So, the main benefits of serverless app are that they automatically expand or contract based on the need and since these components will only run when some API request is made unlike traditional servers which runs all the time hence it gives us a huge reduction in cost.[15]

After this introductionsection this paper has 4 more sections. In Section 2 we have written our Literature Review followed by Proposed Model in Section 3 and Result in Section 4 along with Conclusion in the final Section 5.

2   Literature Review

Cloud Computing An overview

Cloud computing is the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet to offer faster innovation, flexible resources, and economies of scale.[8] You typically pay only for cloud services you use, helping lower your operating costs, run your infrastructure more efficiently and scale as your business needs change. Advantages of cloud computing are speed, cost, productivity, performance, global scale, reliability etc.[1]

Technologies used

S3 bucket. Amazon Simple Storage Service (Amazon S3) is an object storage service that offers industry-leading scalability, data availability, security, and performance. This means customers of all sizes and industries can use it to store and protect any amount of data for a range of use cases, such as data lakes, websites, mobile applications, backup and restore, archive, enterprise applications, IoT devices, and big data analytics. Amazon S3 provides easy-to-use management features so you can organize your data and configure finely-tuned access controls to meet your specific business, organizational, and compliance requirements. Amazon S3 is designed for 99.999999999% (11 9's) of durability, and stores data for millions of applications for companies all around the world. [15]

Web browser. A web browser is an application software for accessing the world wide web. When a user follows the URL of a web page from a particular website, the web browser retrieves the necessary content from the website's web server and then displays the page on the user's device. Example of web browser Google chrome, Opera, Safari etc.

Angular.Angular is a TypeScript-based free and open-source web application framework led by the Angular Team at Google and by a community of individuals and corporations. Angular is a complete rewrite from the same team that built AngularJS.

API Gateway. An API gateway is an API management tool that sits between a client and a collection of backend services. An API gateway acts as a reverse proxy to accept all application programming interface (API) calls, aggregate the various services required to fulfill them, and return the appropriate result.

AWS Lambda.AWS Lambda is a serverless, event-driven compute service that lets you run code for virtually any type of application or backend service without provisioning or managing servers. You can trigger Lambda from over 200 AWS services and software as a service application, and only pay for what you use.

Dynamo DB. Amazon DynamoDB is a fully managed, serverless, key-value NoSQL database designed to run high-performance applications at any scale. DynamoDB offers built-in security, continuous backups, automated multi-region replication, in memory caching, and data export tools.

3rd Party APIs. In this project we are using several 3rd party APIs to fetch movie information like its overview, cast, released date and IMDB page. [15]

Measurements Parameters of Serverless Architecture Efficiency

Lambda has been primarily designed for handling event-based functions and it does that best. So if a new record is added to DynamoDB or a new file added to an S3 bucket needs processing, Lambda is the best fit. It's very easy to set up and saves cost as well.[10]

Concurrency and Scaling.

- Lambda can have a maximum 3 GB memory. So if a program needs to scale vertically for memory, it can't do that more than 3 GB.

- For horizontal scaling, the maximum limit is 1,000 concurrent executions. If your Lambda is deployed in a VPC, then it is even further restricted based on the number of IP addresses available for the subnets allocated.[10]

Performance and Availability.

- A Lambda function is always available but it is not running all the time. By default, the Lambda function is inactive. When a trigger linked to an event is activated, your application (Lambda function) is started. The maximum time for running the Lambda function (timeout) is limited to 900 seconds (15 minutes). Executing long-running applications in AWS Lambda is not a good idea, accordingly. If you need to run applications that require more than 900 seconds to complete successfully or applications that have a variable execution time, consider using AWS EC2. Another limit for a running Lambda function is the maximum amount of memory that is equal to 3008 MB. [13]
- 1000 to 3000 Lambda instances can be executed simultaneously, depending on the region. Contact AWS support if you are interested in running more instances simultaneously.[14]
- A delay between sending a request and application execution is up to 100 milliseconds for AWS Lambda, unlike applications running on EC2 instances that don't have such delay. 100ms is not a long time, but for some types of applications, this time can be critical. If your application must download some data from an Amazon S3 bucket, an additional 1 to 3 seconds may be needed before application execution. Keep in mind this delay time when planning to use AWS Lambda to run applications.[11]

Pricing.

You pay for a number of application executions and the time needed to finish execution. The price for each second of running an application depends on the amount of memory provisioned for an application and is $0.00001667 per each Gigabyte-second. The time of application execution is counted from the application's start to the return of the result or to stop after timeout. Time is rounded up to the nearest number that is multiple of 100ms. When you need on-demand availability, the price for using AWS Lambda to run functions/applications may be better. Whereas in EC2the cost per hour may depend on a CPU's efficiency, memory footprint, and even storage capacity.[3] So the usage of AWS EC2 instances is more feasible for applications or software that needs to handle many user requests. [12]

Figure 3 Lambda execution graph

Example: An app having 5,000 hits every day and every execution taking 100 MS with 512MB.
Lambda Function Cost= $0.16.
Also, having similar requirements, we may choose the EC2 Instance of "t2.nano".
EC2 Instance Cost= $4.25.
Hence, Lambda cost being $0.16 is merely 4% of the price of EC2 which is $4.25.[11]

We are at initial stage but this make opens a new horizon for newer applications pricing and for the AWS Lambda to evolve.

3   Proposed Model
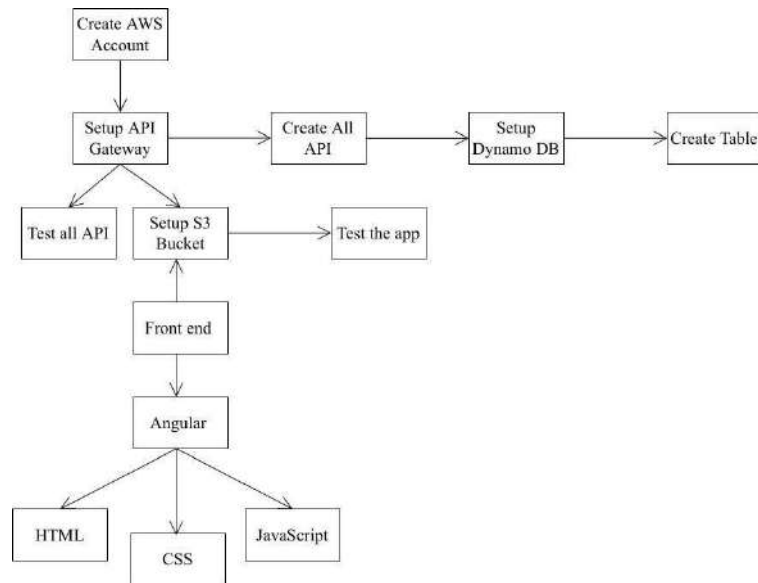
Figure 2 Block Diagram

In AWS serverless model, by serverless it means we didn't have to worry about maintaining the server The benefits of using serverless technologies like AWS lambda, api gateway, DynamoDB is that if load on web app increases more lambda will automatically create according to the need of web app. If one server goes down the web app will shift itself on another available server.[7]
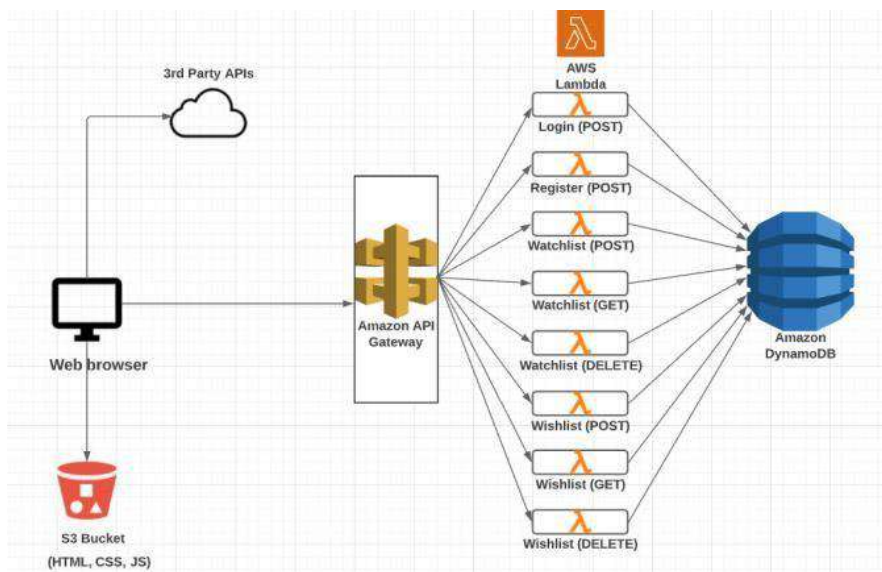
Our project is based on PAAS servicing model in serverless is used that is platform as a service.
Figure 3 Architectural Diagram

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4   Result And Discussion
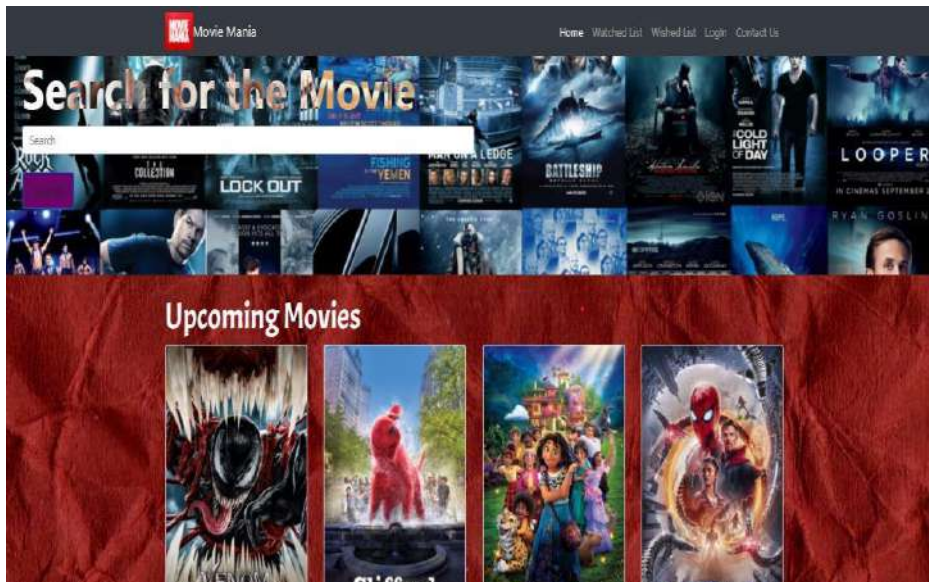
Figure 4 Website Home page

In our Web application 'Movie Mania', we can get info about the most popular and upcoming movies by going onto the home page. On the movie info page, we can see information about the movies e.g., its date of release, cast, and a small plot of the movie, along with similar movies on the page and we can go to the IMDB page of that movie from there too and we can also maintain a personal watchlist and wish list. In watchlist we maintain the total amount of time spent in watching the movie as one can realize how much time he has spent on leisure. We can remove selected movies from watchlist as well as wish list. Users can also give their review of the movie. Existing user can enter with their login credentials and for new user they have to register their information to create an account. We can also search any movie by writing any word from the movie's title. With this web app we can maintain our personalized   wish   list,   watch   list,   and   can   rate   and   give   our   review   to   any   movie.

DevOps has been developed for EC2 for years and has reached a good level of maturity, but Lambda is still going through that journey.[9] AWS SAM and Serverless Framework are addressing those concerns. Local testing is another aspect you need to consider while using Lambda as it has few important limitations.
 AWS EC2 is a service that represents the traditional cloud infrastructure (IaaS) and allows you to run EC2 instances as VMs, configure environments, and run custom applications.

AWS Lambda is the implementation of Function as a Service by Amazon that allows you to run your application without having to worry about underlying infrastructure. AWS Lambda provides you a serverless architecture and allows you to run a piece of code in the cloud after an event trigger is activated. When using AWS Lambda, you have a scalable, small, inexpensive function with version control. You can focus on writing code, not on configuring infrastructure.

If you have calculated that there is a lot of idle time of your application on an EC2 instance that is always running, consider using AWS Lambda with which you don't need to pay for idle time if there are no requests to run an application. If there is a high number of regular requests to run your application, it may be better to deploy an application on an EC2 instance that is always running.

Using AWS EC2 is good for running high-performance applications, long-running applications, and the applications that must not have a delay at the start time. If you use AWS EC2 instances, don't forget to back them up to avoid losing your data.[12]

5   Conclusion

Cloud computing only changes how so many businesses store and access data, but it is also changing how many of these businesses operate,resources are available in minutes, which means companies can respond to new market developments much more rapidly.[8] Dovetailed with the inherent agility of cloud resources is DevOps, which realigns software development and deployment to create continuous integration and continuous delivery.

Comparing the AWS web services, it is clear that AWS Lambda is a better choice for small scale applications. Although a number of companies prefer traditional web hosting services, AWS has the edge to surpass traditional hosting in every aspect. If your business is planning to choose a web hosting service for a large scale then it is advisory to use EC2. We were able to host the website without spending even a single penny as it was on AWS Lambda whereas if we were to host it on an EC2 instance it would have cost us around$5 or 376 Indian Rupees.[15]

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SIGN LANGUAGE DETECTION

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Abstract. Vision-based hand gesture recognition is an area of active current research in computer vision and machine learning. Being a natural way of human interaction, it is an area where many researchers are working on, with the goal of making human computer interaction (HCI) easier and natural, without the need for any extra devices. Currently, it is necessary to provide communication paths between hearing and deaf people, which requires the solution of several specific problems, one of which is gesture recognition. Traditional methods for SLR generally use hand-crafted feature. But reliable handcrafted features are difficult to design and not able to adapt to the large variations of sign words. we have sign language recognition, the communication method of deaf people. Sign languages are not standard and universal and the grammars differ from country to country. In this project, a real-time system able to interpret the Sign Language is presented and described. The system was able to reliably recognize the words in real-time. Although the implemented solution was only trained to recognize the words, it is easily extended to recognize the whole sentences, being a solid foundation for the development of any vision-based sign language recognition user interface system. The system is based on machine learning methods and is an LSTM with MediaPipe Hands as feature extractor

Keywords: Sign Language Recognition, Human Computer Interaction, Long Short-Term Memory

1. Introduction

Sign Language (SL) is an efficient tool for hearing impaired people to communicate with each other. However, it is too difficultfor normal people to understand it without special learning. Sign language is a visual language. It mainly consists of 3 major components:

1. Fingerspelling: Spell out words character by character, and word level association which involves hand gestures that convey the word meaning. The static Image Dataset is used for this purpose.
2. World-level sign vocabulary: The entire gesture of words or alphabets is recognized through video classification (Dynamic Input / Video Classification)
3. Non-manual features: Facial expressions, tongue, mouth, body positions.

Sign language is expressed by hand-shapes, trajectories of hand joints, and even facial expressions. Recently, most methods for SLR are based on hand posture recognition (HPR) and hand-joint trajectories of sign words. In our model we are going to detect sign language through capturing gestures and action of deaf and blind person. To do this, we first install all the dependencies and import all module then we started detecting face, hand and pose landmarks and extract key points.

After that we setup a folder for data collection to collect all the key points sequences. Then we will be going to preprocess data and create labels to build and train our LSTM deep learning model. Then we are going to make sign language prediction and save our model for testing in real time.

The rest of this paper is organized as follows: we first describe our method in Section 2. Then we discuss the experimental results in Section 3. Finally, in Section 4, we make a conclusion and a brief discussion for future work.

2. Our Method

We used LSTM neural network in our system and also a module that is MediaPipe which is used for key points extraction from human's face, hands and whole body.

MediaPipe Holistic

MediaPipe Holistic, with its 540+ key points, aims to enable a holistic, simultaneous perception of body language, gesture and facial expressions. Its blended approach enables remote gesture interfaces, as well as full-body AR, sports analytics, and sign language recognition. The user can manipulate objects on the screen, type on a virtual keyboard while sitting on the sofa, and point to or touch specific face regions (e.g., mute or turn off the camera). Underneath it relies on accurate hand detection with subsequent gesture recognition mapped to a "trackpad" space anchored to the user's shoulder, enabling remote control from up to 4 meters. This technique for gesture control can unlock various novel usecases when other human-computer interaction modalities are not convenient.

0. WRIST	11. MIDDLE_FINGER_DIP
1. THUMB_CMC	12. MIDDLE_FINGER_TIP
2. THUMB_MCP	13. RING_FINGER_MCP
3. THUMB_IP	14. RING_FINGER_PIP
4. THUMB_TIP	15. RING_FINGER_DIP
5. INDEX_FINGER_MCP	16. RING_FINGER_TIP
6. INDEX_FINGER_PIP	17. PINKY_MCP
7. INDEX_FINGER_DIP	18. PINKY_PIP
8. INDEX_FINGER_TIP	19. PINKY_DIP
9. MIDDLE_FINGER_MCP	20. PINKY_TIP
10. MIDDLE_FINGER_PIP	

The MediaPipe Holistic pipeline integrates separate models for pose, face and hand components, each of which are optimized for their particular domain. However, because of their different specializations, the input to one component is not well-suited for the others. The pose estimation model, for example, takes a lower, fixed resolution video frame (256x256) as input. But if one were to crop the hand and face regions from that image to pass to their respective models, the image resolution would be too low for accurate articulation. Therefore, we designed MediaPipe Holistic as a multi-stage pipeline, which treats the different regions using a region appropriate image resolution.

Our LSTM for SLR

Long Short-Term Memory networks – usually just called "LSTMs" – are a special kind of RNN, capable of learning longterm dependencies. They were introduced by Hochreiter & Schmidhuber (1997), and were refined and popularized by many people in following work. They work tremendously well on a large variety of problems, and are now widely used. LSTMs are explicitly designed to avoid the long-term dependency problem. Remembering information for long periods of time ispractically their default behavior, not something they struggle to learn! All recurrent neural networks have the form of a chain of repeating modules of neural network. In standard RNNs, this repeating module will have a very simple structure, such as a single tanh layer. The key to LSTMs is the cell state, the horizontal line running through the top of the diagram. The cell stateis kind of like a conveyor belt. It runs straight down the entire chain, with only some minor linear interactions. It's very easy

for information to just flow along it unchanged. The LSTM does have the ability to remove or add information to the cell state, carefully regulated by structures called gates. Gates are a way to optionally let information through. They are composed out of a sigmoid neural net layer and a pointwise multiplication operation. The sigmoid layer outputs numbers between zero and one, describing how much of each component should be let through. A value of zero means "let nothing through," while a value of one means "let everything through!".

3. Steps Followed

I. **Install and import all dependencies**Installing and importing all libraries NumPy, OpenCV, TensorFlow

II. Detect face, hand and pose landmarks

detecting face and hand land marks using MediaPipe

III. Extract key points

Extracting pose, hand and face key points

IV. Setup folders for data collection creating folder for data collection

V. Collect key points sequences

capturing key points using open cv

VI. Preprocess data and create labels
creating labels as action captured

VII. Build and train an LSTM deep learning model
building and training lstm model with TensorFlow

VIII. Make sign language predictions
Predicting sign language to test the model

IX. Save model weights

Saving the model weights for future use

X. Test in real time

XI. Accuracy testing

4. Results

After following all the above steps this system is capable of detecting the sign gestures very efficiently and with the accuracy score of 1.0
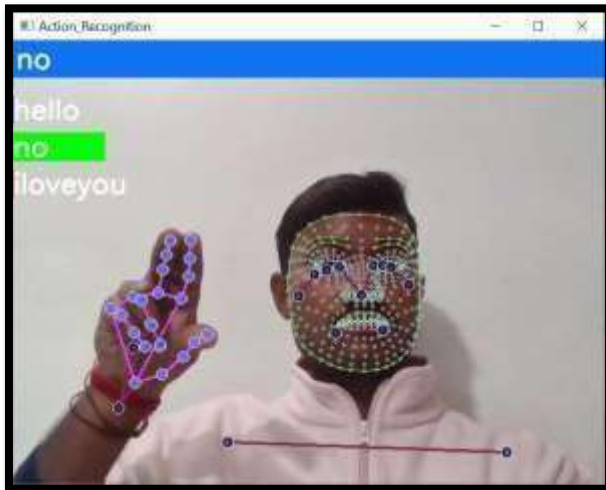
5.   Conclusion and Future Use

In future work, proposed system can be developed and implemented using Raspberry Pi. Image Processing part should be improved so that System would be able to communicate in both directions i.e.it should be capable of converting normal language to sign language and vice versa. We will try to recognize signs which include motion. Moreover, we will focus on converting the sequence of gestures into text i.e., word and sentences and then converting it into the speech which can beheard.

This technology can be widely used in the following:

1.   Controlling devices remotely

2.   Tracking human movements

3.   Posture detection in sports

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ANALYSIS OF BIG DATA INTRUSION DETECTION SYSTEM WITH RANDOM TREE IN DATA MINING

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Abstract. As the volume of data grows, so does the relevance of data protection and analytic solutions for Big Data. Until recently. When a computer or network is breached, an intrusion detection system (IDS) is activated. Traditional strategies for detecting network assaults have become more complex due to the amount, diversity, and speed of data created in the network. Feature section preprocessing was used in this work to obtain a subset of important features for creating the model. The network data was classified using the Random Forest technique. Using the information gain approach, Random Forest's accuracy was improved. The suggested model was tested on the NSL-KDD standard dataset. The suggested model has been evaluated using a variety of measures. It has been shown that the suggested model is more effective in terms of performance metrics than the current paradigm

Keywords: Big-Data, Random Forest, Algorithm, performance

1   Introduction

The location of the detection or the kind of detection may be used to identify an IDS. In general, there are two forms of IDS, one for a single computer and the other for a big network. Host-based intrusion detection systems (HIDS) and NIDS are two forms of IDS based on the location of the detection (HIDS). There has been a dramatic rise in the importance of internet security in recent years. We have been targeted by a variety of threats. Because of this, an efficient and accurate detection model is essential for safety. Intrusion detection (ID) is a sort of computer and network security management solution. a method for detecting intrusions into a computer system by looking at various logs or data records. When it comes to a network intrusion detection system (IDS), the duty of the IDS is passive. It gathers information about intrusions, detecting, logging, and alerting IDS system users to efforts to identify harmful user activity. Some IDSs monitor a single computer, while others monitor a network of computers. A network and a host may be the target of an attack. In a host base assault, one computer is used to gain access to a restricted service or resource.

2   Literature Review

Abdulsalam O. Alzahrani et.al (2021) [1] It has lately emerged as a potential and exciting alternative for the future architecture of the internet. SDN has made the centrally managed network more flexible and transparent. But this benefit comes at a high price in terms of security risks that may lead to network failures, systems paralysis and online banking scams and robberies. These difficulties have a devastating effect on businesses, corporations, and even whole economies. This aim can only be achieved with high-performance, real-time technologies that are accurate. A software-defined network (SDN) has gained a lot of interest in the previous decade for extending sophisticated machine learning methods in a network intrusion detection system (NIDS). It is possible to construct an efficient, trustworthy and dependable system for detecting various forms of assaults that often target networks thanks to a wide variety of data analysis methods and a tremendous progress in machine learning. Machine learning techniques may be used to monitor network traffic and identify suspicious activity as part of the SDN controller's network intrusion detection system (NIDS). Decision

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Tree, Random Forest, and XGBoost are used to illustrate attack detection in a tree-based machine learning framework. For training and testing, the NSL-KDD dataset is regarded a benchmarking dataset for numerous current state-of-the-art methodologies in NIDS. The optimal form of the data is extracted from the dataset using a variety of innovative preparation methods, which outperforms other systems. Multi-class classification is performed using only five of the 41 characteristics of NSL-KDD, which yields an accuracy of 95.95 percent in identifying and categorizing attacks (DDoS, PROBE, R2L, and U2R)

Fadi Salo (2020) [2] Complex, high-performance and scalable processing has become a need thanks to cloud computing. Data from a range of applications, resources, and platforms has been generated by the rapid spread of cloud technology. As a result, data management and security have started to face substantial issues due to the increasing pace and amount of data generation. Since big data is generating so much attention, it is important to consider how IDS should be implemented. A systematic literature review (SLR) of data mining methods (DMT) employed in IDS-based solutions from 2013 to 2018 is presented in this article. Purposeful sampling was used to select 32 articles as the major source of this survey's data. We discovered 17 different DMTs used in an IDS context after a thorough study of these papers. DMTs and distributed streaming frameworks (DSFs) have been used in a variety of research projects in recent years to identify and mitigate malicious assaults in a large data environment.

Manso (2019) [3] As a result of the semantic gap that exists between huge security data sources and actual threat understanding, intrusion detection has evolved into a big data challenge. On the other hand, machine learning (ML) techniques have been effectively employed in various fields. As a result, this strategy has promise for addressing the challenge of large data in cyber security. An alternative to using human analysts to build signatures or categorize large amounts of data is to employ machine learning (ML) instead. Machine Learning (ML) may be used to construct sophisticated algorithms to extract information from data via behavioral analysis or to discover hidden relationships. When it comes to using machine learning (ML), the hostile environment and the dynamic nature of the cyber threat landscape provide significant hurdles. In the future generation of SIEM systems, security monitoring should be automated, orchestrated, and have real-time contextual threat awareness. However, subsequent studies have shown that more effort is required to meet these needs. Big data analytics for intrusion detection is examined in this chapter.

Merieme Britel et.al (2018) [4] Big Data has become security the most important issue for businesses in recent years. Information security has become a global issue due to the rise of cyberattacks. It is not enough to focus just on prevention. Because of this, intrusion detection systems have been developed. An intrusion is an attack on a computer system or network that causes damage to the security of data. Detection of a high number of assaults relies heavily on intrusion detection systems (IDS), which are an integral part of the network security architecture. Network security challenges are examined in this study, as well as recent research in the field of Big Data intrusion detection systems. On the subject of intrusion detection in Big Data, this paper focuses on predictive analysis as a means of reducing security issues.

3   Methodology

Evaluation of neurotree in detection performance We compare the detection rate of the proposed classifier to six different decision tree classifiers, such as Decision Stump, C4.5, Naive Baye's Tree, and a Decision Tree Classifier.
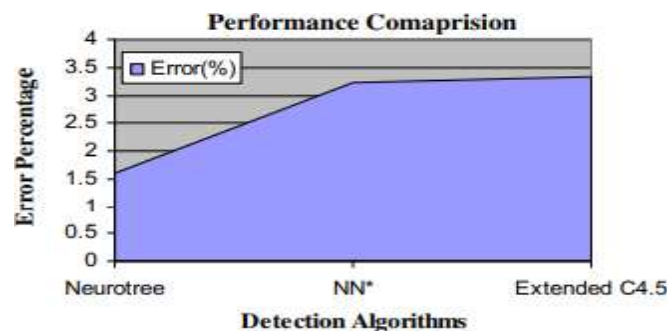
Fig1: Error percentage comparison for neurotree, NN∕and extended C4.5

Table 1 Performance evaluation of proposed classifier with six decision tree classifiers

Classifiers	Detection percentage	Error percentage
Decision Stump	79.73	20.27
C4.5	92.1	7.9
Naïve Bayes	92.27	7.73
Random Forest	89.21	10.79
Random Tree	88.98	11.02
REP Tree	89.11	10.89
Proposed	98.38	1.62

Using Random Forest, Random Tree, and Representative (REP) tree models, we are able to verify that our assertion is correct Comparing the proposed system's performance with six other decision tree classifiers is shown in Table 1.

4   Data Mining

Surveys on current datasets in IDS are conducted in this portion of the study in order to counter the concerns stated by Axelsson and other experts. Feature selection and ranking methods for testing performance characteristics are also examined in this section.Computers have been regarded as one of the only orchestrators in the construction of a platform for the advancement of technology. A large amount of data is created, some of which is heterogeneous and originates from multiple sources and travels across devices at rapid rates, affecting network traffic monitoring systems. As a result, fast and reliable data analysis is challenging due to the aforementioned issues. Adaptability and validity make data mining a viable option for managing data analysis, and it is now routinely used for network security.

Applying Data Mining Algorithms to Intrusion Detection

Pattern recognition, machine learning, and database analysis have all been influenced by the rise of data mining approaches. Audit data may be mined using a wide variety of techniques. Heuristics and designs between data mining models are referred to as data algorithms by Lazar. Algorithms need to begin by analyzing the data presented in order to uncover certain trends and patterns, according to the author's reasoning. Analytical data are then utilized to define ideal parameters by the algorithm for creating a chosen mining model. With the help of chosen patterns and thorough statistics, the parameters are applied to the dataset.

To better understand the present state of data mining methods, Manish and Hadi undertook research into network traffic analysis and prediction. Table 2 is used by the authors to show the most popular data mining methods.

Table 2 DATA MINING TECHNIQUES

Dataminingtechniques
Clustering
Classification
Hybrid
Association
Othermethods

Classification and clustering are the most often utilized data mining methods, according to several research. The hybrid approach and the Association technique are discussed together soon after.

Intrusion Detection Data Sets

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Classification and clustering are the most often utilized data mining methods, according to several research. The hybrid approach and the Association technique are discussed together soon after.
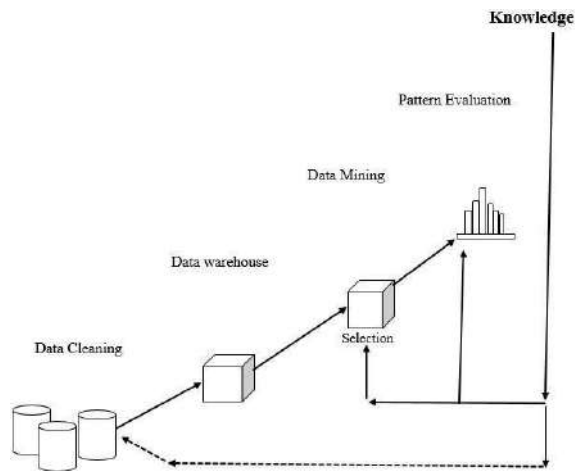
Fig.2 Steps in knowledge discovery [6][7]

Network analysis researchers are familiar with the KDD and DARPA datasets, which offer a wide range of records in the DARPA dataset with up to 4,900,000 training instances; 41 features; 24 training and testing attacks; a further 14 types of attacks. Extensive research shows that the following datasets were commonly used for investigations: The dataset contains more data than the DARPA dataset. As a result, Bajaj and Arora claim that the KDD dataset is no longer relevant for contemporary network research, and instead recommend using the NSL-KDD dataset. KDD 99's dataset has a lot of duplicate data, which leads to biased detection of assaults, such as DOS and probing attacks, they claim. This resulted in the classification of characteristics being incorrect and most records being misinterpreted in the vast majority of situations. As long as KDD datasets are employed, the findings of an inquiry may not be accurate representations of actual network circumstances.

Generalized Block Diagram

In this part, we will take a look at and talk about a simplified block diagram. The NSL-KDD dataset is shown in Figure 3. [5] In order to train the model utilizing the optimal hyperparameters and just five features, data analysis and feature engineering approaches are used. The multi-class classification problem is solved using tree-based methods. An attack will be assessed as either normal or abnormal based on the processed data, and action will be done if the attack falls into one of these categories.

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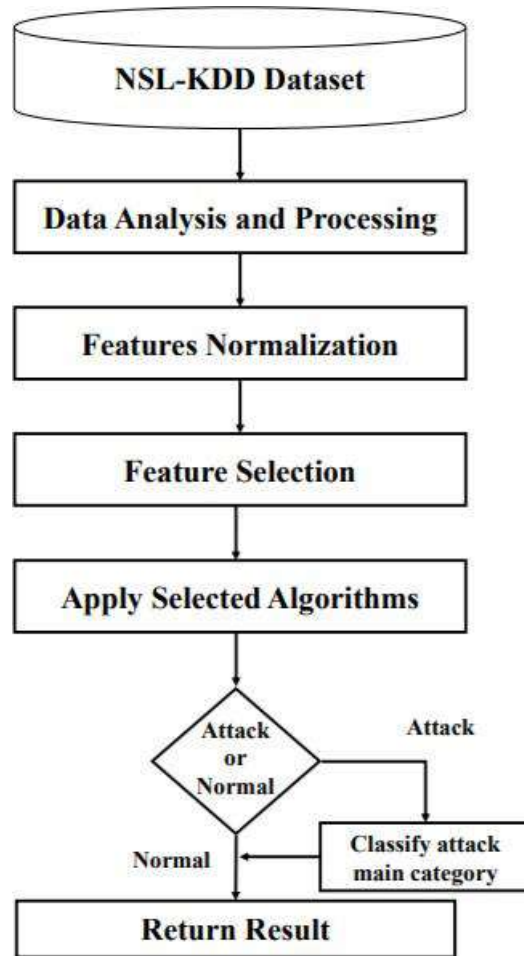
Figure 3. Proposed System Architecture

World-class data mining tournament, the KDD Cup. The NSL-KDD dataset was suggested as a replacement for the KDD Cup 1999 dataset in order to address a number of concerns. The NIDS issue has been developed and evaluated by several researchers using the NSL-KDD dataset. Each assault type is represented in the dataset. 41 features are grouped into three primary groups, which are labeled either normal or attack, with the attack type being accurately characterized. The dataset contains 41 features.
Experimental Setup

MATLAB R2013a-64 Windows 7 Ultimate with a Core i5 processor and 8 GB of RAM was used to develop the suggested model big data intrusion detection system approach, and the Weka tool was utilized to compare with current classification methods. In order to evaluate the suggested model, a variety of performance metrics were applied. Random forest and information gain techniques are combined in this experiment. During this trial, 31 of the most serious threats are chosen. Normal instances are utilized in the data, which contains just 185559 assaults. The total number of assaults is 185559. 25 MB of information is included in the original dataset. Matlab is used to create a Random Forest/Information Gain hybrid model. The suggested model's performance is shown in Table 4. Out of the total of 185559 cases, it was determined that 184331 of them were correctly classified. There are also 1228 cases of misclassification out of a total of 185559.

Table 4: Performance analysis of proposed model

Performance	Proposed model
Time	16.87 seconds
Correctly Classified Instances	184331
Incorrectly Classified Instances	1228
Total Number of Instances	185559

Preprocessing will be used to improve the suggested model. Choosing the best features. The Random Forest classifier may be improved using the information gain approach. Helps in increasing accuracy of classifier and reducing the duration of creating model by using feature selection approach. Thereafter, it was tested by narrowing down the number of relevant characteristics in the original dataset. In order to improve classification accuracy, the characteristics with the most relevant information have been chosen for use.

5   Conclusion

Spark-Chi-SVM is a model for intrusion detection that can handle Big Data, as shown in this work. The Spark Big Data platform, which can process and analyze data at a rapid rate, was employed in the suggested model. Big data have a high dimensionality, which complicates and slows down the classification process. ChiSqSelector was used to pick relevant features in the suggested model, while SVMWithSGD was utilized for data classification. Model performance and speed were found to be excellent in the testing. A multi-classes model that can identify different sorts of attacks might be developed in the future by the researchers. Improve current Intrusion Detection System (IDS) algorithms with this study. Using the suggested approach, it was able to meet its primary goal. Big data intrusion detection systems have been improved by the use of random and information gain approaches. All kinds of assaults have been used in this study. It takes a long time to construct an IDS system because of the massive amount of data. Although the issue can be solved using the features selection approach. The suggested model was tested using a variety of performance metrics. The suggested model's accuracy is 99.33 percent.

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A Paradigm Shift from Machine Learning to Deep Learning – A Survey

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Abstract. As most industries call for smart analytics to maintain themselves beforehand, the two fields specifically gadget gaining knowledge of and deep studying play a essential role. System getting to know has evolved from artificial intelligence and deep studying has advanced from device studying. Despite the fact that deep mastering indicates excessive cease packages from laptop vision to herbal language processing yet device learning dominates the enterprise analytics with its algorithms. This survey paper suggests the learning transition from device gaining knowledge of to deep gaining knowledge of by way of outlining the distinctive types of device getting to know and fashions currently to be had and also provides type of automated gadget learning gear utilized in healthcare in recent times. It also enlightens on deep learning strategies and models in conjunction with challenges confronted and offer insight approximately the destiny of deep learning. A few device gaining knowledge of and Deep Learning healthcare programs presently used are investigated to discover their techniques and method. Ultimately device gaining knowledge of and deep mastering are as compared in phrases of mastering.

Keywords: Machine Learning, Deep Learning and Challenges in Deep Learning, Deep Learning Applications in Healthcare

1 Introduction

Gaining knowledge of is a technique of gaining talents or expertise through revel in and creates beneficial concepts from information. Device mastering is a way that allow computers to examine from records and enhance itself and lets in software program applications to expect greater correctly without being programmed explicitly. The fundamental shape of machine studying is to acquire enter records and use statistical evaluation to predict an output and update the outputs as new statistics which will become to be had. Machine Learning (ML) focusses on locating nonlinear patterns between independent and structured parameters to predict sustained output known as regression, or to expect precise training called type. Regression is prediction for regular numeric values but classification is prediction of the lessons. The supervised gaining knowledge of predicts a dependent variable, as a function of unbiased variables [1]. Machine and Deep Learning to know algorithms are key gamers in prediction and selection making and it trains the pc into an professional gadget. AI is the primary discipline to showcase human intelligence in a gadget, ML is used to accumulate artificial intelligence, at the same time as deep getting to know implements Machine Learning.

Deep Learning (DL) algorithm is a subsection of Artificial Intelligence (AI) that could analyze and classify objects by means of its ability to interpret information like a human brain which is relevant to are expecting the destiny and make decisions based on the modern information. Representation getting to know is a synonym to Deep Learning (DL). Deep Learning knowledge of depends on device gaining knowledge of algorithms which derive top level concept in statistics through numerous nonlinear changes [6]. The time period deep is received from the schooling procedure this means that extra layers of neural community. The Deep Learning to know technique has levels which includes education technique followed through inferring procedure. The education degree involves labelling big amounts of information by locating matching capabilities and inferring level entails labelling new facts the usage of previous information. In Deep Learning or deep neural network, each neuron takes a couple of alerts as enter. It combines the weights with these signals linearly and gives to the nonlinear characteristic to supply the desired final results. Capabilities are extracted robotically the usage of deep getting to know algorithms, domain expertise and guide effort.

In ML category version enter records is accepted in a suitable representation therefore authentic statistics needs pre- processing. In evaluation dl avoids the enter information pre- processing with the aid of introducing a couple of hidden layers among the enter and the output layers. Every layer extracts exceptional features from the input records, amplifies capabilities that are greater applicable to selection making and

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suppresses irrelevant features. Each layer is connected to neighboring layers accordingly robotically extracting appropriate representations for category or detection purpose [17].

2   Machine Learning Model

An explanatory model is built on all the available statistics and has to meet various hypotheses. The mission this model encounters is that it reduces the prediction of non –response that may not be to be had in all sampled records. Explanatory models now not handiest provide statistical inferences but makes predictions. Those models are used to analyze hypotheses associated with exploring relationships among the variables that predict the final results.

The models that predict, need to use variables which can be to be had before the outcome is received and are referred to as ex- ante availability. Growing a version in ml relies upon on pass-validation as one method to avoid over becoming. Go- validation is finished in diverse approaches however one not unusual way is to apply a subset of the information as schooling pattern, to construct a predictive version. The remaining records sample which isn't always part of education subsample is referred to as a take a look at sample and is used to locate the accuracy of the predictive model received from the training pattern. Certain ml strategies use a 3rd subset of data for tuning functions, called the validation sample, to assess the tuning parameters that contribute to ultimate prediction.

3   Types of Machine Learning Techniques

(a).Primary Learning Methods – The Primary Learning Methods can be further classified according to Fig. [1] as follows –
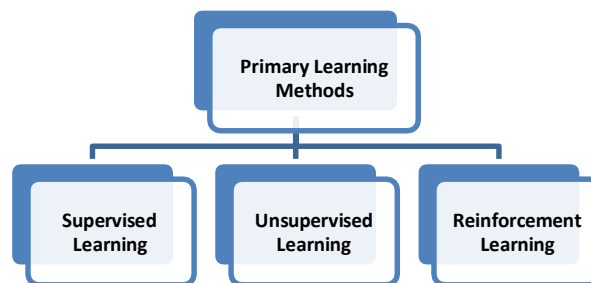
Fig. 1. Primary Learning Methods

➢ **Supervised Learning –** Supervised learning to know algorithms creates styles from the training dataset and implements them to the check dataset for prediction or category. Some examples of supervised learning are –
   o   **Decision Trees –** is a step by step structure which creates rules from the available data and identify the unknown data.
   o   **Naive Bayes –** is applied for grouping and identification purpose.
   o   **Support Vector Machines –** It ensures highest distinction between the classes thus avoiding classification error [2].

➢ **Unsupervised Learning –** tries to emanate with patterns from the data. When unseen data is given, it uses its knowledge (prior learned features) to identify the group the data belongs to. The common algorithm used for clustering is K-Means Clustering.
   o   **K-Means Clustering –** similar data points form a cluster. It derives its name 'k' from k distinct clusters. The cluster head is calculated by finding the mean of all the data points in a cluster.

➢ **Reinforcement Learning –** Reinforcement mastering (rl) is a sort of mastering problem that makes conclusions primarily based on feedback accordingly ensures the end result is effective. The learner isn't privy to the environment or does not have fixed training set to make conclusions till it encounters a similar state of

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affairs. Reinforcement getting to know has standards: trial and error approach and not on time output. Examples: Q-learning, temporal-difference learning, and deep reinforcement learning. Reinforcement Learning focuses on following –

- o **Trial-and-error** – An agent being new to the environment, explores it by executing actions recklessly.
- o **Delayed reward** – It is the positive or negative reward or feedback received by the agent from the environment for an action performed through which an agent learns to behave in an environment.

(b). Composite Learning Methods – The Composite Learning Methods can be further classified according to Fig. [2] as follows –
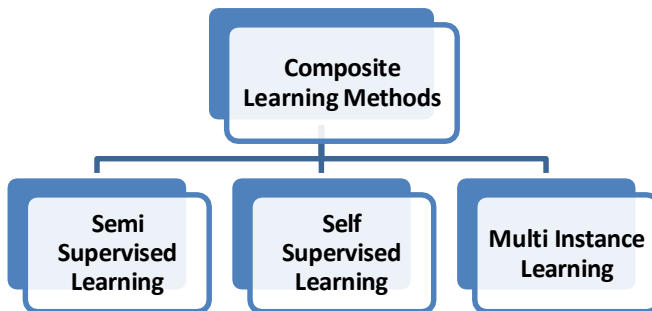
Fig. 2. Composite Learning Methods

➢ **Semi Supervised Learning** – is a studying technique which makes use of first supervised after which unsupervised getting to know. It is beneficial while we've only a few classified records and large unknown facts and implemented in regions of ml and data mining. For Example –

- o **Generative Models** – is a combined distribution where the variety of components can be identified from unknown data. Each known data per component decides the combination of distribution.
- o **Self-training** – where known data is used for training and classification of new data. The predicted labels of new data forms the training set.
- o **Transductive support vector machine** – is an extension of Support Vector Machine. Here, the known and unknown data both are used to classify the unseen data such that there is a maximum difference between them.

➢ **Self Supervised Learning** – is an unsupervised gaining knowledge of method that implements supervised mastering algorithms to discover solutions.

➢ **Multi Instance Learning** – is supervised mastering approach where each information is unknown but group of records is associated with a category label.

(c). Learning Strategies – The Learning Strategies can be further classified according to Fig. [3] as follows –

Fig. 3. Learning Strategies

➢ **Multitask Learning** – facilitates in solving a couple of related hassle. Whilst this method is applied on a trouble, it information the approach of ways the answer is reached.

➢ **Ensemble Learning** – When various base learners are combined to form only one composite predictor then the learning is called ensemble learning. The base learners are Naïve Bayes, Support Vector Machine.

- o **Boosting** – is a method of building a group of base learners to be transformed to experienced leaner where the base learner has weak classification but an experienced learner has strong classification.

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o **Bagging or bootstrap aggregating** – are same type of slow learners who learn individually and increases the accuracy and stability in ML algorithm to avoiding over fitting.

4   Automated Machine Learning Tools

The time taken to method the digital information available to clinical professionals is turning into hard to system inside the time taken in step with patient consultation and it's miles practically impossible to check huge quantity of affected person info received in each man or woman ehr (digital health record). As we have studied within the phase above, the prediction and alertness of system gaining knowledge of models improves excellent of healthcare given through looking after safety of the affected person and minimizing medical fees.

In all machine learning problem the pipeline depicted in determine [4] is observed to get an appropriate machine learning set of rules for the problem. The primary level includes making ready the statistics by loading and cleaning the facts to the format to be applied in the system through applying adjustments. Choosing the specified capabilities to create the model is the next stage. This technique of utilizing professional expertise to create new capabilities in an effort to improve the gadget learning version known as function engineering. The last degree is a persistent method which includes version constructing, training, optimizing, comparing and sooner or later choosing a device getting to know set of rules for the trouble.
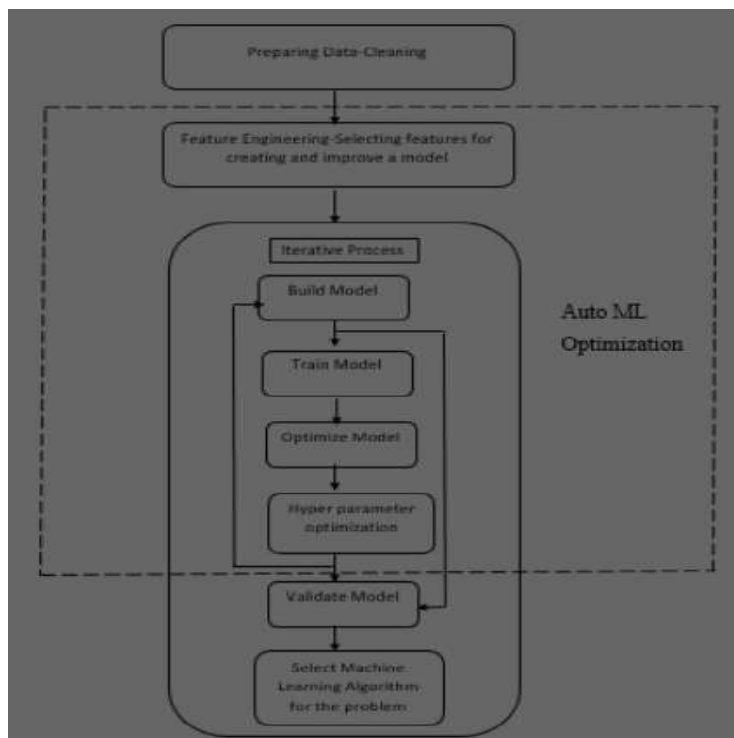
Fig. 4. Automated Model

Automatic characteristic engineering applies deep learning methods to find essential capabilities in unstructured statistics kinds like images, text, audio or video and it isn't always similar to the sector of representation mastering. Illustration gaining knowledge of isn't an Auto ML approach however nevertheless utilized in healthcare to represent EHR information that facilitates in medical predictive modelling and additionally belongs to the device learning pipeline for unstructured facts kinds. Some of the Auto ML tools used in healthcare are as follows –

➢ **ChaLearn AutoML[3]** – Manual interaction not required to solve supervised machine learning problems with minimal computational condition that involves training, testing time and usage of memory limitations.

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➢ **Auto-WEKA** – First AutoML system to select machine learning algorithm and upgrades its hyper parameters at the same time. This problem is called combined algorithm selection and hyper parameter optimization (CASH) problem. It solves the CASH problem with the help of learners and feature selectors by using the SMAC optimization algorithm available in its platform

➢ **Auto-sklearn** – It finds solution for the CASH problem along with two increments to the previous AutoML. The first increment is by first finding a set of meta features like number of data points, number of features, biased data for different datasets in the OpenML repository. The second increment is the models estimation during optimization by automated ensemble technique. This ensemble construction prevents in following one pipeline configuration and hence more tough and less liable to over fitting.

➢ **Auto-Tuned Models (ATM)** – It has included distributed, interactive, and extendable features in AutoML system. The ATM environment simplifies the task of uploading a dataset, selecting a required ML technique and selecting a hyper parameter range for data scientists. ATM optimize the pipeline using either a mixed Bayesian or bandit optimization system.

➢ **Autostacker [4]** – It draws its motivation from ensemble learning methodology known as stacking and evolutionary algorithmic technique to show hyper parameter optimization for layered stacked ML models

➢ **AutoPrognosis [5]** – It is a system designed for the task of clinical prognosis by constructing a machine learning pipeline automatically. It finds the model and hyper parameter space, and enlighten the medical professionals with association rules to predict risk from patients' clinical data. This system performs lost data misclassification and feature preprocessing and can also handle heterogeneous types of clinical data .It also shows increased accuracy in cardiovascular disease risk and cystic fibrosis prognostication prediction.

 Generally Machine Learning Model uses two parameters –
a) Hyper parameters – that are decided before the training phase by model designer randomly
b) Normal parameters – that are upgraded while training the model.

Fixing the hyper parameter is the basic task of AutoML to improve model performance. Hyper parameter optimization is a skill that requires practical experience. Two well-known examples of hyper parameter optimization processes that are inspired by natural instinct are: particle swarm optimization (PSO) [19] and evolutionary algorithms [20]. PSO operates by improving the data points at each repetition by arriving at a solution towards the best individual data points and finding the data points closer in the upcoming iterations whereas evolutionary algorithms are inspired by natural evolution and maintain an initial population and upgrades the population by implementing mutations and crossover for a better generation.

Auto ML Tools Challenges in Healthcare Domain –
➢ Ability of Auto ML to work on large scale health data integrated with clinical setting [8].
➢ Currently 15% of hospitals are using machine learning for few tasks.
➢ Creation of a black box that reduces the need for human intelligence.
➢ To overcome the scarcity of data scientist and enlighten those with domain knowledge.

5   Deep Learning Models

Deep Supervised Learning is a learning methodology that uses sampled data to change the features for getting the required output. Deep Neural Networks (DNN), Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN), Long Short Term Memory (LSTM), and Gated Recurrent Units (GRU) [6] are some supervised learning methods for deep learning. Deep Unsupervised Learning learns distinct features and finds new relationships from the input data. Some unsupervised learning strategies are clustering, dimensionality reduction.
Deep Reinforcement Learning (RL) is a learning approach to be used in a new environment. The agent interacts with the environment to get answer for the question. RL does not have control of the function and has to question the environment whereas supervised learning is based on current state.

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Feature Learning – In DL, the features are identified automatically and shown in various layers. Representational learning includes ways to help the machine to take the fresh data as input and decide their perception and grouping.

The **Deep Learning** models identifies the hierarchical capabilities the use of an unmanaged pre-processing and a calibrated supervised method for classification and identification. Deep Learning paradigm makes use of labelled statistics to decide particular functions and builds a mixture of characteristic extraction and category version which has created specific types of deep studying architectures. Deep Learning has carried out superior overall performance in laptop vision, speech recognition and text interpretation. Deep Learning Models can be classified as in Fig. [5] –
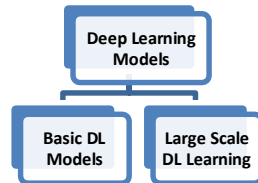
Fig. 5. Deep Learning Models

(a). Basic DL Models –

➢ **Stacked auto-encoder model** is stacked by several auto- encoders that are the feed-forward neural networks which is based on unsupervised learning technique and uses back propagation algorithm. A basic auto-encoder has encoding stage and decoding stage. It is closely related to Principle Component Analysis (PCA).

➢ **Deep Belief Network (DBN)** is constructed by stacking Restricted Boltzmann Machines (RBM). RBM is an undirected graph modeled to represent two layers, visible layer and hidden layer and connection between the layers. A pair of connected layers is a RBM and is also known as a stack of restricted Boltzmann machines. DBN is a multilayer network architecture with training phase included in the hidden layers [7].

➢ **Convolutional neural network (CNN)** is a deep learning model used in feature learning for large-scale image classification and recognition. CNN takes advantage of sharing parameter, few interactions and correct representations. The initial layers are feature extractors used for identifying the features such as edges and the final layers are used for the combining the features to create high level attributes of the input followed by the classification. Then reduce the dimensionality of the extracted features by pooling. The two types of pooling are max and average pooling [18]. This process depicts sensitivity of visual cortex cells in certain sections of scene when compared to the entire scene. These cells work as local filters to extract spatially features in the subsampling layers [9].

➢ **Recurrent neural network (RNN):** the above mentioned deep learning models are not suitable to learn features from the time series data (example in natural language sentence to understand a word, context has to be known) as feed-forward deep learning models cannot store the information of previous inputs (previous word).The RNN is a sequential learning model that is able to learn features from the series data by storing previous inputs in the memory units that can store it for small period of time and it has the input layer, hidden layer, and output layer.

(b). Large Scale DL Models –

Long Short Term Memory (LSTM) includes a few hidden layers, each with a large number of neurons thus leading to large number of parameters and prevents the gradient vanishing or gradient exploding in large-scale deep learning model. To train large-scale deep learning models, algorithmic methods are grouped into three categories that are parallel deep learning models, GPU-dependent implementation and improved deep learning models.

➢ **Deep Stacking Network (DSN)** is an example of parallel deep learning models. In this each module is a deep neural network with its own hidden layer and sets of weights. The DSN consists of three modules in which each module includes a model having an input zone, a single hidden zone and an output zone. The DSN uses the sigmoid function as activation function to map the input to the hidden layer by a set of weights and a bias.

➢ **Bi-modal deep Boltzmann machine** is used for feature learning in text image objects. It consists of two deep Boltzmann machines to analyze the attributes for text and image technique. The studied features of the text and the image are merged into a vector as the combined representation. The attached vector machine could be processed with the combined representation as feed-in to perform the grouping task.

➢ **Multi-source deep learning model** used [21] for human posture judgment. It trains non-linear parameters from various data sources like human body diction and clothing. This deep learning model has two hidden layers for extracting features individually which are then merged for the combined representation.

➢ **Multi-modal deep learning models** include diverse deep neural models added with random variables for Chinese dialogue identification [22], multi-modal deep neural network with sparse group lasso for mixed feature selection [23]. Multi-modal deep learning models first studies the attributes for single approach and then join the analyzed attributes as combined representation. Lastly, the combined representation is loaded to the deep learning model for grouping and perception.

6   ML and DL Applications In Health Care

Healthcare domains can be classified as Fig. [6] –
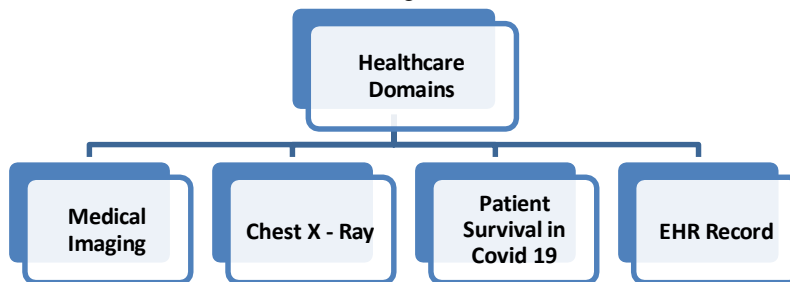
Fig. 6. Healthcare Domains

(a). Medical Imaging –

➢ **Pattern Recognition in Machine Learning [10]** – Features of diseases extracted from medical images to predict and derive conclusions for diagnosis and to decide the treatment.

➢ **Pixel Based Investigation Analysis in Machine Learning** – Certain values of images used directly instead of features extraction from chunks as input data.

➢ **Neural Network** – It investigates the discovery of cancer using distinct network which predicts either a normal cell or cancer cell.

➢ **Feature Extraction** – Evaluating knee osteoarthritis with accuracy 57.6%.

➢ **Feature Retrieval** – CNN uses fine-tuning in image classification of cytopathology with accuracy of 70.5%.

➢ **3 D Data Parsing Approach in Deep Learning** – It identifies specific pixels of image to create the object of interest and extracts interested object and discard the noise. Independent groups 2D and 3D MRI chunks of medical image created to locate the regions of objects related to specific diseases like heart, aortic arch, descending aorta.

(b). Chest X – Ray –

➢ **Feature Extraction in Convolutional Neural Network** – Inception V3 models perform convolution, pooling, softmax and fully connected procedures for feature extraction and classification.
Chest X – Ray images are classified using transfer learning into three types Normal, Viral and Pneumonia COVID – 19 [11]

➢ **Bidirectional Long – Short Term Memory (RNN – LSTM) – COVID – NET** network architecture with accuracy of 83.5% for small data sample corresponding to COVID – 19 cases.
Inception RESNET V2 – RNN used for splitting images by getting a hidden layer and predicting categories of split images [12].

(c). Patient Survival in Covid 19 –

Logistic Regression and Statistical Test – Death risk factor is proposed in [13,14] using real data and studies on COVID-19.This work provides a simple estimation for health professionals to evaluating the patient survival in COVID-19 considering the risk factors like age, comorbidity and infection rate.

(d). EHR Record –

Gated Recurrent Units (GRU) – The time series data that correlates with each patient timeline is taken in pairs and given as input for Gated Recurrent Units (GRU) to predict the future status by taking the weight of the hidden unites of the GRU.

Computational Phenotyping and Clustering – Specific and fine-grained description of the diseases is obtained through clustering. Personalized and accurate healthcare is achieved by computational phenotyping which is a main clinical application of the deep learning technique to discover relationships and concepts from the data without the supervision.

Bidirectional LSTM Network – Confidentiality of patients (names, addresses, identification numbers and geographical information) details in EHR is protected in [16] through automatic clinical note deidentification.

Deep Learning and CNNs – Deepr, a predictive framework to represent patients and predict future risk.

7   Challenges In Deep Learning

The challenges in Deep Learning can be classified as under –

(a). Black-box perception of Deep Neural Network – Deep learning models find their meaning from results unaware of how they derived the conclusion. These results cannot reproduce as it involves large number of parameters with uncertainty. Hence many industries are not using DL for standard processes. Even it is difficult to convince the medical professionals about the predictive model and recommended action with lack of interpretability of the model.

(b). Non-availability of data – In deep learning the system's ability to generate data becomes a priority (example: computer vision). Large datasets are needed for training the machine and predicting the new data. Problem arises when dataset are small (example: healthcare) or when the real time data is needed. Diseases are heterogeneous with incomplete information regarding their progress and leads to complexity. Hence in recent years one-shot learning and zero-shot learning are reviewed to reduce this issue.

(c). Multi-task and transfer learning – Combining different domains or different models for learning.

(d). Scalability of Deep Learning methods – Deep learning methods and models have to be used for different types and categories of data.

(e). Unsupervised learning and semi supervised learning – It will be the most awaited solution in the future for deep learning due to the rapid increases in the size and complexity of data and as a solution to handle real- world unlabeled data.

(f). Multimodal deep learning – When dealing with modeling multiple complex data modalities at the same time, deep learning finds it challenging.

8   Conlcusion

Machine Learning and Deep Learning are two important research areas in computer science with continuous rigorous developments in the past decade due to the advancement in technologies. This paper gives comprehensive survey of the varied learning types, models used in Machine Learning .It introduces automated tools of Machine Learning, problem pipeline and the challenges encountered in the field of healthcare. It also outlines Deep Learning with its enhanced learning methods, basic and large scale models used as per requirement along with the challenges and future work.

ML algorithms finds meaning from data, interpret data and produce informed decisions. ML needs limited amount of data to derive conclusion. ML trains and works faster without GPU. Users recognize features in

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ML correctly. ML solves the problem by breaking down the larger problem into smaller problems and then combines the results. Features are extracted in ML by applying hard coded rules from feature extraction algorithms, learning algorithms and boosting approaches. Training time is less but testing time is more (example: k-nearest neighbour) compared to DL.

DL builds algorithms in its layers to construct an artificial neural network, which is capable of learning and taking intelligent decisions on its own. DL requires large datasets for training and prediction. DL needs of high performance hardware with lots of GPU power. New features are created in DL using its own methods and techniques. DL finds solution for the entire problem. DL automatically learns the features from data that is represented in successive levels. Training time is large due to the number of parameters but testing time is small compared to ML.

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IDENTIFICATION OF LOWER BACK PAIN USING MACHINE LEARNING

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Abstract: One of the most common conditions that may happen in everyday life for a person while undertaking regular duties, irrespective of age is lower back pain. Lower back pain can be caused by many complications that arises from any part of the spine. However, it is noted from the patient that it is often very difficult to distinguish the intensity of pain to an abnormal condition. This research aims to identify machine learning models with accuracy for predicting spinal abnormalities and the most significant physical parameters that contribute to spinal abnormalities. The dataset used for the analysis is from kaggle. Various machine learning models were tested including KNN, logistic regression, random forest, SVM and decision tree. Percentage of accuracy of random classifier after hyperparametertuning was found to be 87%. Degree spondylolisthesis was found to be one of the most significant parameters that contributes to spinal abnormalities.

Keywords: Lower backpain, Machine learning, Chronic Pain, Identification, Prediction.

1. Introduction

Lower back pain (LBP) is one of the most common musculoskeletal disorders experienced by people of all ages as mentioned in [1]. It is observed in previous researches [3,4,5] that pain in the lower back area is due to problems with the lumbar spine, the discs between the vertebrae, the ligaments around the spine and discs, the spinal cord and nerves, muscles of the low back, internal organs of the pelvis and abdomen, or the skin covering the lumbar area. Not only aging, but poor lifestyle, wrong posture, stressful working conditions, physiological disorders and even some abdominal problems like kidney stone are some causes of lower back pain. But as mentioned in [2] the intensity of pain varies from person to person and it often become difficultto discriminate the intensity of pain to an abnormal condition. Therefore, it is important to classify spinal abnormality at its beginning stage so that they can get right treatment.

Such complex and multidimensional classification problems can be classified using machine learning algorithms which has the potential to learn from data, identify complex relationships among parameters and select the best model that describes the problem. Taking this as a motivation point, here different machine learning algorithms are tested for classifying lower back pain along with investigating the effect of hyper-parameter optimization.

In section 2 a literature survey is done, section 3 is about the methadology used, section4 is about the result and evaluation and section5 gives the conclusion and the future scope.

2. Literature Survey

It was proposed in [1], to predict chronic pain using both regression and machine learning. It aimed to investigate use of sense-based parameters as predictors when controlling for patient's demographics. Firstly, the regression models were used to predict sensor-based parameters and using these parameters classification model was created to predict the pain intensity and interference using deep neural networks producing an accuracy of 75% and 82% respectively.

A study was done [2] on chronic pain research using machine learning that focused on treatment and management of chronic pain. The study signified the use of machine learning indifferent categories namely: Classification/diagnosis of patients with chronic pain usingstructured health data, using text and images, applying Genomics approaches and pain biomarker identification. This study signified the need of methods that integrate multiple datasources both EHR data and patient-generated data so as to get better results.

A study by Sir Pedro Berjano[4], with his team-mates researched to define an invasiveness score for LBP procedures based on biological markers and inflammatory profiles. A combination of feature selection techniques has been used due to low sample size and an AUCof 0.87 has been achieved for invasiveness score definition and an AUC of 0.76 for invasiveness prediction task is achieved.

Sir Abdullah A, Yaakob A, and Ibrahim Z [5] researched to identify the most significant physical parameters that contribute to spinal abnormalities and also predict spinalabnormalities using both unsupervised and supervised machine learning approaches. Unsupervised approach of Principal Component Analysis (PCA), and Supervised machine learning algorithms such as K-Nearest Neighbors (KNN) and Random Forest (RF) have been used which came out with an accuracy of 85.32% and 79.57% for KNN and RF Classifier respectively.

Sir Mittal Bhatt, Vishal Dahiya and Arvind K. Singh [6] did a comparative analysis on classification methods to diagnose lower back pain using machine learning. In this study five independent classifiers were implemented at base level and meta level and a combination wasused to get fruitful diagnosis. A maximum efficiency of 83.87% was achieved using Naïve Bayes and Multilayer Perceptron.

Sir Wendy Oude and his team-mates [7] evaluated three machine learning models for decision support on low back pain. It basically aimed at self-referral decision support in primary care for LBP patients. Machine Learning Algorithms namely decision tree, random forest and boosted tree were used which came out with an accuracy of 70%, 69%, and 72% respectively.

Sir David Murphy, Stan Lindsay, Amanda C.De C Williams [8] conducted a study chronic low back pain. The study showed the variation of pain experienced and the pain rated by the patients. A set of different exercises were made to be done the patients to rate the level of pain.The greater the discrepancy between predicted and experienced pain the greater was the increase in pain predicted for the subsequent exercise.

3. Methodology

Data

Lower Back Pain Symptoms Dataset Collection of Physical Spine data (from Kaggle) has been analyzed in this project. The data consists of 13 attributes with 12 numeric predictors and 1 binary class attribute namely pelvic_incidence, pelvic_tilt, lumbar_lordosis_angle, sacral_slope, pelvic_radius, degree_spondylolisthesis, pelvic_slope, Direct_tilt, thoracic_slope, cervical_tilt, sacrum_angle, scoliosis_slope, and target.

Data Preprocessing

The data is used to predict the abnormality of spine, using the independent variables, as normal or abnormal. The whole data contained 210 abnormal and 100 normal instances. The data did not contain any null values already. The correlation between features were studied using correlation matrix emphasizing the dependency of target variable on the feature, degree_spondylolisthesis, the most. Further the data was checked for normal distribution and was standardized using Standard Scaler. The data was then divided into training and test datasetas 80% and 20% respectively.

Classification

Use of supervised machine learning algorithms has been done this study. A comparative study of five different algorithms was done to determine which algorithm works best to predict the given problem. The algorithms used were as follows: Logistic Regression, Random Forest Classifier, K Nearest Neighbor, Decision Tree, Support Vector Machine.

Table 1. Parameters of some Supervised Machine Learning Algorithms

Sno	Classifier	Set of Parameters
1.	Logistic Regression	{'solver': liblinear, 'penalty':l2}
2.	Random Forest Classifier	{'n_estimators': 910, 'min_samples_split': 2, 'min_samples_leaf': 10, 'max_depth': 7}
3.	KNN	{'n_neighbors'=5, 'leaf_size'=30}
4.	SVM	{'kernel'=linear, 'gamma'=auto, 'C'=2}
5.	Decision Tree	{'max_leaf_nodes'=10, 'random_state'=0}

4. Results and Evaluation

The model with highest Accuracy came out to be Random Forest Classifier with an accuracy of 85%.

Table 2. Accuracies of different algorithms

Sno.	Classifier	Accuracy
1.	Logistic Regression	82%
2.	Random Forest Classifier	85%
3.	KNN	66%
4.	SVM	75%
5.	Decision Tree	72%

Fig 1. Comparison of Accuracies
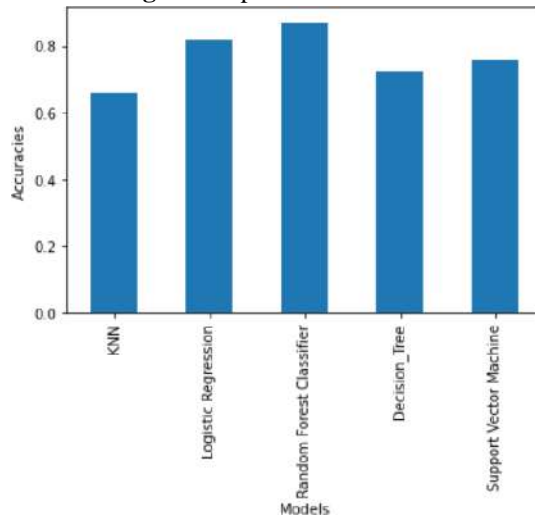
To overcome any overfitting or randomness, Hyperparameter tuning of Random ForestClassifier was done with the best parameters using RandomizedSearchCV and GridSearchCV.After hyper-parameter tuning, we got an accuracy of **87%**.

For evaluation, a classification report and confusion matrix of the model is made.

Table 3. Classification Report for Random Forest Classifier

Model	Random Forest Classifier
True Positives	39
False Positives	4
True Negatives	15
False Negatives	4
F1 measure	0.90
Accuracy	0.87

Fig 2. Confusion Matrix

Fig 3. AUC Curve

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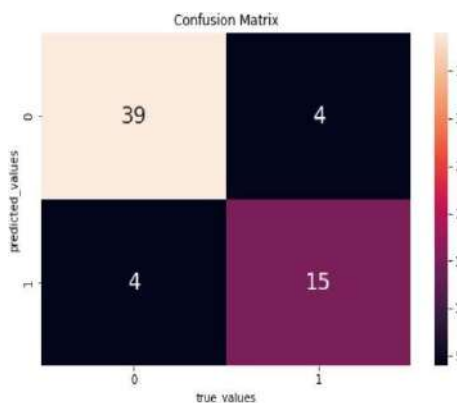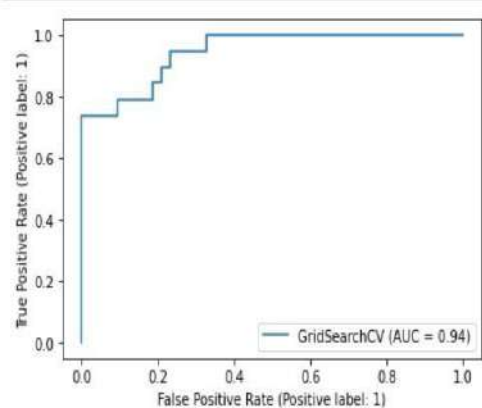
Table 4. Best Hyperparameters Chosen

Sno.	Hyperparameter	Value
1.	max_depth	8
2.	min_samples_leaf	10
3.	min_samples_split	2
4.	n_estimators	600
5.	cv	10

5. Conclusion and Future Scope

It can be concluded by using Random Forest Classifier algorithm and hyper-parameteropti-mization (max_depth, min_samples_leaf, min_samples_split, n_estimators), an accuracy of 87% can be achieved to identify the abnormality of Lower Back Pain with Kaggle Dataset. Further, this data can be tested using other techniques like neural networks.

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YOGA POSE CORRECTION

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Abstract. Human activity monitoring using pose estimation and correction has a lot of real world applications. Real time pose estimation can be used for solving many problems in fields like fitness training, sports coaching, gaming, motion capture and assisted living.Fitness exercises are exceptionally beneficial to individual health but, this can also be ineffectual and quite possibly harmful if performed incorrectly. With our fast-paced lives these days, people usually prefer exercising at home where there is no one to correct them . This proposed application utilizes post estimation and detect user's exercise posture and provide feedback and tell where they where getting wrong .We are using Mediapipe BlazePose model in this application .

Keywords: pose estimation, BlazePose,pose correction

1   Introduction

Real time pose estimation can be used for solving many problems in fields like fitness training, sports coaching, gaming, motion capture and assisted living.Fitness exercise are exceptionally beneficial to individual health . Due to the lack of training or knowledge many people do not follow the correct posture to be maintained while performing exercises regularly. This may lead to muscle fatigue and muscle strain. In this course project, using the latest techniques in pose estimation we help people in performing exercises with correct posture by developing a project that detects the users pose while exercising and provides feedback and suggests improvements if necessary. The goal for this project is to prevent injuries and improve the form of human workout with just a computer and a camera.Thisis done in two parts : pose estimation and pose correction .

Pose estimation predicts body keypoints of a person in each frame of the video feed . Pose estimation can be done for single-person or multi-person.This project is focused on single-person pose estimation.There are number of model available like Lightweight OpenPose [7],Pifpaf[4],Tensorflow Lite(mobilenet)[1]and BlazePose(Mediapipe Api)[2].

For this project we have used Mediapipe's BlazePose model[2].BlazePose generates 33 keypoints which are used in pose correction in calculating the angle between the keypoints,after which is compared to our data of the correct exercise posture which is already taken . Smooth landmark function is used to filter pose landmarks across different input images to reduce jitters.

2   Literature Review

Various methods have been studied for pose estimation that evaluate human poses using sensors, videos and machine learning approach. A few of them are mentioned below. A. Toshev and C.Szegedy [11] used neural network for the first time to improve pose detection using regression on CNN for finding the location of body joints. A stacked hourglass neural network architecture was introduced by A. Newell, K. Yang, and J. Deng [12] which works on bottom up and top-down approach for finding pose predictions, S. Wei, V. Ramakrishna and others [16] propose a different architecture which uses multiple

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convolutional networks to clarify joint estimates over sequential passes and design a cascaded CNN network to represent texture and spatial information with convolution layers, sequentially incorporating global context to refine part confidence maps from previous iterations F. Bogo, A. Kanazawa and others [13] used single RGB images to predict 3D pose and 3D mesh shape. Research work on detecting multiple human pose in a single frame has also been focused and worked on.T. Zhu and others [17] used a two-stage process for detecting multiple poses, first step includes identifying people and the second includes detecting of their key points. For analysis of physical movements

Chen, Steven, and Richard R. Yang [5] used DTW[10] to calculate the similar sequence in the excercise .Here we do not the dynamic time warping algorithm because most of work is static.To increase the efficiency we use function to remove the blur/jitters in images so that processing is decreased.

Valentin Bazarevsky , Ivan Grishchenko and others[14] used BlazePose model and is tailored for real-time inference on mobile devices.The brightness and contrast of the input feed is changed as required to increase the accuracy of the model , from Jannik christian , Mattias Foltmar and other[15] showed how low level image processing operation change the accuracy of the model.

3   System Design
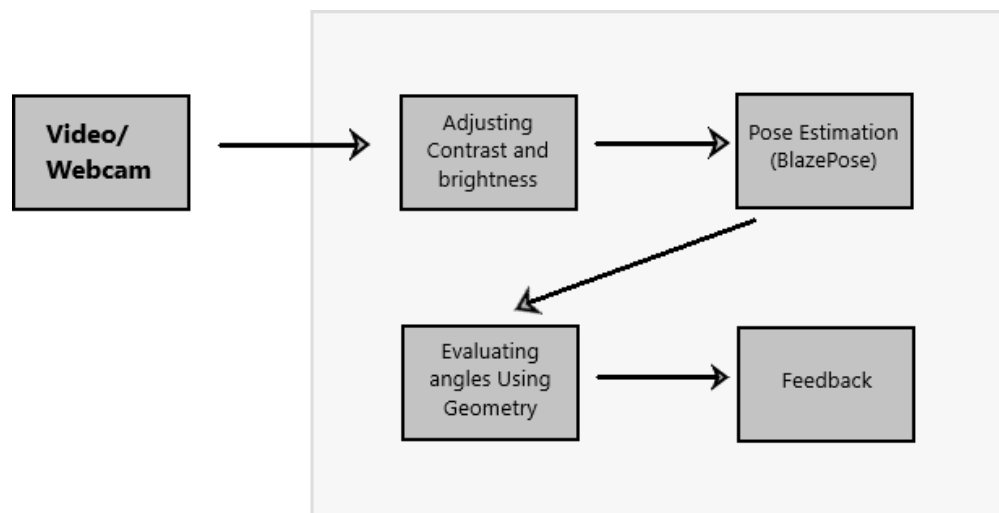
Fig 1:Block Diagram of Pose Estimation and Correction

For the first step of the project, Live feed of user doing exercises is taken .user's complete body should be visible for correct results .Then Feed is normalized , the brightness and contrast is changed so that user's body is more clearer and keypoints came accurately .Then pose estimation is applied used a pertrained model BlazePose . BlazePose model generates 33 keypoints which is more than other model available today.BlazePose uses top-down approach that is first the body is tracked and then key point is detected .Using a detector, the pipeline first locates the person/pose region-of-interest (ROI) within the frame. The tracker subsequently predicts the pose landmarks and segmentation mask within the ROI using the ROI-cropped frame as input . Using these key points, angles are calculated between different body parts then compared with our data for correct angles . After this feedback is provided to the user what they can improve while doing these exercise .

4 System Implementation

Pose Estimation

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BlazePose model generates 33 keypoints instead of the 17 keypoints generated by most models. BlazePose uses a two step pose estimation technique that first detects and then tracks the person.The detector detects the region of interest for pose estimation and then the tracker tracks the 33 landmarks. The pose detection uses BlazeFace to detect the human body. It also predicts the midpoint of a person's hips along with the radius of a circle circumscribing the whole person and the incline angle of the line connecting the shoulder and hip midpoints. This results in consistent tracking even for very complicated cases (link). The tracking model predicts the 33 keypoints with their x location, y location and their visibility. It also detects the two alignment keypoints mentioned above.

0. nose	17. left_pinky
1. left_eye_inner	18. right_pinky
2. left_eye	19. left_index
3. left_eye_outer	20. right_index
4. right_eye_inner	21. left_thumb
5. right_eye	22. right_thumb
6. right_eye_outer	23. left_hip
7. left_ear	24. right_hip
8. right_ear	25. left_knee
9. mouth_left	26. right_knee
10. mouth_right	27. left_ankle
11. left_shoulder	28. right_ankle
12. right_shoulder	29. left_heel
13. left_elbow	30. right_heel
14. right_elbow	31. left_foot_index
15. left_wrist	32. right_foot_index
16. right_wrist	

Fig 2 : The landmark model in BlazePose model predicts the location 33 pose landmarks.

Pose correction

In geometric evaluation, body vectors are calculated with the help of key points.Smooth landmark function is used to filter pose landmarks across different input images to reduce jitters.

Formula used to calculate angle between key points :

radians =   np.arctan2(c[1]-b[1], c[0]-b[0]) - np.arctan2(a[1]-b[1], a[0]-

b[0])angle = np.abs(radians*180.0/np.pi)

Examples:

1. Plank

Plank   is an   isometric   core   strength exercise that involves   maintaining   a   position   similar   to a push-up for the maximum possible time.shoulder , hip and knee should form a straight line .

When planking we have used four angles and two distances to verify the pose. The mention angles and distance are:

- a and b are angle of hands

- c and d are angles of legs

- e and f are distance between head to ankle

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formula: If a in range(50,100) or b in range(50,100) and (c in range(135,175) or d in range(135,175)) and (e in range(50,250) or f in range(50,100)

      return True
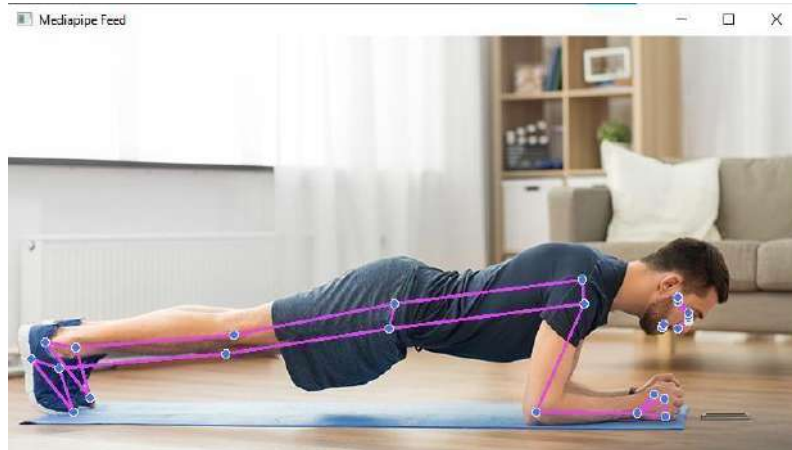
Fig 3: It is an example of plank . The keypoints have changed their color to

pinkTelling the user that they are doing it correctly

2. Tadasana(Mountain pose)

It is a basic standing asana in most forms of yoga with feet together and hands at the sides of the body.The posture is entered by standing with the feet together, grounding evenly through the feet and lifting up through the crown of the head.the hands should be parallel to each other .

- a is distance between two wrists

- b and c are angle between neck, shoulder and wrist

- e and f are distance between head to ankle

Formula : if a in range(20,160) and b in range(60,140) and c in range(60,140) and d in range(100,145) and e in range(100,145):

      return True

3. Virabhadrasana II (Warrior II Pose)

In this pose you distribute your weight evenly between both legs with your front knee bent, your hips squared forward, and your arms extended over your front and back legs.The angle of the right knee should be 90* , the arm should parallel to the ground and the left leg knee should be straight **.**

Formula:if a in range(160,180) and b in range(160, 180) and c in range(120,90) and d In range(160,180)

      return True

Fig 4 : It is an example of warrior 2 pose . The application is providing the feedback

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In top left corner of the screen .

5 Conclusion

In this project, an application is presented which provides feedback on human posture while providing yoga using pose detection and visual geometry . The output of pose estimation is used to calculate human body key points. Using geometry , feedback is provided for improvement . In this project three basic yoga pose is used to show results and can be extended to many other yoga poses for future work . Also for future work a mobile application can be created so that user can use it any where . Feedback improvement can be increased suggesting targeted action and specific suggestions regarding the body part used.

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E-Commerce web Application by using MERN Technology

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Abstract. The majority of people in today's generation rely on technology to guide their lives and meet their every-day demands. The majority of us in this generation shop for clothes, groceries, and electronics via E-commerce websites We have developed one E-commerce web application by using MERN stack technology as it contains Mongo DB, Express.JS framework, React.JS library, Node.JS platform. In this project, Customers can add and delete different items to the cart. Based on the items in the cart then the bill gets generated and the customer can pay online .

Keywords: React.js, MongoDB, Node.js, Express.js, JavaScript, Software Stack, Framework, Library, Performance Analysis.

1. Introduction

We all know that in today's world, technology has become an indispensable instrument for online market-ing. We can tell that most people throughout the world are interested in purchasing items online. We can see, however, that many small shops and supermarket stores sell their products offline. Most of us will have a terribleexperience with this style of selling. For example, in some businesses, the seller may have a product to sell in the offer, but the buyer may not be aware of it; or the client may require the goods urgently and go to the shop, only to discover that the product is out of stock; in this situation, the customer will have a negative experience. Furthermore, customers can select a wide range of products based on their interests and pricing by utilizing online shopping. Customers can also compare costs from one business to another by using online shopping [3].

Creating an E-commerce web application is required for searching and shopping in each shop after facing all of the challenges and weaknesses of the offline shopping system. These days, several e-commerce web-sites have been launched, such as Flipkart, Amazon, and Myntra, where people can quickly purchase their required things. These websites allow people to buy their products while remaining at home. Finally, we can see a difference in product prices, such as when we see that the cost of a product is slightly more in offline buying compared to online purchasing. MERN stack will be the greatest alternative for constructing these types of E-commerce web apps because it can assist us in creating the most effective and powerful web applications.

The objective of this project is to develop a web application which can make buying and selling of goods more convenient. In this E-commerce web application customer can enjoy discounts and can have catego-ries like summer sales, winter festival, etc. which will make overall experience better. Customers can easily search for their favorite goods. They can also change the quantity by adding to the cart and can alter the quantity by clicking on the "+" sign and "-" sign. They can check the total bill of the items they've added to the cart once they've finished adding them. A successful payment gateway way available to complete the transaction and place an order.

2. Literature Review

E-COMMERCE An overview

E-commerce, often known as electronic commerce, is the process of buying and selling things through the internet, as well as the movement of funds and data to complete the purchase or sale [4]. E-commerce was not well-known in the beginning, but as the use of mobile phones increased, more people expressed an interest in purchasing items online, and it grew in popularity.

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Types of E-commerce: There are exists mainly four models of E-commerce business.

- B2C (Business to consumer).

It is an internet-based business model that allows us to sell things to the end-user.

- B2B (Business to business)

It is a business that will happen between companies, organizations, and businesses, most of e-commerce falls in this category.

- C2B (Consumer to Business)

Individuals can sell their things to businesses using this sort of E-commerce. Individuals will assign work to finish in a certain amount of time via websites or other electronic medium in this sort of E-commerce. Consumers can establish their own pricing for their service in this type of E-commerce. Freelancing is the most well-known example of this kind of job.

- C2C (Consumer to Consumer)

This sort of E-commerce connects consumers to consumers in order to exchange things and make money. By charging transactions, buyers and consumers will be motivated [5]

ADVANTAGES

- **A MASSIVE MARKET**

E-commerce allows you to reach clients all over the world and purchase anything you want from the comfort of your own home. People nowadays are accustomed to purchasing solely through their mobile devices. As a result, it will benefit E-commerce.

- **LARGE PRODUCT RANGE**

Customers can buy many types of things from various areas in this huge world; we can buy electronics from Japan, shoes from Bangladesh, garments from London, and good old international products; the depth and advantages of E-commerce are infinite**.**

- **FOLLOW-UP**

If you order a thing through e-commerce, you will receive information about where the goods is being shipped and when it will arrive. You can also cancel the order if you do not like the product.

- **CHEAPER PRICES**

We can compare the costs of things from one website to another on e-commerce websites. As a result, we will be able to readily determine where we can purchase the product for a lower price and will have a general notion of how much money we can spend on a certain product.

MORE OPPORTUNITIES TO "SELL"

With conventional storefronts, merchants are unable to provide complete product information; but, in an E-commerce store, customers may obtain complete product information as well as read reviews from other customers who have purchased the product previously. If the product is good, this method can be used [6].

DISADVANTAGES:

- **SECURITY**

While E-commerce offers additional benefits to customers, it also poses a security risk. People are wary of disclosing personal information to website owners, resulting in security concerns when shopping on e-commerce platforms

- **TAX**

If we wish to buy a thing from an e-commerce site, we will have to pay taxes such as GST, which will vary depending on your location and the distance between you and the product, and will be higher than buying in a physical store.

- **DELIVERY TIME EXTENSION**

When we order a thing through e-commerce, the item may or may not arrive on time; this is one of the most typical e-commerce issues; it will take time depending on the distance between you and the organization from whom you ordered.

- **TECHNOLOGY COST**

It costs a lot of money to build a website, and it costs a lot of money to build an ecommerce website since you have to examine all the options and provide a decent security system.

RESEARCH AND DEVELOPMENT

There are numerous applications for developing a web application, and in this study, we used MERN technologies to develop a web application.
MERN is expressed as MongoDB Expressjs Nodejs Reactjs. These are the four technologies that assist us in developing or constructing this web application.

MongoDB:

MongoDB is a cross-platform open-source database. It belongs to the NoSQL database category. It was a database that focused on documents. It works with JSON documents that can be customised Schemas
- Data flexibility means that we can store any data in a separate file.
- Large data can be dispersed across multiple connected apps.
- Data fetching can be done quickly since indexing is used. It's a horizontally scalable database, which means it can manage a lot of data and distribute it over multiple machines.
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- Data fetching can be done quickly since indexing is used. It's a horizontally scalable database, which means it can manage a lot of data and distribute it over multiple machines.

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NodeJS

NodeJS is a JavaScript runtime environment that works outside of a web page. It's primarily for server-side applications.

- NodeJS is open source and completely free.
- By default, NodeJS employs asynchronous programming. The data will always be stored in JSON format by NodeJS.

ExpressJS

- ExpressJS is a well-known node.js library for routing. It has some methods, such as a router, that assist with performing basic operations such as put, get, post, and delete requests.
- Reliable routing
- It will focus on high performance.
- It is an HTTP helper, such as redirection, catching, and so on.

ReactJS:

- React is a javascript library developed by Facebook. React is primarily utilised as a user interface, which means it is primarily used in client-side applications. There are numerous libraries, such as React-dom, React-router-dom, and others, that can assist in the development of any application's frontend.
- Because it has virtual Dom, the website will render considerably faster   than others.
- It is based on a stable code
- It is well-liked by a large community [7].

3. Proposed Model

E-commerce   :
　　　　　　　　　　　Front End (Client-side)
　　　　　　　　　　　Database
　　　　　　　　　　　Back End (Server-side)

Home
Front End :　　　　　　　Dashboard

Cart
Database　　　　:　　　　MongoDB

　　　　　　　　　　　Models Back Routes

End　　　　:

Controllers　　　　　[8]
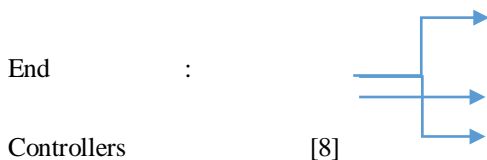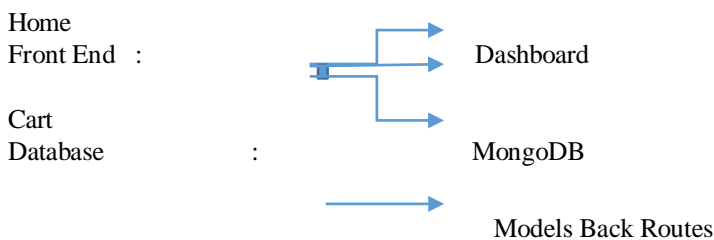
4. Result And Discussion

Figure 1 Website Home page

FRONT-END

Home Page:

The web application's home page mostly contains a list of the objects saved in the database. There exists an option of login if the user has not logged in such as "Log in", otherwise username will be displayed, on the login page there exists to register as a user. Beside there is a Search bar. We can scroll on the front page for a list of items available on discount and can add to the cart. And customer can add the desired the option to all of these things have appeared in the preview image below:

Log in:

These two options open the page where they may fill out a form to either create or sign in to an account.

Cart:

Users can see their product on this page after picking a product, and payment will be completed here. Paytm payment gateway, net banking debit cards, credit cards, UPI are the available payment methods available.
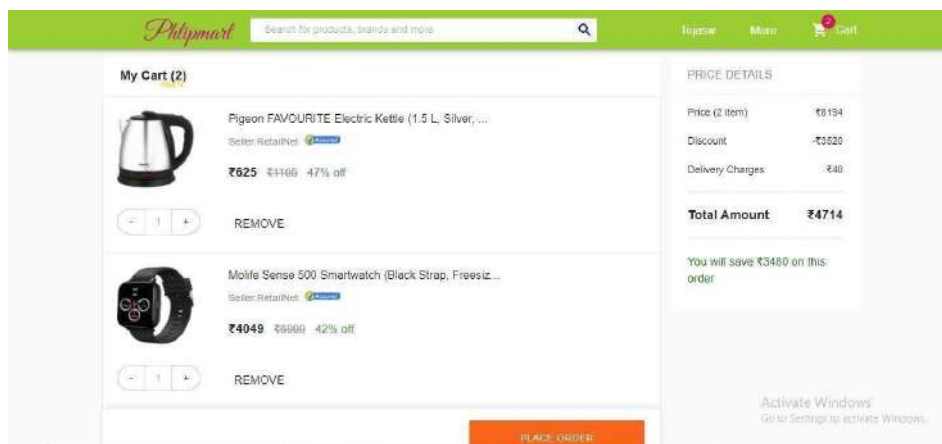
Figure 2 Website cart page

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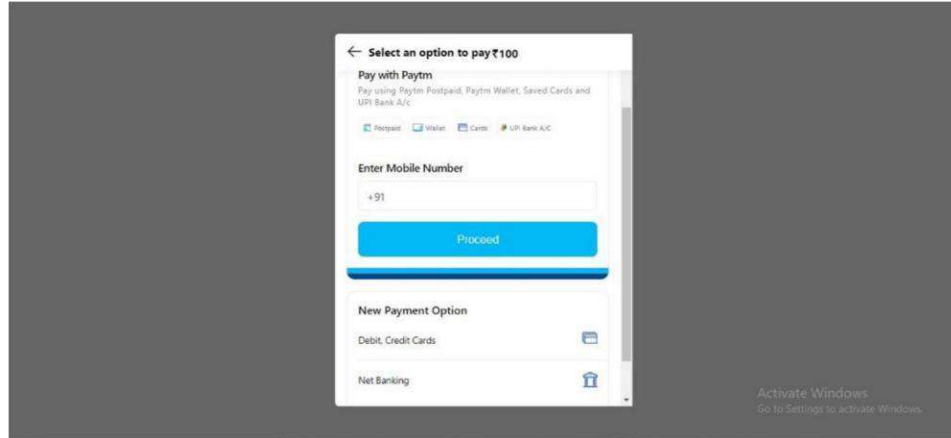
Figure 3 paytm gateway page

BACK-END:

Models:

The structure of the data that should be stored in the database is defined here. It is one of the most well-known libraries in NodeJS because it uses models to assist store data in databases, such as mongoose. Using Mongoose to create schemas that include the names and types of data.

Routers:

This is where all of the page routing work was completed. ExpressJS is a popular form routing library. This folder contains CURD operations and routing-related code.

Controllers:

The definitions of the functions that are defined in the routing, as well as the codes of the middleware, are placed in this folder. The function definitions of the functions declared in the Routers will be completed in the controller phase. We've also defined some middleware in this section.

DATABASE:

The data that users enter will be saved in the database. Nowadays, there are a plethora of databases to choose from. MongoDB is the database used in this project. We may connect to MongoDB using the mongoose library. This package has numerousmethods for creating schema and saving data to a database.

5. Conclusion

The primary goal is to create an e-commerce web application that includes all three components: front end, back end, and database. This web application is completely functional, including login authentication, adding things to cart, and using a payment gateway. It can be used in any retail sector, whether on a small or large scale. They can easily use the web application, and they can create categories and add products with no effort. Customers will find it quite appealing to view products whether sitting at home or at work. It will be extremely

beneficial to small-scale industries because instead of selling through wholesalers or huge retail mediators, they would be able to sell directly to customers, saving both time and money.

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Linguistic-Based Chatbot for Assisting StudentEnquiries

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Abstract: Achatbotisanintelligentsystemwhichcanholda conversation with humans using natural language in realtime. Due to the rise of Internet usage, many businesses nowuseonline approaches tohandlecustomer enquiries,andmany of them turn to chatbots for improving their customerservice or for streamlining operations and increasing theirproductivity. The aim of our Project is to design and deploy a conversational AI powered chatbot for assisting student enquires using Deep Learning and Natural Language Processing which aims to solve enquiries of students that visit our platform Knowledge Torch, a web-based notes sharing application. The chatbot being designed has the capability to understand the context of query of the student and provide appropriate response through a web interface. NLTK (Natural Language Toolkit) is a module/ program in python which is able to perform symbolic and statistical Natural Language Processing for English written in Programming. It is used to analyze the input in the form of human language primarily English and generate responses that are similar to humans. We have reviewed theliterature published over the past decade, from 2000 to 2021.The research findings suggest that chatbots operate in threesteps: understanding the natural language input; generatingan automatic, relevant response; and, constructing realisticandfluentnaturallanguageresponses using Artificial Intelligence/Machine Learning.

Keywords: Chatbots, Conversational agents,Natural Language Processing, Machine Learning, Linguistic

Introduction

This linguistic based (rule – based) chatbot would help in assisting users or students that are new to our platform Knowledge Torch i.e., A Notes Sharing Platform.

The main issue which we are facing in educational sector amid global pandemic is the lack of resources for students. As all educational institutes like schools and colleges are closed, therefore students are not able to access the proper physical textbook resources needed for their education and this restricts the learning abilities and productivity of the students. The main purpose of this project is to provide a platform where students from various discipline can come together to help each other by sharing digital resources i.e., notes of a subject in PDF/Word format. That being stated, they spend most of their time researching for appropriate notes from various sources ranging from their subject teacher's given notes or they take notes from their batchmates from other sections/colleges.

Therefore, having a centralized repository or precisely an application that stores the resources in digital format such as subject notes, sample questions from previous years, practical files for various academic laboratories, all in PDF format becomes very crucial as it eliminates a lot of stress for students in terms of various aspects such as time taken to search quality resources and finally, they would be left with having a variety of options to choose from.

The Knowledge Torch Query bot project is built using Artificial Intelligence algorithms that analyses user's queries and understand user's message. This System is a web application which provides answer to the query of the student. Students just have to query through the bot which is used for chatting. Students can chat using

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any format there is no specific format the user has to follow. The System uses built in artificial intelligence to answer the query. The answers are appropriateaccording to the userquery of the user. The User can query any college related activities through the system. The user does not have to personally go to the college for access-ing the resources. The System analyses the question and then answers to the user by proper understanding the context of the message being queried. The system replies using an effective chat window user interface which implies that as if a real person is talking to the user. The user just has to register himself to the platform and has to login to the system. After login user can access to the various helping pages.The user can query about the use of platform and the query bot would guide the user accordingly. The user can query digital resources related enquiries such as, they can provide their education details such as the course they are pursuing, their academic year, the discipline in which they are majoring and lastly the subject for which they require the resources and get relevant response within fraction of seconds.

Literate Review

Linguistic/Rule based Chatbots

The term "chatbot" was coined by Mauldin [1] to describe systems that could mimic human interaction and thereby pass the Turing Test; an experiment crafted by Alan Turing in the 1950s to assess the intelligence of computer programs. Essentially, the test would involve a human judge who must distinguish reliably based on conversation alone, if a computer program is impersonating a human being in real time [2]. Various chatbots have spawned to pass the Turing Test since its initial conceptualization. Weinbaum [3] during his tenure in Massachusetts Institute of Technology (MIT) created ELIZA, the first chatbot, that when given an input sen-tence, could identify keywords and be able to match those keywords against a collection of pre-defined rules to generate appropriate responses. The development of increasingly intelligent chatbots since ELIZA began to advance; most notably with the creation of PARRY, a bot impersonating a paranoid schizophrenic by [4]. Both bots by [3, 4] abide by the rule-based orientation, where an algorithm processes user utterance through a pre-pared set of rules. Essentially, conversational systems scan for keywords within the user input, and proceed to craft a reply with the most matching keywords, or the most similar wording pattern, from a database or hard code. In the early 1980s, ALICE [5] was conceived, momentous not for its conversational capabilities but for its role in the development of Artificial Intelligence Markup Language (AIML). AIML is applied to declare pattern-matching rules that links user-submitted words and phrases with related topic categories. Most chatbot platforms and services as well as complex chatbot projects rely upon AIML. Over the years, as more evolving technologies were introduced, chatbot capabilities began delving into the realms of artificial intelligence with increased knowledge in areas such as machine learning, data analytics and most importantly, natural language processing (NLP); which gives computers the capability of communication to occur between human-to- ma-chine and machine-to-machine, using natural human language [6]. Chatbots have now began understanding human speech as it is spoken, although the technology itself had not turned mainstream. Alternatively, chatbots may not necessarily have to understand human speech, but can also rely on pattern recognition, abiding by the rule-based approach. Rule-based pattern recognition occurs when chatbots identify certain words, phrases or even actions that trigger an entire set of responses. The benefit of such rules is that they are precise, and allow developers to create and remove rules to handle new situations and address bugs with certainty [7].

Chatbot Revival

At present, chatbots have spawned a new revival and gained vast popularity due to the significant foothold messaging applications have begun receiving. Shevat [7] believes that the "bot revolution" began as the mobile apps ecosystem quickly become saturated, making it harder and costlier to engage with users.

As software providers continued to churn out native mobile experiences, users became increasingly tired of

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installing and uninstalling these apps. Messaging apps such as Kik, Slack and Facebook were apps that continued to prevail as more users spend their time on these applications; a particularly growing trend with youths [7]. Furthermore, according to Shevat [7], the growth of messaging applications, is indicative to the responsiveness of messaging and the ubiquity of connectivity; desired by present users. This led Facebook to launch the "Messenger Platform" as an avenue to allow businesses to deploy chatbots for purposes such as business-to-consumer (B2C) customer service, sales and marketing, as well as to pioneer the revival of the chatbot [9]. The user growth for Facebook Messenger itself (the default chat component of social networking site, Facebook) has been on an exponential rise with 600 million users in April 2015, 1 billion in July 2016, and 1.2 billion in April 2017 [10, 11, 12]. As technology developers rekindle their interest in chatbots, educators have also begun examining the offerings that chatbots deliver and assess how it can be used toward pedagogical goals. Deakin University, Australia recently launched its Deakin Explore Bot (DEB), which aims to assist high school students to find career options interactively via Facebook Messenger; DEB asks a series question, which assess students' interests and capabilities [13]. Upon completion, these students will receive a description of their results and will subsequently be linked to a list of courses in Deakin University. Nerdy Bot is another educational bot available through Facebook Messenger that can handle college- related tasks such as solving math equations, plotting graphs, looking up definitions, and finding historical events [14].

System Design
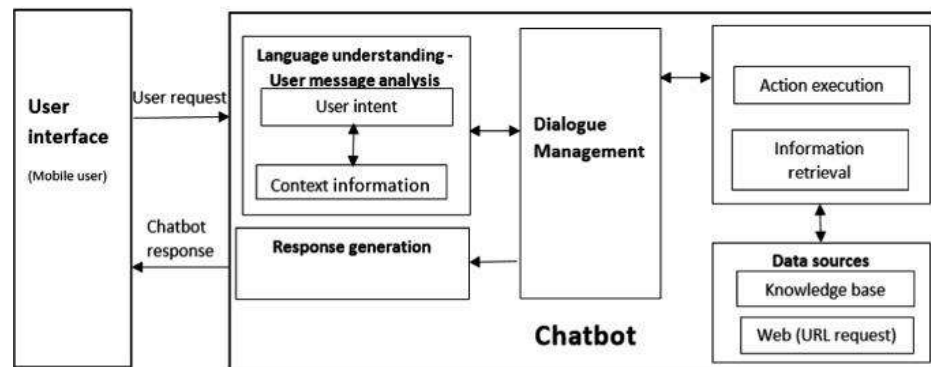
Figure 1. System Design of a Chatbot

The design and development of a chatbot involve a variety of techniques. Understanding what the chatbot will offer and what category falls into helps developers pick the algorithms or platforms and tools to build it. At the same time, it also helps the end-users understand what to expect.

The requirements for designing a chatbot include accurate knowledge representation, an answer generation strategy, and a set of predefined neutral answers to reply when user call. Upon retrieval, the Response Generation Component uses Natural Language Generation (NLG) to prepare a natural language human-like response to the user based on the intent and context information returned from the user message analysis component.

The process starts with a user's request, for example, "What is the meaning of environment?", to the chatbot using a messenger app like Facebook, Slack, WhatsApp, WeChat or Skype, or an app using text or speech input like Amazon Echo. After the chatbot receives the user request, the Language Understanding Component parses it to infer the user's intention and the associated information (intent: "translate," entities: [word: "environment"]). Once a chatbot reaches the best interpretation it can, it must determine how to proceed. It can act upon the new information directly, remember whatever it has understood and wait to see what happens next, require more context information or ask for clarification. When the request is understood, action execution and information retrieval take place. The chatbot performs the requested actions or retrieves the data of interest from its data sources, which may be a database, known as the Knowledge Base of the chatbot, or external resources that

are accessed through an API call. Upon retrieval, the Response Generation Component uses Natural Language Generation (NLG) to prepare a natural language human-like response to the user based on the intent and context information returned from the user message analysis component

A Dialogue Management Component keeps and updates the context of a conversation which is the current intent, identified entities, or missing entities required to fulfill user requests. Moreover, it requests missing information, processes clarifications by users, and asks follow-up questions. For example, the chatbot may respond: "Would you like to tell me as well an example sentence with the word environment?"

Many commercial and open-source options are available for the development of a chatbot. The number of chatbot-related technologies is already overwhelming and growing each day. Chatbots are developed in two ways: using any programming language like Java, Clojure, Python, C++, PHP, Ruby, and Lisp or using state-of-the-art platforms. At this time, we are distinguishing six leading NLU cloud platforms that developers can use to create applications able to understand natural languages: Google's Dialog Flow, Facebook's wit.ai, Microsoft LUIS, IBM Watson Conversation, Amazon Lex, and SAP Conversation AI. All these platforms are supported by machine learning. They share some standard functionality (they are cloud-based, they support various programming and natural languages) but differ significantly in other aspects.

Methodology

Modules Required

1. TensorFlow

It is an end-to-end Open-Source platform for `Machine Learning. It has a different tools, libraries and community resources.

2. NaturalLanguageToolkit(NLTK)Libraries:

It contains libraries and programs for Natural language processing. It is the most powerful NLP libraries, which contains packages to make chatbot understand human audio and reply to it with an accurate response.

3. Django RESTFramework:

Django is a high-level Python web framework that encourages rapid development and clean, pragmatic design. It's free and open source.

4. Keras:

It is a deep learning API written in Python language, running on the top of the machine learning platform i.e., Tensor flow. It is used to create layers in Neural Network.

Figure 2. Layered structure of the Keras API. As it can be seen, it can run on top of different frameworks seamlessly.

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4.2   DataPreprocessing

1.Stemming:

Stemming is the process of producing morphological variants of a root/base word. Stemming programs are commonly referred to as stemming algorithms or stemmers.
Often when searching text for a certain keyword, it helps if the search returns variations of the word. For instance, searching for "boat" might also return "boats" and "boating". Here, "boat" would be the stem for [boat, boater, boating, boats].
Stemming is a somewhat crude method for cataloguing related words; it essentially chops off letters from the end until the stem is reached. This works fairly well in most cases, but unfortunately English has many exceptions where a more sophisticated process is required. In fact, spaCy doesn't include a stemmer, opting instead to rely entirely on lemmatization.

S1		S2	word		stem
SSES	→	SS	caresses	→	caress
IES	→	I	ponies	→	poni
			ties	→	ti
SS	→	SS	caress	→	caress
S	→		cats	→	cat

Figure 3. Process of Stemming, Morphological Analysis provides a stem of root word.

2.   Lemmatization:

In contrast to stemming, lemmatization looks beyond word reduction and considers a language's full vocabulary to apply a morphological analysis to words.
The lemma of 'was' is 'be' and the lemma of 'mice' is 'mouse'.
Lemmatization is typically seen as much more informative than simple stemming, which is why Spacy has opted to only have Lemmatization available instead of Stemming.

Lemmatization looks at surrounding text to determine a given word's part of speech, it does not categorize phrases.

Note that: Stemming and Lemmatization both generate the foundation sort of the inflected words and therefore the only difference is that stem may not be an actual word whereas, lemma is an actual language word. Stemming follows an algorithm with steps to perform on the words which makes it faster. Whereas, in lemmatization, you used a corpus also to supply lemma which makes it slower than stemming. you furthermore might have to define a parts-of-speech to get the proper lemma.

3.   Bag of Words:

Bagofwordsmodelisthetechniqueofpre-processingthetextbyconvertingitintoanumber/vector format, which finds the frequencyof a word in a given sentence.It is the method of extracting features from the given text and use thesefeaturesformodel training.

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	it	is	puppy	cat	pen	a	this
it is a puppy	1	1	1	0	0	1	0
it is a kitten	1	1	0	0	0	1	0
it is a cat	1	1	0	1	0	1	0
that is a dog and this is a pen	0	2	0	0	1	2	1
it is a matrix	1	1	0	0	0	1	0

Figure 4. Bag of words vector representation.

5.   Implementation

Define Intents

An "**intent**" is the intention of the user interacting with a chatbot or the intention behind each message that the chatbot receives from a particular user. Define simple intents and set of messages that corresponds to those intents and also map some

Responses according to each intent category. Create a JSON file named "**intents. json**", which is in the form of categories provided with some tags. Define set of patterns with the corresponding responses. Following is the sample intents data:

```
{"intents": [
    {"tag": "greeting",
     "patterns": ["Hi there", "How are you", "Is anyone there?","Hey","Hola", "H
     "responses": ["Hello, thanks for asking", "Good to see you again", "Hi ther
     "context": [""]
    },
    {"tag": "goodbye",
     "patterns": ["Bye", "See you later", "Goodbye", "Nice chatting to you, bye"
     "responses": ["See you!", "Have a nice day", "Bye! Come back again soon."],
     "context": [""]
    },
    {"tag": "thanks",
     "patterns": ["Thanks", "Thank you", "That's helpful", "Awesome, thanks", "T
     "responses": ["Happy to help!", "Any time!", "My pleasure"],
     "context": [""]
    },
    {"tag": "noanswer",
     "patterns": ["","."."","_"],
     "responses": ["Sorry, can't understand you", "Please give me more info", "N
     "context": [""]
    },
```

Figure 5. Intents.json file, Intents are stored in format of patterns and corresponding responses.

Model Training

Define Neural Network architecture for proposed model and for that use the "Sequential" model class of Keras. Keras is an open source, high level library for developing neural network model [10].
The steps for creating a Keras (Sequential) model are the following:

Step1:Define neural network model(i.e.,Sequentialmodel).
The network is defined as a sequence of layers, each with its own customizable size and activation function. In this sequential model, the first layer is the input layer, which define the size of the input, which is feed to neural network. After this more and more layers (hidden layers) can be added and customized until reached to the final output layer.

```
model = Sequential()
model.add(Dense(128, input_shape=(len(train_x[0]),), activation='relu'))
model.add(Dropout(0.5))
model.add(Dense(64, activation='relu'))
model.add(Dropout(0.5))
model.add(Dense(len(train_y[0]), activation='softmax'))
```

Figure 6. Defining neural network sequential model.

*Step2:*Define the optimization algorithm that will be used to train the sequential model, for that use "SGD" optimizer and also choose the loss function. Then, compile the neural network, which transforms the simple sequence of layers into a complex group of matrix operations that describes the behavior of the network.

```
# compiling the model & define an optimizer function
sgd = SGD(lr=0.01, decay=1e-6, momentum=0.9, nesterov=True)
model.compile(loss='categorical_crossentropy',optimizer=sgd, metrics=['accuracy'])
```

Figure 7. Defining optimizer for neural network.

*Step3:*Train or fit the neural network and save it in"**chatbot_model.h5**"file.

```
mfit = model.fit(np.array(train_x), np.array(train_y), epochs=200, batch_size=5, verbose=1)
model.save('chatbot_model.h5', mfit)
```

Figure 8. Fitting model into training data.

*Step4:*Now that model is trained, user can input a query to make a prediction

Get User Input

Accept input query/message from user with developed UIusing Django Framework.

Predict Class for Input

Filter out the class/tag for user input, with specifiedthreshold and make list of all filtered tags. Sort the list in reverse order, so that it returns class/tag, which has the highest probability. Finally, return the list, with classes andtheir correspondingprobability.

```
def predict_class(sentence):
    sentence_bag = bow(sentence)
    res = model.predict(np.array([sentence_bag]))[0]
    ERROR_THRESHOLD = 0.25
    results = [[i,r] for i,r in enumerate(res) if r > ERROR_THRESHOLD]
    #sort by probablity
    results.sort(key=lambda x: x[1], reverse=True)
    return_list = []
    for r in results:
        return_list.append({'intent':classes[r[0]], 'probablity':str(r[1])})
    return return_list
```

Figure 9. Predict class function defined to predict class of input/tag query.

Get Bot Response

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Store the class/tag, returned by previous functionhaving the highest probability. Compare that class/tag, with tags define din"intents.json"file.Returntheresponsecorresponding tothat class/tag.

```python
def getResponse(ints):
    tag = ints[0]['intent']
    list_of_intents = intents['intents']
    for i in list_of_intents:
        if(i['tag']==tag):
            result=random.choice(i['responses'])
            break

    return result

def chatbot_response(msg):
    ints = predict_class(msg)
    res = getResponse(ints)
    return res
```

Figure 10. Functions defined for getting a response according to query and chatbot response as a final output.

Display Bot Response

Display the Bot's reply on the Web UI built using Flask/Django.

5. Results

In this research we learned how Intelligent human like conversational agents can be designed and developed using **Artificial Neural Networks and Deep Learning.**

A Linguistic based chatbot or a rule based chatbot learns right from scratch through Machine Learning algorithms called "Deep Learning", Natural Language Processing using the data provided. In this process, the Knowledge Torch query bot is created using MachineLearning algorithms. Some Framework and libraries used throughout the design and development phase are:

1. NLTK
2. Keras
3. NumPy
4. TensorFlow
5. Django Rest framework:Web Application Programming Interface development

6. Conclusions

In conclusion, we have presented an Artificially Intelligent Chat-bot using applications of Deep Learning and Natural Language Processing to assist queries of student so that they can get their queries solved within fractions of second and thereby have a smooth experience while exploring our platform i.e., Knowledge Torch, a NotesSharing Web Application. Keeping in mind, the current pandemic situations the country is facing, our platform aims to be one stop solution for the educational needs of the students and aspires to increase the productivity of students by providing them with ample number of resources for learning. Building this platform essentially builds a student community as a whole in which students from various age levels and discipline of study can come together and contribute their notes as well as access notes of other students. Knowledge Torch Query bot will bridge a gap by creating a conversational application with natural language processing.

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Our research gives the whole solution of developing and deploying a linguistic based chatbot and how it can help users on a large scale. We have shown how the Data is given as input to the Deep Neural Network and how task is constructed as learning problem. We have covered some solutions to the user's query which will be beneficial for proper understanding of the students.

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An analytical Appraisal on assessment methods of usability for E-Commerce portals

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Abstract. The This paper aimed to identify some work steered within the sector of user testing that aims at lay down or illustrative the test measures and at defining and evolving methods to assist, organize user testing. The carefully chosen issues are considered to be applicable to pragmatic evaluation within the internet business applications. These themes are the count of members who ought to partake in client testing (sample size), assessment process, far off convenience evaluationsand usability testing tools.Nowadays, Electronic-trade has changed the method of purchasing, and hence, we'd prefer to represent considerable ways in approaches to improve the ease of use of online business applications.

Keywords:user friendly, Usability Issues, E-Commerce, Usability testing tools.

35. Introduction

Usability testing is an approach to investigate the usability of an application. Usually, before the software goes live, a cluster of contestants investigating errors in the application. The core emphasis of usability testing is to achieve the goal of user-friendliness of the portal. Usability testing is a key factor in user-centered design [1] of any communicating systems. Usability evaluations aim to measure the effectiveness and efficiency of a system. It is essential to design domain specific guideline, instead of designing of general rule and guidelines for all websites [2].Usability assessment is a manner to make sure that interactive systems are tailored to customers and their dutiesand their usage will now no longer have any terrible effects. Usability assessment is a primary step withinside the person-targeted layout system of any interactive machine [1], whether or not it's miles software program, website, or statistics and conversation era or service. The purpose of usability assessment is to assess the effectiveness of the systemand is useful to the potential customers Positive mind-set and reaction [3]. The 3 preferred strategies for comparing user interfaces are evaluator based, end user based, and software tool-based assessment. The second strategies are maximum utilized by researcher [4,5]. software tool-based strategies are taken into consideration restrained or immature, steeply-priced to use, and their utility is basically restrained to investigate teams [6,7]. The choice standards rely upon elements which include usefulness, honorarium and very important element is no doubt the time. Inappropriate usability checking out also can cause misplaced clients and sales. If the user interface of any e-commerce portal is neither clear or nor user friendly than it may cause the loss of customers and decrease the revenue of the portal. This has a look at pursuits to decide the traits affecting the usability of e-trade networks and cell applications. The have a look at is primarily based totally at the reports of a number of the famous e-trade titans in India.The purpose of this article is to review the work done in user testing, to stipulate or simplify testing measures, and to develop and describe tools for accomplishment user testing. Although, this is not a comprehensive evaluation. The carefully chosen topics are considered to be relevant to the evaluation of the e-commerce portal. These topics are: the number of contestants who should participate in user testing, the assessment process, usability testing tools.

36. End- User based testing approach

It refers to a class of user evaluation methods that include using end users to categorize latent usability issues. The purpose of end-user-based testing is to capture the user's interactions with the interface and document their satisfaction. A study of the human performance data will record as how much time it takes a user to complete the task, the rate at which tasks are completed, and how many and what kind of errors occur. Once errors are identified, design suggestions will be made to make the product more ergonomic. The end user testing generally executes in following steps:

❖ Defining the purpose of testing.
❖ Decide qualification and experience of end users.
❖ Recruitment process for selection of end users.

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❖ Describe task scenarios.
❖ Design the test etiquette.
❖ Data analyses measures.
❖ Lastly the representation of test result.

a. Sample size

We have considered Virzi, Nielson and launder and Lewis studies to guesstimate sample size: Virzi[8] designed a model and this found the value of p between 0.32 and 0.42. Finally, the model concluded that 4 to 5 users might be found approximate 80% issues usability. The percentage of issues revealed was demonstrated using cumulative binomial probability formula, given below-

Percentage of issues = $1 - (1 - p)^n$
n = no. of contributors
p = detection rate of issues

Author draw following conclusionsafter examined the data:

- 80% of the issues can be recognized by 4–5 users.
- Each subsequent test detects fewer unknown problems.
- The most serious problems are identified by the first users.

The detection rate of issues, for an active session is equivalent to the remainder between the quantity of remarkable issues identified, and the quantity of issue events saw by all contestants.Laundaure and Nielsen[9], mentioned a formula for determining the count of usability problems, during testing.

$$Found = N \left(1 - (1 - \lambda)^i\right)$$

Lewis (1994) applied the strategies utilized by (Virzi, 1992) in experimental information from ease-of-use testing directed on a part of programming for office applications. The discoveries of this review harmonized with Virzi's outcomes. All things considered; he noticed a likely misjudgment of p where the sample size was small.

According to Caulton[10] contends that owed to the conglomeration of users, various types of issues will determine by diverse nature of users. Caulton said, the model should integrate a rule or some value that reflects the amount of sub user category. Turner, Lewis and Nielsen [11] "responded to criticism of sample size formulae by providing a method to adjust the estimated average problem frequency".

b. The assessment processes

Maximum usability assessment sessions are run with one participant. Though, in few cases, test sessions could also be conducted with two contestants, they both working together. But each case having their own strength and weakness [12,13]. Paired user testing is good rather than one tester because in paired-user testing, contestants(contestants) are requested to achieve together few tasks on an equivalent system. During this milieu, the researcher saw a rise within the number of sounds, thoughts and explanations on the way to attain the tasks the contestants involve in.

O'Malley et al. [14] were the first to explore the potential of constructive interaction for human computer interaction. They conducted two studies, each of which involved two contestants.

Westerink et al. [15] used O'Malley protocol with youngsters for the assessment of computer games. On this protocol Wilson and Blostein [16] afford a list of arguments for or against protocol. During the study it was observed that pair testing is good rather than more contestants because the analysis on large group is

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tougher.Nevertheless, the different learning skills of contestants'might upshot on feedback. To investigate the which testing is good singlecontestants or pair testing. we conduct a test session of 24 contestants to execute 6 tasks to investigate services of Interactive Tv [17]. This group was divided into 2 parts. Half part of the contestants 12 participate individually and another half contestants participated in pair testing (6*2). The result of the task showed that the rate of task completion is not statistically different. The result also shown thatpaired-user testing had higher accomplishment rates in comparison of single user testing.

c.   User testing tools

In most user testing techniques, the active sessions are recorded with audio and video software. These recorded sessions than seen by experts. They identified how the user worked like the time span of every performance that can show the user issues and examined how much time to complete the task, user frustrations, problem face during active session, frequency of problems and user satisfaction. This process needs specific hardware and software. The observation of user activity by the evaluators is prolonged process. Therefore, this procedure is time consuming. To intensification the proficiency of user tests, increase the need of automatic tool.

d.   Laboratory usability testing

In this testing, the user and the evaluator set a separate lab. The evaluator noted the actions of the user and act on behalf of silent monitor. Furthermost of the usability check sessions square measure run with one check participant. However, in some cases, check sessions could also be conducted with 2 contestants operating along. Each cases have its own benefits and downsides [18,19]. tantalizing 2 half contestants to require part during a check session has typically been used to alleviate the difficulties or feelings of unease some contestants could expertise in individual sessions. In paired-user testing, or co-discovery analysis, contestants square measure invited to accomplish along some tasks on identical laptop. During this context, we have a tendency to observe a rise within the variety of utterances contestants impromptu build and conjointly a rise within the variety of discussions and justifications on the way to attain the tasks the contestants interact in. In these things, interactions between the test's contestants take precedence over the interactions with the judge.

e.   Remote Usability Testing

Using this method, the observer and the tester are located in different locations. Here, the tester performs the assigned tasks and records them, and then the observer analyzes the results. Two methods used in remote usability evaluation process- synchronous and asynchronous [20].

- Synchronous approach- In this approach an implementor and the assessors accumulate the data and arrange the assessment session for remote user in actual time.
- Asynchronous approach- assessors do not have access to the data in real time, and there is no facilitator interacting with the user during data collection. This approach contains automated methods, whereby users' click streams are collected automatically (e.g., WebQuilt). The main benefit of this approach is, several users can join parallel, by less or no progressive cost per user. Various stratagems have been anticipated for steering asynchronous tests.

37. Conclusion

The objective of the paper was to investigate some work directed in the ground of user testing that target indicating or explaining the test strategies and at characterizing and creating devices to assist with leading client tests. Our paper also pointed toward appearing to the how convoluted client testing could be in explicit circumstances. Albeit the survey was a long way from comprehensive, it gave a thought of the work led just as the work expected to foster legitimate convenience assessment strategies. Also need of such automatic software tool that automatically evaluate the usability of the portal. In this chain we proposed an agent-based framework to analyze usability of homepage of e-commerce portal.

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Sign Language Recognition Using Deep Learning

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Abstract - Sign language is one of the oldest and most natural form of lan-guage forcommunication, but since most people do not know sign language and interpretersare very difficult to come by. Even it is hard for deaf and mute person to communi-cate with blind people as well. We have come up with a real time method using neural networks for fingerspelling based American sign language recognition sys-tem with read out.

The focus of this work is to create a vision-based system to identify sign language gestures from the video sequences then suggest gestures made and read it out loudfor the ones who are blind. The reason for choosing a system based on vision re- lates to the fact that it provides a simpler and more intuitive way of communicationbetween a human and a computer.

We are bridging the gap between two isolated sectors of the community in this way,and encouraging them to think that they, too, can be a part of many things despite their impairment. We are making an impact in this way, which will enable them to grow and discover more.

Keywords: Hand gesture, Sign language, Communication
, OpenCV, ANN, CNN.

1   Introduction

Communication is the exchange of ideas and messages through various means such asspeech, signals, and visuals. Deaf and mute (D&M) people use their hands to express their ideas to others through various gestures. Gestures are nonverbally exchanged messages that are understood through vision. A ges-ture is any movement of a body part, such as the face or hand. Image pro-cessing and computer vision are used here forgesture recognition. Gesture recognition allows computers to understand human ac- tions and acts as a translator between computers and humans. Sign language refers to deaf and dumb people's nonverbal communication

— Sign language is a visual language with three major components:

Fingerspelling	Word level sign vocabulary	Non-manual features
Used to spell words letter by letter .	Used for the majority of communication.	Facial expressions and tongue, mouth and body position.

Fig. 1.

In our project, we primarily aim to create a model that can recognize Fingerspelling-based hand gestures. The gestures we want to practice are de-

picted in the image below.

Fig. 2. Finger Spelling American Sign Language

2 Motivation

'Talk to a man in a language he understands, that goes to his head,' Nelson Mandelasaid. Talk to him in his language; it speaks to his heart.' Language is undeniably im- portant in human interaction and has existed since the dawn of civilization. It is a medium through which humans communicate to express themselves and comprehend real-world concepts. Without it, there would be no books, no cell phones, and no meaning to the words we are writing. It is so deeply ingrained in our daily lives that we frequently take it for granted and fail to recognize its significance. Unfortunately, in our fast-changing society, people with hearing impairment are frequently forgottenand excluded. They must struggle to express themselves to people who are different from them, to express their ideas, to voice their opinions, and to express themselves. Despite being a medium, sign language When conveyed to a non-sign language user,

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the meaning of communication to deaf people remains ambiguous. As a result, the communication gap has grown wider.

We are proposing a sign language recognition system to prevent this from happen-ing. It will be an excellent tool for people with hearing impairments to communicate their thoughts, as well as an excellent interpretation for non-sign language users to understand what the latter is saying.

This project was created to contribute to Human Computer Interaction (HCI) by utilising Deep Learning and Computer Vision concepts.

3   SURVEY OF LITERATURE

There has been outstanding research on hand sign language gesture recognition in recent years.

With the help of a literature review, we discovered the following basic steps in hand gesture recognition and multiple preprocessing techniques being followed –

Deaf Mute Communication Interpreter- A Review [12]

The purpose of this paper is to discuss the various deaf-mute communication transla- tor systems that are currently in use. Wearable Communication Device and Online Learning System are the two broad categories of communication approaches utilized by deaf-mute people. Glove-based systems, keypad methods, and Handicom Touch- screen are all examples of wearable communication methods. Various sensors, an accelerometer, a suitable microcontroller, a text to speech conversion module, a key- pad, and a touch-screen are used in all three sub-divided methods stated above. The second option, an online learning system, can eliminate the requirement for an exter- nal device to decipher messages between deaf-mute and non-deaf-mute people. The Online Learning System employs a variety of techniques. SLIM module, TESSA, Wi-See Technology, SWI PELE System, and Web-Sign Technology are the five subdivi-sion approaches.

An Efficient Framework for Indian Sign Language
RecognitionUsing Wavelet Transform [13]

The suggested ISLR system is a pattern recognition technique with two key compo- nents: feature extraction and classification. To recognize sign language, a combina- tion of Discrete Wavelet Transform (DWT)-based feature extraction and a nearest neighbor classifier is utilized. The experimental re-sults reveal that utilizing a cosine distance classifier, the proposed hand gesture recognition system achieves a maxi- mum classification accuracy of 99.23%.

Hand Gesture Recognition Using PCA in [9]:

The authors of this study provided a system for database-driven hand gesture

identifi-cation based on a skin color model approach and thresholding approach, as well as aneffective template matching approach, that may be employed in human robots and similar applications. The hand region is first segregated using a skin color model in the YCbCr color space. Thresholding is used to distinguish the foreground and back- ground in the next stage. Finally, for recognition, a template-based matching tech- nique is constructed utilizing Principal Component Analysis (PCA).

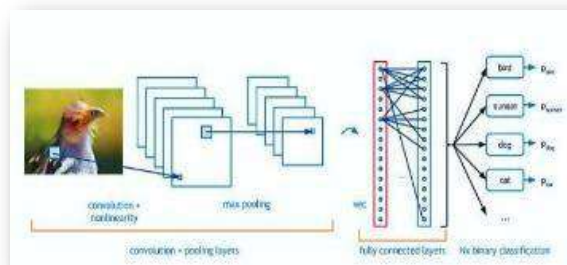### A Review on Feature Extraction for Indian and American Sign Language in [14]:

The research and development of sign language based on manual communication and body language were reported in this paper. Preprocessing, feature extraction, and classification are typically three processes in a sign language recognition system. Neural Network (NN), Support Vector Machine (SVM), Hidden Markov Models (HMM), Scale Invariant Feature Transform (SIFT), and other classification approach-es are utilized for recognition.

4   Convolutional Neural Network ALGORITHMS (CNN)

As the name implies, neural networks are a machine learning technique that is modelled after the structure of the brain. It is made up of a network of learning units known as neurons. These neurons learn how to convert input signals (for example, a picture of a cat) into corresponding output signals (for example, the label "cat"), whichserves as the foundation for automated recognition. A convolutional neural network (CNN) is a type of feedforward artificial neural network whose connectivity pattern isinspired by the organisation of the animal visual cortex. CNNs use repetitive neural blocks that are applied across space (for images) or time (for audio signals etc.). For images, these neural blocks can be interpreted as 2D convolutional kernels that are applied repeatedly over each patch of the image. They can be thought of as 1D convo-lutional kernels applied across time windows for speech. The weights for these repeated blocks are 'shared' during training, which means that the weight gradients learned across various image patches are averaged.

CNN Explained in 5 Easy Steps.

Convolution Convolution filters are the first layers that receive an input signal. Convolution is a process in which the network attempts to label the input signal by referring to what it has previously learned. If the

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input signal resembles previous cat images, the "cat" reference signal will be mixed in with, or convolved with, the input signal. The output signal is then forwarded to the next layer.

Fig. 3.

Convolution has the advantage of being translationally invariant. This implies that each convolution filter represents a feature of interest (e.g., whiskers, fur), and the CNN algorithm learns which features comprise the resulting reference image (i.e., cat). The output signal strength is determined not by the location of the features, but rather by their presence. As a result, a cat could be sitting in a variety of positions andthe CNN algorithm would still recognize it.

Subsampling

Convolution layer inputs can be "smoothed" to reduce the filters' sensitivity to noise and variations. This smoothing process is known as subsampling, and it is accom- plished by taking averages or the maximum over a sample of the signal. Subsamplingmethods (for image signals) include reducing image size and colour contrast across red, green, and blue (RGB) channels.

Pooling

Another component of a CNN is a pooling layer. Its purpose is to gradually reducethe spatial size of the representation, thereby reducing the number of parameters and computation in the network. Each feature map is treated separately by the pooling layer. The most common method of pooling is max pooling, which takes the maxi- mum of a region as its representative.

Activation

The activation layer regulates how the signal flows from one layer to the next, simulating the firing of neurons in our brain. Output signals strongly associated with previous references would activate more neurons, allowing signals to be propagated more efficiently for identification.

To model signal propagation, CNN is compatible with a wide range of complex ac-tivation functions, the most common being the Rectified Linear Unit (REL), which is preferred for its faster training speed.

Fully Connected

The network's final layers are fully connected, which means that neurons from previ- ous layers are linked to neurons from subsequent layers. This simulates high-level reasoning by considering all possible paths from input to output
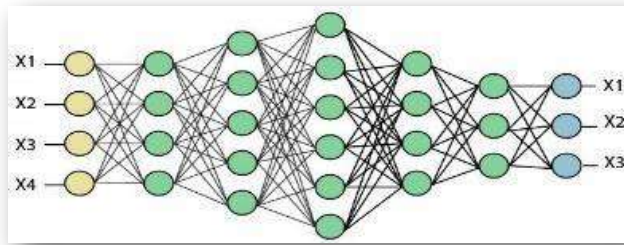
Fig. 4.

5   METHODOLOGIES

The system is based on a vision. Because all of the signs are represented with bare hands, it eliminates the need for any artificial devices for interaction.

Data Set Creation

We tried to find pre-made datasets for the project, but we couldn't find any that matched our requirements in the form of raw images. We could only find datasets in the form of RGB values. As a result, we decided to develop our data set.

To create our dataset, we used the open computer vision (OpenCV) library. To begin, we took approximately 800 images of each ASL symbol for training purposes and approximately 200 images per symbol for testing purposes. First, we capture eachframe displayed by our machine's webcam.

Classification of Gestures

For the image pre-processing, there were two ways –
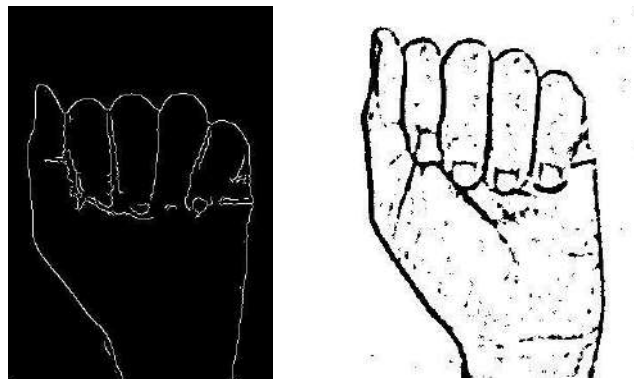
- The first image was created by applying Filter 1 to the image, then applying grey scaling, Gaussian Blur, and finally the Canny Edge method. It had 94.2% accuracy rate.

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- In second image we applied grey scaling then gaussian blur filter and thresh-old to the OpenCV frame to obtain the processed image after feature extraction.
- The processed image is sent to the CNN model for prediction, and if a letter is detected for more than 50 frames, it is printed and taken into account. It gave accuracy of 96%

CNN Simulation

— **First Convolution Layer**: The input image is 128x128 pixels in size. It is first processed using 32 filter weights in the first convolutional layer (3x3 pixels each). This will yield a 126X126 pixel image, one for each of the Filter-weights.
— **First Pooling Layer**: The images are down sampled using 2x2 max pooling, which means we keep the highest value in the 2x2 square array. As a result, our image has been down sampled to 63x63 pixels.
— **Second Convolution Layer**: The 63 x 63 pixels from the first pooling layer's output are now fed into the second convolutional layer. It is processed with 32 filter weights in the second convolutional layer (3x3 pixels each). This produces a 60 x 60-pixel image.
— **Second Pooling Layer**: The resulting images are down sampled again with a maximum pool of 2x2 and reduced to 30 x 30 image resolution.

— **First Densely Connected Layer**: These images are now fed into a fully connected layer with 128 neurons, and the output of the second convolutional layer is re-shaped to an array of 30x30x32 =28800 values. This layer receives a 28800-value array as input. This layer's output is routed to the second Densely Connected Layer. To avoid overfitting, we're using a 0.5 dropout layer.
— **Second Densely Connected Layer**: The output of the first densely connected layer is fed into a fully connected layer with 96 neurons.
— **Third Densely Connected Layer**: The output of the second densely connected layer is fed into a fully connected layer with 64 neurons. The output of the third densely connected layer serves as an input for the final layer, which will have the same number of neurons as the number of classes we are classifying (alphabets + blank symbol).

Function of Activation

In each layer, we used ReLU (Rectified Linear Unit) (convolutional as well as fullyconnected neurons). For each input pixel, ReLU computes max(x,0). This adds non- linearity to the formula and aids in the learning of more complex features. It aids in the removal of the vanishing gradient problem and speeds up training by reducing computation time.

The Pooling Layer

Max pooling is applied to the input image with a pool size of (2, 2) and relu on ac- tivation function. This reduces the number of parameters, lowering computation costsand reducing overfitting.

Dropout Layers

Overfitting is a problem in which the weights of the network are so tuned to the training examples that the network does not perform well when given

new examples after training. This layer "drops out" a random set of activations in that layer by set- ting them to zero. Even if some of the activations were also dropped out, the system should be able to provide appropriate classification or output for a specific example.

Optimizer

The Adam optimizer was used to update the model in response to the loss functionoutput. Adam combines the benefits of two extensions of two stochastic gradient de- scent classifiers, namely adaptive gradient algorithm (ADA GRAD) and root mean square propagation.

Testing and Training

To eliminate unwanted noise, we convert our RGB image features to grayscale andapply gaussian blur. To obtain our hand from the background, we use adaptive threshold and resize our images to 128 x 128. After performing all of the operations listed above, we feed the preprocessed input images to our model for training and testing. The prediction layer calculates the likelihood that the image will fall into one of the classes. As a result, the output is normalized between 0 and 1, and the sum of each value in each class equals 1. We accomplished this by utilizing the SoftMax function. At first, the prediction layer's output will be somewhat off from the actual value. To improve it, we trained the networks with labelled data. Cross-entropy is a performance metric used in classifying. It is a continuous function that is positive when the value is not the same as the labelled value and zero when the value is the same as the labelled value. As a result, we optimized the cross-entropy by bringing it as close to zero as possible. To accomplish this, we alter the weights of our neural network models in our network layer. TensorFlow includes a function for calculating cross entropy. As we discovered the cross-entropy function, we optimized it using Gradient Descent; in fact, the best gradient descent optimizer is known as the Adam Optimizer.

6   CONCLUSION

A functional authentic vision-based American sign language recognition system for D&M people has been devised in this report for ASL alphabets. On our set of data, we accomplished a final accuracy of 96.0 %. We can enhance our prediction by incorporating two layers of algorithms that verify and predict symbols that are similarto each other. We can identify almost all of the symbols in this manner if they are properly displayed, there is no noise in the background, and the illumination is ade- quate.

7   FUTURE PERSPECTIVE

We wish to improve our prediction after integrating an additional layer algorithm, which will result in a correctness of nearly 99 percent, by verifying and estimating more similar symbols. Aside from that, we intend to improve accuracy even in the presence of complex backgrounds by experimenting with various background subtrac-tion algorithms. We are also considering boosting

the preprocessing to better predict gestures in low-light conditions.

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Forecasting Stock Market Prices Employing Discrete Wavelet Transform and Deep Neural Networks

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Abstract. Stock market forecasting has remained one of the most critical time series forecasting problems owing to the fact that serious financial repercussions may arise out of inaccuracies of forecasting models. However, achieving high forecasting accuracy pertaining to stock prices is challenging since stock prices exhibit an extremely volatile time series nature and dependence of a multitude of financial and non-financial parameters. It is commonplace to find a noisy baseline average for the time series statistical data which makes accurate forecasting challenging. This paper presents a data cleaning technique based on the discrete wavelet transform to offset the noisy nature of stock prices. Subsequently, a deep neural model has been proposed for pattern recognition and forecasting. The evaluation of the proposed system has been done based on the values of the mean absolute percentage error, mean square error, regression and accuracy. A comparative analysis has been made with existing baseline techniques for S&P benchmark datasets. It has been shown that the proposed system outperforms the baseline techniques in terms of forecasting accuracy.

Keywords: Stock Market Forecasting, Discrete Wavelet Transform, Deep Neural Networks, Regression, Mean Absolute Percentage Error,Forecasting Accuracy.

38. 1 Introduction

Forecasting prices of stocks or shares is an extremely important time series application as several organizations and individuals in their own capacity consider future estimates of stock prices prior to investing. Stock markets can be modelled as a stochastic time series models where the stock prices are a function of time (predominantly) along with other associated variables [1]. Generally, time series patterns exhibit a noisy baseline average but stock market prices may exhibit a far more waxing and waning pattern as the attributes governing stock prices have extreme divergences [2]-[3]. This stems from the fact that the stock prices are not only dependent on historical stock/share values, but also on a multitude of socio-economic and political parameters such as political scenario in the region or country, recent market trends, reputation of the company whose stocks are to be analyzed, prevailing economic conditions and trade wars etc [4]. The stock market forecasting problem can be modelled for three basic scenarios [5]:

1) Short-Term Forecasting: Ranging from a few hours to a few days.
2) Mid-Term Forecasting: Ranging from a few days to a few weeks.
3) Long-Term Forecasting: Ranging from a few weeks to a few months.

The time span for the forecasting models are not rigid though, but rather may vary with the application and stock under analysis. Several techniques have been adopted for stock market forecasting, most of the contemporary of which are machine learning and deep learning models. A brief summary of the existing models is presented in this section to render insight into the latest trends in the domain. Kim et al. in [6] presented an effective transfer entropy based approach analysing the impact of global influencing parameters of the same stock from different global markets. For instance, the stocks listed in the share markets in the eastern parts of the world such as India, China and Japan have a time advance compared to western stock markets such as the London stock exchange to New Your stock exchange. The impact of the prices of the Eastern markets (with a time advance) is analysed on the markets with a time lag (Western markets). Bouktif et al. in [7] presented an opinion mining and sentiment analysis based approach to augment the training vector. The sentiment analysis is performed based on public se4ntiments collected from micro-blogging sites such as twitter. It has been shown that opinion mining can add additional attributes to the otherwise numerical attributes. The sentiment analysis based approach tries to cover the impacts of socio-economic parameters on the stock prices. Eapen et al. in [8] employed an ensemble of the convolutional neural networks (CNN) and Long Short Terms Memory (LSTM) based deep learning models for forecasting stock prices. It has been shown that the ensemble outperforms the conventional techniques applied alone. Wen et al. in [9]presented a cross entropy based approach similar to the transfer entropy based learning method adopted by Kim et al. The cross entropy among the variables has also been used as an additional training parameter. Guo et al. in [10] presented a hybrid support vector machine (SVR) and particle swarm optimization (PSO) based approach for stock market forecasting. The PSO is used to update the weights of the SVR model. Raimundo et al. in [11] presented the idea of employing the discrete wavelet transform (DWT) as a filtration tool in conjugation with the SVR for stock market forecasting. An iterative decomposition process employing the wavelet transform was employed to filter out the noisy nature of the raw data around the baseline. Baek et al. in [12] proposed a cascaded LSTM model for stock market forecasting, The two

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LSTM models were shown to have a domino effect with one of the modules predominantly avoiding overfitting and the other predominantly recognizing patterns and forecasting values. Selvin et al. in [13] experimented with multiple regression models such as auto-regressive integrated moving average (ARIMA), recurrent neural networks (RNNs), GARCH and LSTM.Billah et al. in [14] employed the Levenberg Marquardt (LM) back propagation algorithm for stock market prediction. A comparison was made with the deep feed forward network architecture and it was found that the back propagation based approach outperformed the feed forward networks. Lincy et al. in [15] employed fuzzy logic and adaptive neuro fuzzy inference systems (ANFIS) for the forecasting of stock prices. The performance of the NFIS was shown to yield better results compared to the fuzzy logic based predictor applied alone. Varous membership functions and training rules for creating the ANFIS model was also presented in the paper. Cakra et al. in [16] presented a combination of linear regression and BayesNet for sentiment classification analysis. Authors in this paper tried to render a tag to the sentiment data as positive influence, negative influence on neutral influence on the feature vector for training.

39. 2Proposed Methodology

The objectives of the proposed methodology are addressing two fundamental challenges:

1) Offsetting effects of noise and disturbances inherent to stock.
2) Employing a training algorithm which can render high prediction accuracy for multiple benchmark datasets.

The proposed methodology employs a recursive data filtering technique based on the discrete wavelet transform for filtering and a Bayesian Regularization algorithm for pattern recognition.

The Discrete Wavelet Transform

The discrete wavelet transform is a sampled version of the continuous wavelet transform which can be used for filtering time series data. The DWT acts as a multi-level filter, with even length scaling and shifting operations acting as high and low pass filtering operations [17]. DWT is a recursive pyramidal filter which breaks down the function to be transformed into the approximate and detailed co-efficient values [18]. While the detailed co-efficient values would contain the noisy disturbances, the approximate co-efficient values would contain the intrinsic patterns in the data except the noisy component. Thus iteratively applying the DWT, discarding the detailed co-efficient values and retaining the approximate co-efficient values would allow to filter out the noisy component of the data. While some data loss may be incurred in the process, but it would outweigh the detrimental effects of the disturbances in the data [19]. Mathematically, it can be summed up as:

$$X(t) \xrightarrow{S,W} Co-efficients\ (Approx, Detailed) \quad (1)$$

Here,

Approx. represents the approximate co-efficient values.

Detailed represents the detailed co-efficient values.

S and W are the scaling and wavelet filters of the DWT.

X is the time domain samples of the data.

Training Algorithm

The DWT is used to filter the raw data, subsequent to which the back propagation-based Bayesian Regularization algorithm is used for pattern recognition and forecasting. The data features used in this study are date, previous day closing price, present day opening price, volume (swing), highest and lowest price of the day [20]. The training algorithm employed here is the back propagation-gradient descent. Following a standard convention, 70% of the data is utilized for training the neural network and 30% is used for testing.

It is back propagation based deep neural network which works on the principle of Bayes' theorem of conditional probability [21]. The essence of the back propagation algorithm is the fact that in this network, the errors at the output layer of the network are fed back towards the input layer in each iteration until training is stopped. The weights **w** and the bias **b** are updated in each iteration $'i'$ not only based on the input data of the particular iteration, but also on the error of the previous iteration [22]. The idea is to train the network in each iteration with the present data as well as the estimates of previous iterations to reach convergence quickly and attain a relatively lesser value of the objective function **J** which is typically chosen as the mean square error [23]. The net input to the activation function **f** can thus be given by [24]:

$$x_{net} = x_i w_i + b_i + (v_i - v'_i) \quad (2)$$

Here,

x_{net} denotes the net input to the activation function

x_i denotes the input vector of iteration i.

w_i denotes the weights of iteration i.

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b_i denotes the bias of iteration i.

$v_i - v'_i$ denotes the error in the estimate for iteration i.

v_i denotes the actual value

v'_i denotes the predicted value

The weight of the network are to be chosen in such a way that it maximizes the conditional probability of a data weights belonging to a particular pattern [24]. The probability function can be computed as:

$$P\left(\frac{X}{X_i, k_1, k_2, M}\right) = \frac{P\left(\frac{X_i}{X, k_2, M}\right)P\left(\frac{X_i}{k}, M\right)}{P\left(\frac{X}{k_1, k_2, M}\right)} \tag{3}$$

Here,

P denotes probability

X_i denotes the set of weight and bias

X denotes the training data set

M denotes the network architecture in terms of the hidden layers and neurons

$k_1 \ and \ k_2$ are the regularization parameters for the network

Generally, the term $\rho = \frac{k_1}{k_2}$ is called the regularization ratio. The regularization parameter is adopted in this case to limit the variations in the weights by introducing a penalty factor to the learning algorithm's cost function or objective function $J.$ The regularization is different from early stopping or convergence in the sense that the earlier truncates the iterations prior to convergence to a minimum value of J whereas the latter tries to restrict the values of weights and number of parameters by modifying the cost function [25]. Thus, regularization allows a much steeper decrease in the cost function and eventually lesser values as compared to early stopping [26]-[27]. This significantly helps to reduce the time complexity of the algorithm [28]. The regularization parameter is responsible for the number of iterations needed to reach convergence and typically shows an in inverse relationship with the number of iterations n. The number of hidden layers in the network have been taken as 20, with the activation function being the sigmoid function. The Deep Bayesian Network is typically a deep neural network trained using the Bayesian Rule.

The training algorithm adopted in this work is given by:

Step.1: Initialize weights (w) randomly.

Step.2: Fix the maximum number of iterations (n) and compute $\rho = \frac{k_1}{k_2}$

Step.3: Update weights using gradient descent with an aim to minimize the objective function J given by:

$$J = \frac{1}{m} \sum_{i=1}^{m} (v_i - v'_i)^2 \tag{4}$$

Step.4: Compute the Jacobian Matrix J given by:

$$J = \begin{bmatrix} \frac{\partial^2 e_1}{\partial w_1^2} & \cdots & \frac{\partial^2 e_1}{\partial w_m^2} \\ \vdots & \ddots & \vdots \\ \frac{\partial^2 e_n}{\partial w_1^2} & \cdots & \frac{\partial^2 e_n}{\partial w_m^2} \end{bmatrix} \tag{5}$$

Here,

The error e is computed as:

$$e = (v_i - v'_i) \tag{6}$$

Step.5: Iterate steps (1-4) till the cost function J stabilizes or the maximum number of iterations set in step 2 are reached, whichever occurs earlier.

Step.6: The weight updating rule for the Bayesian Regularization algorithm is given by:

$$W_{k+1} = W_k - [J_K^T J_k + \mu I]^{-1} J_K^T e_k \tag{7}$$

Here,

I is an identity matrix,

W_k is weight for iteration k,

W_{k+1} is the weight for iteration k+1

e_k is the error for iteration k,

μ is the amount by which weight changes in each iteration

Generally, the gradient is the rate of change of error w.r.t. weights given by:

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$$g = \frac{\partial e}{\partial w} \tag{8}$$

The second order gradients generally comprise the Jacobian matrix. The simple gradient is actually a function of time or iteration. As data is fed to a neural network for pattern recognition, the weights keep updating. However, it has been found that in case of time series problems, the latest data sample have the maximum impact on the latest output. Hence it is logical to calculate a moving average of latest (previous) data and apply it to the neural network [29]. This is also called a moving average. Mathematically,

$$I_k = X_{1,k}, Mean(X)_{k,k-n}, Y_k \tag{9}$$

Here,

I_k is the kth input sample to the neural network

$X_{1,k}$ are the data samples from the first to the kth sample

$Mean(X)_{k,k-n}$ is the mean of the data samples form k-n to k, i.e. it is a moving average depending on the value of k

Y_k is the target

Thus a moving average of the the C_A and C_A values can be computed after the after the application of the PCA. The next step would be creating a new training vector compising of the follwing variables:

$$Tr = [X1_{CA,CD}, X2_{CA,CS} \ldots \ldots Xn - 1_{CA.CD} Xn_{CA,CD}, Avg_{n-k}, Y] \tag{10}$$

Here,

Tr is the training vetcor,

Y is the target vector.

$X1_{CA,CD}, X2_{CA,CS} \ldots \ldots Xn - 1_{CA.CD} Xn_{CA,CD}$ are the individula decomposed values of the features using the DWT iteratively.

Avg_{n-k} is the ,oving average of the variables.

The moving average would allow the machine learning algorithm to find recent patterns in the data along with overall historical data [30]. The final data vector would thus contain the DWT co-efficients of the decomposition along with the moving average exogenous input. Gradient Boosting is then proposed to compute the final prediction output as a summation of the outputs from the individual learning models [31]. The performance evaluation of the proposed model is done based on the evaluation of the following parameters [32]:

1) Mean Absolute Percentage Error (MAPE)
2) Mean square error (MSE)

$$MAPE = \frac{100}{N} \sum_{t=1}^{N} \frac{|V_t - V_t|}{V_t} \tag{11}$$

$$MSE = \frac{1}{N} \sum_{t=1}^{N} e_t^{\frac{2}{}} \tag{12}$$

Here,

N is the number of predicted samples

V is the predicted value

V_t is the actual value

e is the error value

The next section discusses the obtained results.

40. 3 Experimental Results

The data has been extracted from https://in.finance.yahoo.com/quote. Three data sets have been used for the analysis of the proposed algorithm, which are the SBI, Infosys and Reliance. The feature selected are the date, opening price, closing price, mean price of the day, maximum price and minimum price. The day wise parameters are modelled to affect and govern the final share prices. The data processing and prediction methodologies are explained subsequently using the obtained results.
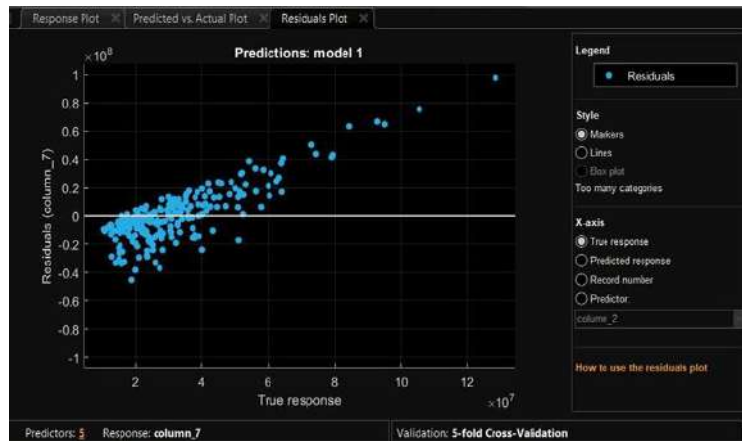
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Fig.1 Scatter plot of the data after application of PCA (SBI dataset)

The data is decomposed into the approximate co-efficient and the 3 level detailed co-efficient values. Here 's' represents the approximate co-efficient value while d1, d2, d3 and d4 represents the detailed co-efficient values. The noise spectrum can be analyzed using the histogram analysis of the data. An analysis of the recursive wavelet decomposition is shown in table 1. Table 1 clearly indicates that there is a distinct similarity between the histogram of the original data and the approximate co-efficient values of the data, whereas the detailed co-efficient values bear a clear difference in both magnitude, distribution and the polarity of the values. This clearly indicates that the noise and disturbance in the noise floor affects the detailed co-efficient values much more compared to the approximate co-efficient values. A similar analysis has been done for the Infosys and Reliance datasets.

Table 1. Statistical Analysis of Data

| S.No.	Parameter	Values	Class
1.	Minimum	8.628×10^4	Original Data
2.	Maximum	8.807×10^7	
3.	Mean	2.756×10^6	
4.	Median	2.068×10^6	
5.	Standard Deviation	4.308×10^6	
6	Mean Absolute Deviation	6.861×10^6	
7.	Minimum	3.383×10^6	Approximate Co-efficient values
8.	Maximum	3.858×10^7	
9.	Mean	7.796×10^6	
10.	Median	6.501×10^6	
11.	Standard Deviation	5.152×10^6	
12.	Mean Absolute Deviation	1.194×10^6	
13.	Minimum	-3.304×10^7	Detailed Co-efficient values
14.	Maximum	7.22×10^6	
15.	Mean	-8.081×10^5	
16.	Median	-2.9×10^5	
17.	Standard Deviation	4.732×10^6	
18.	Mean Absolute Deviation	9.876×10^5	

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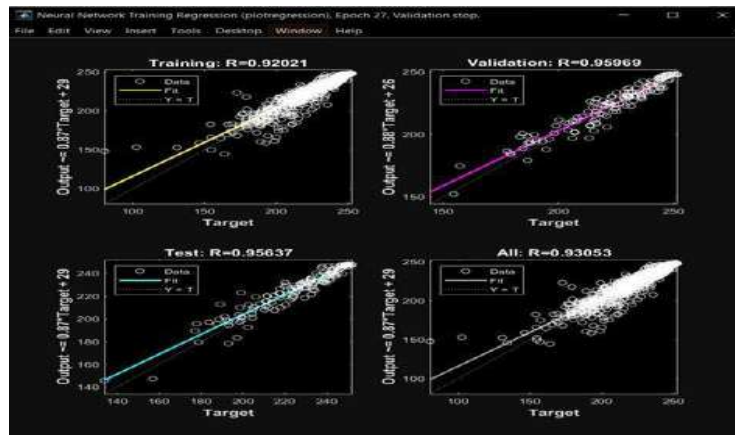
Fig.2 Regression of the Proposed Model

The **R (regression)** values have been depicted in figure 2 for the training, testing, validation and average overall cases. It can be observed that the proposed system attains an average regression of 93%. A high value of regression indicates the closeness in the forecasted and actual values.
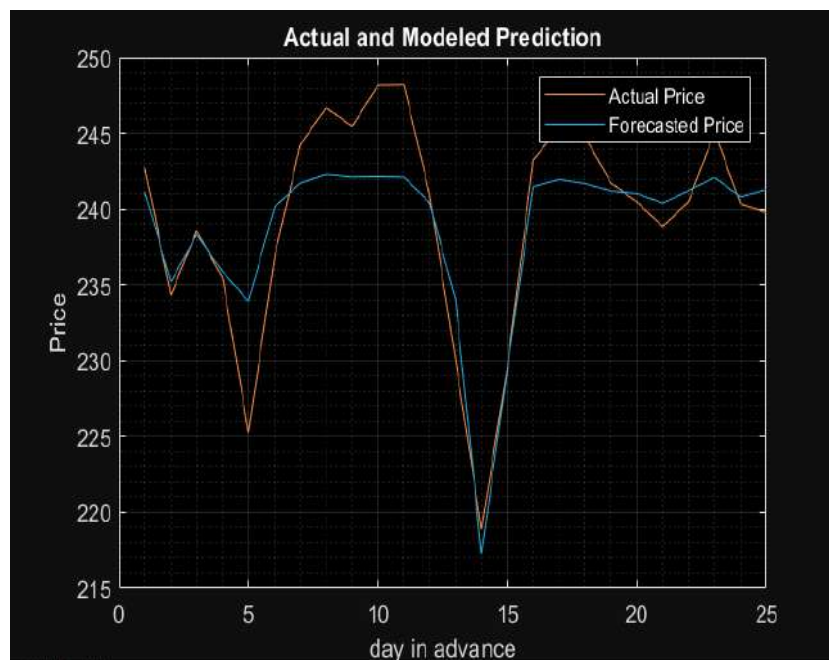

Fig.3 Forecasting for SBI Dataset

Three different datasets have been used in the proposed work which are that of SBI, Infosys and Reliance share prices, obtained from [1]. The actual and modelled forecasting values are depicted in figure 9. The mean absolute percentage error of the system is found to be 7.6% for the SBI dataset. This yields and accuracy of 92.4% which is relatively high compared to the existing literature [1]-[3] and more recent hybrid techniques in [12-[14]. A similar analysis has been adopted for the Infosys and Reliance datasets. The MAPE and Regression Values for the Infosys and TCS datasets are 10.55, 0.915, and 11.3, .0.91 respectively. The value of the MAPE and accuracy are suggestive of the fact that the proposed system is capable to filter out the noisy values from the original noise floor and forecast the stock prices with relatively high accuracy. This statistical analysis of the approximate and detailed co-efficient values also indicate the same as the histogram of the detailed coefficient values are significantly w.r.t. to the original data while the detailed co-efficient values are convergent with the actual data. This indicates that the noise effects have been removed by iterative filtering employing the DWT. The regularization parameter avoids the chances of overfitting and facilitates pattern recognition.

Table 2. Summary of MAPE and Regression Values

S. No.	Dataset	MAPE	Accuracy (%)	Iterations to Convergence	Regression (Over-all)

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1.	SBI	7.6	92.4	47	0.93
2.	Infosys	10.55	89.45	66	0.93
3.	Reliance	11.3	88.7	59	0.94

A comparative analysis with exiting work in the domain has presented in Table 3.

Table 3. Summary of Comparative Average Accuracy

S. No.	Technique	Accuracy
1.	Transfer Entropy and Machine Learning [1]	57%
2.	Augmented Textual Feature Based Learning [2]	60%
3.	LSTM with Sentiment Analysis [3]	49.6%
4.	HFS based X-Boost[12]	79%
5.	Hybrid Red Deer-Grey Algorithm[13]	85.2%
6.	Variational Autoencoders (VAE) [14].	67%
7.	**Proposed Technique (Mean Accuracy)**	90.183%

41. 5 Conclusion

This paper presents a stock market forecasting model based on recursive DWT decomposition and Bayesian Regularization Algorithm. A 3rd level decomposition of the data is done and subsequent statistical analysis is performed to correlate the noise floor with the actual data to be analyzed. It has been successfully shown that discarding the detailed co-efficient values helps in data cleaning and retaining the approximate co-efficient values results in subsequent accurate pattern recognition in the data. The performance of the system has bene evaluated in terms of the regression, mean absolute percentage error and accuracy of the system. The system attains an average accuracy of 90.183 which is significantly higher compared to existing literature. The novelty of the approach lies in the fact that the approach uses the gradient boosting methodology for all the co-efficient values of the DWT decomposition as training values. Moreover, the moving average acts as an additional input the algorithm to find recent patterns in the data

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Salesforce- Customer Relationship Management

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Abstract: This paper is about the upcoming technology i.e., salesforce, which just created a boom in IT industry. Many companies like Accenture, Infosys, Deloitte, etc. are using this technology. Salesforce is a Customer Relationship Management (CRM) platform that uses cloud technology to bring companies and customers together. Then I discussed about components of CRM and its type. Later I continued with products and services provided by salesforce and its technologies. In the end I discussed about uses of salesforce and how it is used.

1. Introduction

Salesforce is an American cloud-based software company headquartered in San Francisco, California. It provides customer relationship management (CRM) service and also provides a complementary suite of enterprise applications focused on customer service, marketing automation, analytics, and application development. In 1999, four Salesforce founders, working shoulder to shoulder in a small San Francisco apartment, launched a customer relationship management system with a ground breaking twist. All the software and critical customer data would be hosted on the internet and made available as a subscription service. This pioneering "software as a service", or SaaS, model quickly spread across the technology industry.

2. SalesforceTechnology

Salesforce is a cloud computing service as a software (SaaS) company that specializes in customer relationship management (CRM). Salesforce's services allow businesses to use cloud technology to better connect with customers, partners and potential customers. The software has become the number one for customer success and helps businesses track customer activity, market to customers and many more services.

The software company has become very popular in recent years. TheStreet's founder Jim Cramer even dubs the service as a 'Cloud King' and has been very bullish on the stock - seemingly with good reason.

Founded in 1999 by a former Oracle (**ORCL**) – Get Oracle Corporation Report executive Marc Benioff, Dave Moellenhoff, Frank Dominguez and Parker Harris, Salesforce is one of the first global companies to successfully employ a cloud-based CRM software. Salesforce has been able to leverage cloud technology and build a variety of applications for businesses to better connect to their customers and help give them key insights into their services through analytics and apps.

While their applications are vast, according to Salesforce, their CRM primarily focuses on helping companies with customer retention, keeping their customers happy, seeking out and executive customer acquisition, giving companies insights into their customers and much more.

3. CRM

Customer relationship management (CRM) is the combination of practices, strategies and technologies that companies use to manage and analyse customer interactions and data throughout the customer lifecycle. The goal is to improve customer service relationships and assist in customer retention and drive sales growth.

CRM systems compile customer data across different channels, or points of contact, between the customer and the company, which could include the company's website, telephone, live chat, direct mail, marketing materials and social networks. CRM systems can

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also give customer-facing staff members detailed information on customers' personal information, purchase history, buying preferences and concerns.

A CRM system gives everyone — from sales, customer service, business development, recruiting, marketing, or any other line of business — a better way to manage the external interactions and relationships that drive success. A CRM tool lets you store customer and prospect contact information, identify sales opportunities, record service issues, and manage marketing campaigns, all in one central location — and make information about every customer interaction available to anyone at your company who might need it. With visibility and easy access to data, it's easier to collaborate and increase productivity. Everyone in your company can see how customers have been communicated with, what they've bought, when they last purchased, what they paid, and so much more. CRM can help companies of all sizes drive business growth, and it can be especially beneficial to a small business, where teams often need to find ways to do more with less.

The use of CRM systems can benefit organizations ranging from small businesses to large corporations, through:

> Having customer information such as past purchases and interaction history easily accessible can help customer support representatives provide better and faster customerservice.
>
> Collection of and access to customer data can help businesses identify trends and insights about their customers through reporting and visualizationfeatures.
>
> Automation of menial, but necessary, sales funnel and customer supporttasks.

4. Components of CRM

At the most basic level, CRM software consolidates customer information and documents it into a single CRM database so business users can more easily access and manage it.

Over time, many additional functions have been added to CRM systems to make them more useful. Some of these functions include recording various customer interactions over email, phone, social media or other channels; depending on system capabilities, automating various workflow automation processes , such as tasks, calendars and alerts; and giving managers the ability to track performance and productivity based on information logged within the system.

> **Marketing automation.** CRM tools with marketing automation capabilities can automate repetitive tasks to enhance marketing efforts at different points in the lifecycle for lead generation. For example, as sales prospects come into the system, it might automatically send email marketing content, with the goal of turning a sales lead into a full-fledgedcustomer.
>
> **Sales force automation.** Sales force automation tools track customer interactions and automate certain business functions of the sales cycle that are necessary to follow leads, obtain new customers and build customerloyalty.
>
> **Contact center automation.** Designed to reduce tedious aspects of a contact centeragent's job, contact center automation might include pre-recorded audio that assists in customer problem- solving and infor-

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mation dissemination. Various software tools that integrate with the agent's desktop tools can handle customer requests in order to cut down on the length of calls and to simplify customer service processes. Automated contact center tools, such as chatbots, can improve customer user experiences.

Geolocation technology, or location-based services. Some CRM systems include technology that can create geographic marketing campaigns based on customers' physical locations, sometimes integrating with popular location-based GPS (global positioningsystem)

apps. Geolocation technology can also be used as a networking or contact management tool in order to find sales prospects based on a location.

Workflow automation. CRM systems help businesses optimize processes by streamlining mundane workloads, enabling employees to focus on creative and more high-leveltasks.

Lead management. Sales leads can be tracked through CRM, enabling sales teams to input, track and analyse data for leads in oneplace.

Human resource management (HRM**).** CRM systems help track employee information, such as contact information, performance reviews and benefits within a company. This enables the HR department to more effectively manage the internalworkforce.

Analytics. Analytics in CRM help create better customer satisfaction rates by analysing user data and helping create targeted marketingcampaigns.

Artificial intelligence. AI technologies, such as Salesforce Einstein, have been built into CRM Platform to automate repetitive tasks, identify customer-buying patterns to predict future customer behaviours andmore.

Project management. Some CRM systems include features to help users keep track of client project details such as objectives, strategic alignment, processes, risk management andprogress.

Integration with other software. Many CRM systems can integrate with other software, such as call center and enterprise resource planning (ERP)systems.

5.   Types of CRMtechnology

The four main vendors of CRM systems are Salesforce, Microsoft, SAP and Oracle. Other providers are popular among small to midsize businesses, but these four tend to be the choice for large corporations. The types of CRM technology offered are as follows:

Cloud-basedCRM

With CRM that uses cloud computing, also known as SaaS (software as a service) or on-demand CRM, data is stored on an external, remote network that employees can access anytime, anywhere there is an internet connection, sometimes with a third-party service provider overseeing installation and maintenance. The cloud's quick, relatively easy deployment capabilities appeal to companies with limited technological expertise or resources.

Data security is a primary concern for companies using cloud-based systems, as the company doesn't physically control the storage and maintenance of its data. If the cloud provider goes out of business or is acquired by another company, an enterprise's data can be compromised or lost. Compatibility issues can also arise when data is initially migrated from a company's internal system to the cloud.

Companies might consider cloud CRM as a more cost-effective option. Vendors typically charge the user on a subscription basis and offer the option of monthly or yearly payments. However, cost may still be a concern, because paying subscription fees for software can be more costly over time than with on-premises models.

Popular cloud-based CRM providers include Salesforce, HubSpot and Zendesk.

On-premisesCRM

This system puts the onus of administration, control, security and maintenance of the database and information on the company using the CRM software. With this approach, the company purchases licenses upfront, instead of buying yearly subscriptions from a cloud CRM provider. The software resides on the company's own servers and the user assumes the cost of any upgrades. It also usually requires a prolonged installation process to fully integrate a company's data. Companies with complex CRM needs might benefit from an on-premises deployment.

Many cloud-based providers, such as Salesforce and Work Wise, also offer on-premises versions of their CRM software.

Open sourceCRM

An open source CRM system makes source code available to the public, enabling companies to make alterations at no cost to the company employing the system. Open source CRM systems also enable the addition and customization of data links on social media channels, assisting companies looking to improve social CRM practices.

Open Source CRM platforms such as Oro CRM, Bitrix24, Suite CRM and Sugar CRM offer alternatives to the proprietary platforms from Salesforce, Microsoft and other vendors.

Adoption of any of these CRM deployment methods depends on a company's business needs, resources and goals, as each has different costs associated with it.

6.   CRMChallenges

For all of the advancements in CRM technology, without the proper management, a CRM system can become little more than a glorified database in which customer information is stored. Data sets need to be connected, distributed and organized so that users can easily access the information they need.

Companies may struggle to achieve a single view of the customer if their data sets are not connected and organized in a single dashboard or interface. Challenges also arise when systems contain duplicate customer data or outdated information. These problems can lead to a decline in customer experience due to long wait times during phone calls, improper handling of technical support cases and other issues.

CRM systems work best when companies spend time cleaning up their existing customer data to eliminate duplicate and incomplete records before they supplement CRM data with external sources of information.

7.   Salesforce Products andServices

We are discussing some major Salesforce Services:

SalesCloud

It is the cloud storage for all your data. Sales Cloud salesforce service helps to accommodate all the data in one place that is cloud so that user can access that data from anywhere and from any device. This Sales cloud is used to manage grants and campaigns, fundraising, and automate your organizational process collaborate across teams.

It also enables the businesses to process more business in less time, collaborate more closely, and finish the deals early usingSFA.

It is an entirely customizable cloud service of Salesforce that integrates all the customer related information at oneplace.

It includes marketing, sales, lead generation, customer service, business analytics, etc., and also provides access to various other applications through the AppExchange. To read more, click here (Salesforce SalesCloud).

Salesforce AnalyticsCloud

The analytics cloud service provides a business intelligence platform to thecustomers.

It helps the customers to work with comprehensive data easily. It also improves data visualization by including the graphs, charts, and other pictorialrepresentations.

We can also integrate the analytics cloud service with our services provided by theSalesforce.

Salesforce CommerceCloud

The salesforce commerce cloud service is all about the customer services andexperiences.

It allows the companies to provide the best services and experiences to their customers, either online orin-store.

It integrates customer data to provide a better customerexperience.

It aims to provide the best, positive, and engaging customer experience to the companies. To learn more, Click here(Salesforce CommerceCloud).

Chatter

Chatter creates by Salesforce which acts as a social media network. It is a place where collaborate instantly in context. The user can update all the records, people, files, and other information that the user need pushes into the chatter feed within seconds so that the work could collaborate which includes: Crowdsourcing ideas and solutions, and videos; solving constituent issues more quickly, sharing files, sites, articles. and even the work can be managed on an informal basis.

ServiceCloud

The Service Cloud is the platform to provide services and support to thecustomers.

The Service Cloud is an excellent customer service platform to give the much faster, and personalized services virtually using any possible platform such as phone, email, instant messaging, Twitter, Facebook or other socialplatforms.

With the service cloud, customers can reach to the customer support from any platform and get support as per their requirement. To read more, click here (Salesforce ServiceCloud).

LightningPlatform

Lightning Platform (also known as Force.com) is a platform as a service (PaaS) that allows developers to create add-on applications that integrate into the main Salesforce.com application. These third-party applications are hosted on Salesforce.com's infrastructure.

Force.com applications are built using declarative tools, backed by Lightning and Apex (Application Express), a proprietary Java-like programming language for Force.com, as well as Visualforce, a framework including an XML syntax typically used to generate HTML. The Force.com platform typically receives three complete releases a year. As the platform is provided as a service to its developers, every single development instance also receives all these updates.

In 2015, a new framework for building user interfaces – Lightning Components – was introduced in beta. Lightning components are built using the open-source Aura Framework but with support for Apex as the server-side language instead of Aura's JavaScript dependency. This has been described as an alternative to, not necessarily a replacement for, Visualforce pages.

As of 2013, the Force.com platform has 1.4 million registered developers.

Lightning Base Components is the component library built on top of Lightning Web Components.

MarketingCloud

Engaging each and everything with the world's leading social marketing applications. Marketing cloud can be highly suitable for the organizations who want to engage, listen, gain insight, optimize social advertising, publish content, measure social marketing programs and integrate social data with CRM information. We can use it to make better decisions in marketing, fundraising, and service.

The marketing activities include Content management, content marketing, data analytics, content building, web personalization, customer influence, email, mobile, social media activities,etc.

The Marketing cloud service of Salesforce provides one of the best digital marketing platforms to enhance any company's marketing strategies. It allows the organizations to send customized mass emails to various potential customers with just aclick.

It also helps to solve customer issues related to any product. Organizations can increase com- munication with any custom communities and connect to customers through social media plat- forms such as Facebook, Twitter,etc.

Salesforce AppCloud

Salesforce App cloud provides a platform to build custom apps that can run on the Salesforce platform.

It can be assumed as the ecosystem to build, discover, and run any custom application. It provides multiple development tools that help to build custom apps. Some of the tools of App cloud include:

Force.com

9.8.2.2. Ap-pExchange**9.8.2.3.**Heroku

9.8.2.4. Salesforce Thunder

9.8.2.5. SalesforceSandbox

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8. SalesforceTechnologies

Salesforce is powered by the Model–view–controller architecture.

Apex

Apex is a proprietary programming language provided by the Force.com platform to developers similar to Java and C#. It is a strongly typed, object-oriented, case-insensitive programming language, following a dot- notation and curly-brackets syntax. Apex can be used to execute programmed functions during most processes on the Force.com platform including custom buttons and links, event handlers on record insertion, update, or deletion, via scheduling, or via the custom controllers of Visualforce or Lightning Experience pages.

Due to the multitenant nature of the platform, the language has strictly imposed governor limitations to guard against any code monopolizing shared resources. Salesforce provides a series of asynchronous processing methods for Apex to allow developers to produce longer-running and more complex Apex code.

Lightning

In 2014, Salesforce made public the front end of its platform, called Lightning. This component-based framework is what the Salesforce mobile app is built on. Salesforce built on this framework in 2015 by releasing the Lightning Design System an HTML style framework with default CSS styling built in. This framework allows customers to build their own components to either use in their internal instances or sell on the AppExchange.

The Salesforce Lightning App Builder is a tool for rapid application development of responsive web interfaces. This interface allows for different screens to be put together based on Lightning components. This can be used as layouts for records or specific applications. Lightning Experience, released in 2016, is the new redesigned interface in Salesforce for processes enhancement. Since then all the apps available on AppExchange need to be Lightning and those built on Classic have to migrate to Lightning as Classic is not to be updated any more by Salesforce. The platform offers an option for developers to employ migration techniques to enable the new user friendly interface and switch to Lightning.

9. Uses ofSalesforce

Companies use Salesforce to understand their customers, connect with them on a variety of levels and help grow their customer base.

The cloud-based software allows companies to track (in real time) analytics, customer success and support, customer complaints and a variety of other CRM functions with the ease of cloud storage and access wherever the users are.

According to the Salesforce website, companies that use the software see average increases in a variety of areas, including an average 27% increase in sales revenues, 32% increase in lead conversion, 34% increase in customer satisfaction and a 56% faster deployment.

Because of its diverse selection of clouds and applications, Salesforce is also used by companies to assist with marketing, tracking sales and spending and analysing performance. A variety of different clouds allow users to analyse various data, maintain communication forums with customers, implement sales strategies and more.

In essence, Salesforce is the one-stop-shop for businesses to manage, maintain, communicate with and grow their customer base and revenue streams.

The company is a service as a software (SaaS) - which means it uses a cloud-computing, software distribution model that hosts applications and makes them available online.

Salesforce hosts numerous different cloud platforms that allow companies to interact with different data and service their customers in various capacities.

As of 2020, Salesforce has multiple different cloud platforms - a service cloud, marketing cloud, health cloud, app cloud, community cloud, analytics cloud, IoT cloud, Chatter cloud, commerce cloud, Heroku engagement cloud and more.

According to the company, Salesforce's sales cloud gives companies the ability to track contacts, opportunities and manage a team to increase sales. The service cloud allows companies to connect with customers and deliver premium customer service through showing customer activity and resolving issues. With their marketing cloud, Salesforce helps companies track customer journeys while providing multichannel marketing campaigns, while their community cloud allows companies to directly interact with their customers and allows their customers to interact with each other.

Additionally, Salesforce has been implementing artificial intelligence (AI) into their Einstein platform, which helps simplify the analytics workflow and produce more accurate forecasting, among other benefits. Still, Salesforce's entire model supports customer relationship management (CRM).

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Snagnay(Online Examination System)

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Abstract: Snagnay is an Online examination system. Snagnay is a web-based examination system where examinations are given online. Either through the internet or intranet using a computer system. The main goal of this online examination system is to effectively evaluate the student thoroughly through a totally automated system that not only reduces the required time but also obtains fast and accurate results.

Keywords: Web Application, Python, Django, Web Server

1   Introduction

SNAGNAY (Here Snag means 'glitches and Nay means 'No' or 'less') so aiming to have as few glitches as possible, Online Examination System is considered a fast-developing examination method because of its accuracy and speed. It also needs less manpower to handle the examination. Almost all organizations today, are managing their exams by online examination system since it reduces students' time in examinations. Organizations can also easily monitor the progress of the student that they give through an examination. As a result of this, the result is calculated in less time. It also helps diminish the need for paper [1]. According to today's requirements, an Online examination system is significantly important to the educational institution to prepare for the exams, saving the time and effort that is required to check the exam papers and to prepare the results reports. Online examination system helps educational institutions to monitor their students and keep their eyes on their progress [2]. The best use of this system in Scholastic Institute and training centers is because it helps in managing the exams and getting the results in an easy and efficient manner.

2   Literature Survey

The online examination system is one of the methods of taking exams that does not require any kind of piece of paper and pen. Speed and accuracy are the reason behind the fame of this method. Much different research has focused on an online examination system this work can be represented as the following SIETE: Guzman and Conejos (2005) proposed an online examination system called System of Intelligent Evaluation using Tests for Tele-education (SIETE). SIETE is a web-based environment to generate and construct adaptive tests. It can be used for instructional objectives, via combining adaptive student self-assessment test questions with hints and feedback. SIETE supports secure login and portability features. On the other hand, the other features: resumption capability, multi-instructor, random question selection, random questions distribution, and random choices distribution are missing. EMS: Rashad Et. Al. (2010) proposed a web-based online examination system called Exam Management System (EMS). EMS manages the examination and auto-grading for students' exams and supports conducting exams, collects the answers, auto mark the submissions, and produce the reports for the test. EMS supports secure login, multidistrict, and portability features. However, the other features: resumption capability, random question selection, random questions distribution, and random choices distribution are missing.
Arvind Singh, Niraj Shirke, Kiran Shetty 2011: The project evaluates the examiners by using the online examination system concept. The exams will be totally customizable.

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This system will check results automatically based on students' answers [4]. CBTS: Fagbola et. al. (2013) developed a Computer Based Test System (CBTS). CBTS is a web-based online examination system developed to address issues such as lack of timing flexibility for automation candidates log- off upon expiration of allowed time, result integrity, guaranty, stand-alone deployment, need for flexibility, robustness, designed to support the examination processes and overcome challenges framing the conduct of examination, auto- marking, auto- submission, and generation report of the examination result.

3 Problem Statement

Since the traditional Examinations systems have many drawbacks such as time-consuming, Difficulty of analyzing the test manually, more observers are required to take exams of many students, Results are not accurate since calculations are done manually, the chance of losing exam's results is higher in current systems, checking of result is time-consuming since it is done manually, Limitation of no of student can give examination at a time. with the development of information technology and use it in an orderly and properly helps to overcome the existing error in the manual system. Online examination system saves the exams information in a database, and this makes it an easier way to give exam teachers can add their exams rules, and students can give exams in a totally automated system [3].

4 Proposed system

Online examination system (Snag nay) saves the exams information in a database, teachers (or admins) can add/delete questions, set the correct answers, specify the exam period, register students, delete students, show questions for students randomly, calculate and show the results for students.

System Design

Online Examination System (Snag nay) is a web-based application system used to create and evaluate examinations. This system architecture consists of 3 sections: - frontend, backend, and database server. For the design of the system, we used interpreted programming language Python, client-side Ajax techniques, to send and retrieve data from the server, CSS for the styling of web pages, and the relational database management system MySQL. The whole system is divided into three modules: administrator module, teacher, and student module.

Administrator module:

The admin can control the execution of the whole system where he/she can add courses, can modify teachers' and students' data according to use. The main controller of the whole Snagnay.

Teacher module:

The teacher module includes test Management module, automatic organizing of examination paper, examination-paper management, paper analysis, result, and so on. The teacher can register and use Snag nay to take exams and give instant results by adding courses and questions [3].

Student module:

The student module has a login option to attend the exam and after completing and submitting the exam the result is immediately generated. The student can take exams and get the marks instantly and can know about the courses he/she is enrolled into etc. [3].
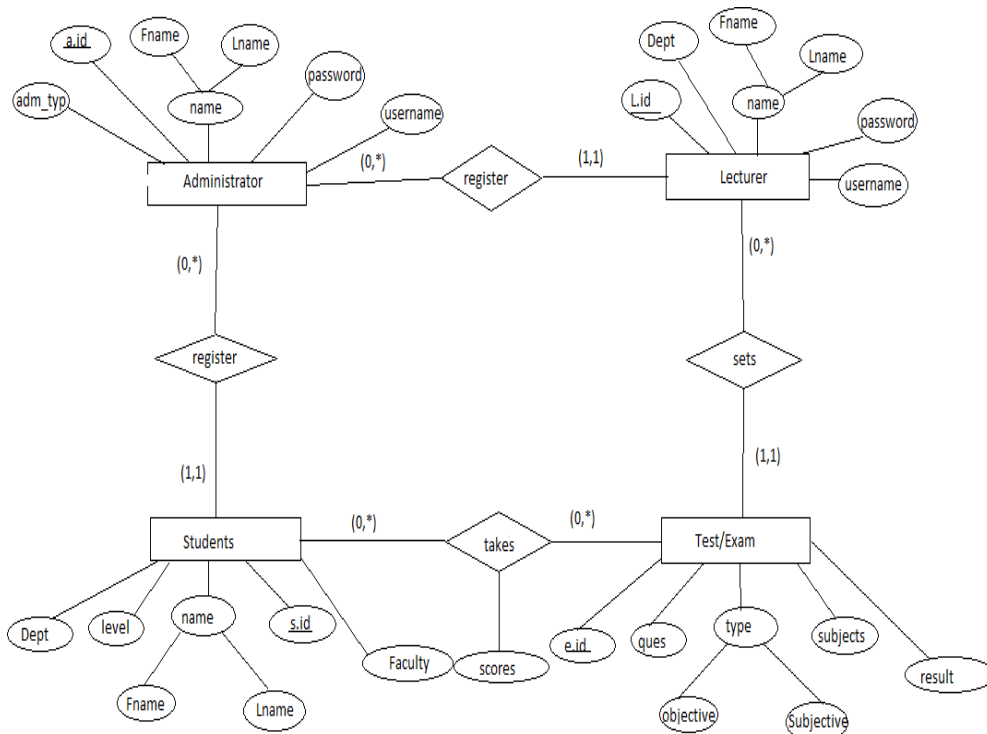
Functionality of system:

Fig.4. Entity Relationship Diagram

Login system: The login system contains the following programs.

Login as admin:

By using already stored admin name and password the individual can log on to the system any time he/she desires as an admin to manage the admin activities. Logging is successful only if the input detail is matched with the database, else an error message is displayed.

Login as a student:

The information of each student will be sorted by the admin upon the registration process, enabling this way the student to log on the system without having to undergo the process of registration again. Logging is successful only if the input detail is matched with the database, else an error message is displayed.

Login as Teacher:

The information of each Teacher will be sorted by the admin upon the registration process, enabling this way the student to log on to the system without having to undergo the process of registration again. Logging is successful only if the input detail is matched with the database, else an error message is displayed.

Admin activities:

Admin activities contain the following things:

1. Add teachers and Students based upon their registrations.
2. Can modify/ delete the data related to teachers and students.
3. Can decide the number of courses and update them according to the need.
4. Can Set the answers and questions also for additional reviews

Students' activities:

Students contain these main operations:

1. Register Themselves: include inserting the information of each student (student name, email, and password)to complete the registration process.
2. Give Exam.
3. Get the scores for exams.

Teacher activities:

 Teachers contain these main operations:

1. Register Themselves: include inserting the information of each teacher (student name, email, and password)to complete the registration process. And only after getting approval by the admin he/ she can join the institute to take the exam.
2. Set Exam, add questions.
3. Set the answers for exams.

5 DATABASE DESIGN

To fully use MySQL server technology, it is essential to make sure that the database is well designed. The files names chosen to label all the tables created within the database attempt to reflect the table's purpose and, therefore, contribute to a well-design system. The intimal step in designing was to decide, according to the requirements and specifications of the project, which tables should be created, and what type of information each one should hold.

6 SYSTEM INTERFACE AND RESULT SCREENSHOTS

Admin Login of Snagnay: Here the main admin can log in and control the overall management

of the examination system from controlling teachers to students.

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Fig.2. Admin Login Page

Teacher Login Page: Here the teacher can log in and add exams and view the exams accord- ing to the need of the examination.
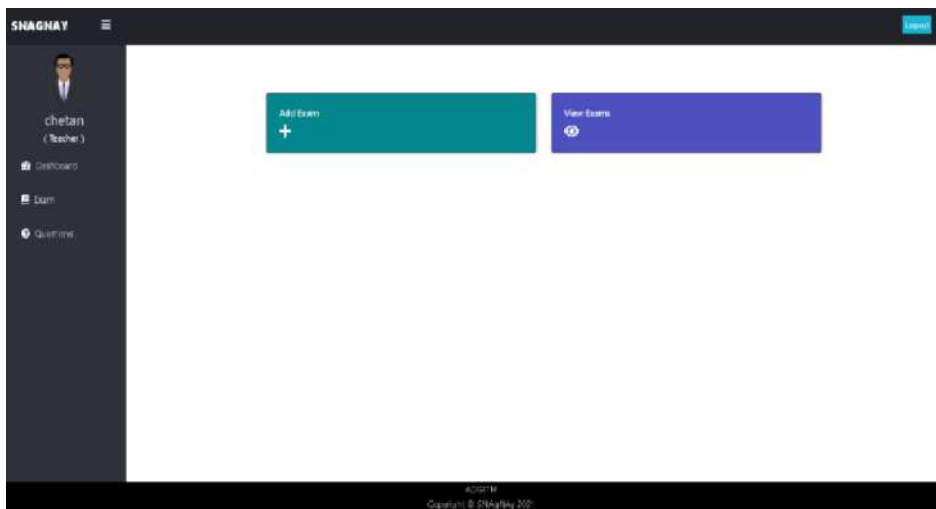

Fig.3. Teachers Login Page

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Student Exam Page: A student can give exams by logging in to the portal and also get the result instantly and can review the answers before final submit.
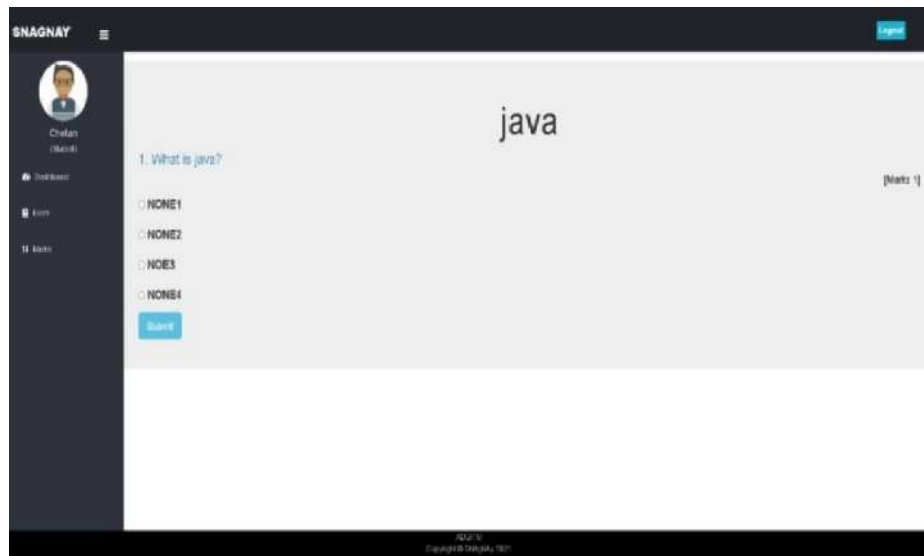

Fig.4. Student Exam Page

Dashboard of Snagnay in Mobile: As the Snagnay is device friendly and students can give exams either on the phone or laptop/desktop without any problems.
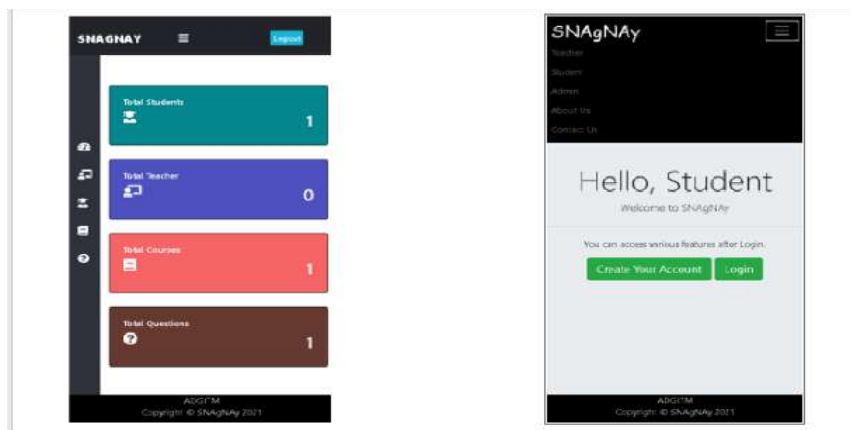
Fig.5. Dashboard of Snagnay in Mobile Phone

7   Advantages and Disadvantages

Advantages

Online examination systems can make the student's life easier because they don't need any paper and pen for examination. It is eco-friendly and forward-thinking approach to daily processes is essential in a world were

students can graduate into an environmental crisis caused by climate change. Students will imbibe these values over the course of their education. Online examinations can be effective and efficient.

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The students don't waste so much time answering the questions because they only click on the best answer that is provided. A great feature of this exam conducting system is that there is not any compromise with data security. Question paper leak in the online examination is not possible at all. All can fully believe on examination process over its security feature. In this online system, a set of question papers are a lock in a security system and that will only open at the time of examination [5].

The sheer number of resources that can be used to set up a single exam is mind-boggling copies of the exam paper. The online examination system removes many of these procedures and the related labor costs, which have a significant and positive impact on the bottom line of the method of implementing educational institutions. Another advantage of online examinations is that we can know our scores just after the exam. Students can give online exams anytime anywhere. The major feature which adds up to the online examination, it is scalable over a larger region. It can serve a larger audience and has the potential to do so. Sometimes, instructors can be very busy on a given day and do not have any time to check the exams. An online examination can solve this problem. The instructor does not need to check all the exams. It can be easily accessed 24/7 over the open test period.

It gives immediate test feedback when a test is submitted. Student can check their progress with a single click.

This enables you to track the report and progress of a child with just a click. Improvement in a child is checked through a progress report made by the software.

Disadvantages

Network Issue: One of the biggest challenges in conducting online examinations is connectivity. If any network issue occurs during the exam, the online test can be delayed or postponed. The exams can indeed be taken some other time, but it negatively affects the students' minds.

Security Issue: In online examinations, data are shared online and stored in cloud-based storage. But being in a totally online environment brings the risk of data breaches and hacking. Suppose Hackers can get into the online examination system. In that case, they can completely sabotage the data and may even extract question papers. Not every type of question can be checked automatically with the Online examination system. While online evaluation is excellent for short multiple-choice questions, they are not useful for broad questions. Teachers must manually check the answers and grade the students. Accessibility can be an issue.

8 Conclusion

This system aims at the popular examination system research at present, designing a set of common examinations for the college platform and providing a good condition for organizing all kinds of tests, and have a great reference value for other colleges and universities. Using an open-source language gives us more flexibility, but at the same time, it required more time to be programmed. The proposed Online Examination System (OES) can be easily adopted by universities and institutions to make the exam more secure and more flexible. The system is subdivided into two main subsystems (student and administrator) that are designed to give the system maximum benefit by carefully demonstrating each subsystem service. The administrator's functions are clearly identified to be able to manipulate user's information such as add (register), delete users, and manage the exam materials and content such as add, delete questions, Thus the proposed system is easy and flexible because for future maintenance and development because each subsystem can be handled separately without influence on another

system.

9 Future Scope

The online examination system application is vast. It is used in various sectors, schools, colleges, tuition centers, or individual tutors. Online Examination System is widely used as compared to other exams. Online examination systems can be used in private institutes as well as educational institutions. As it is a user-friendly web-based application it can be used anywhere and anytime. Every software may have some cases of bugs, errors, security-related problems, or system faults. There are many problems or system faults for example, computer collapse or crashes due to power supply problems will invalidate the efforts of several students. There are large numbers of chances in which software may produce wrong results or may display invalid data. These bugs must be identified and solved for improving the quality of software. So, in the future, we can develop more secure software by using advanced technologies.

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Exam Result Analysis System

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Abstract: To develop an Exam Result Analysis System for students in colleges. It facilitates to access the academic information of a particular student in a particular class. The main objective of theprojectis to provide the examination result to the students in a simple and faster way and help them track their progresswith help of easy-to-read charts.

Keywords: Result Analysis, Visualization, Data Extraction, Result Reporting Sheet

1.   Introduction

Exam result analysis system is a simple web-based application designed using HTML, CSS, and JavaScript. This project deals with the elimination of paperwork and documentation to progress the student performance. Theprojectovercomesthe hurdles of going through lengthy PDFs and gives a convenient portal for students to checktheirresultsandcalculateGPAforthem.Italsohelpsthestudenttokeepatrackof their performance and compare their per semester result with their friends in a simple visualized manner[1]. This designed system willmanage:

a.   Information about various users.

b.   Information about subjects offered in various semesters.

c.   Grade and Marks are obtained by students in every examination. Generation of GPA score sheet

d.   Generate a chart to compare results of student

Introduction to technologies used

JavaScript:

JavaScript often abbreviated as JS, is a programming language that conforms to the ECMAScript specification. JavaScript is high level, often just-in-time compiled and multi-paradigm. It has dynamic typing, prototype-based object orientation, and first-class functions. Alongside HTML and CSS, JavaScript is one of the core technologies of the World Wide Web.[2] Over 97% of websites use theirclient-side for web page behavior, often incorporating third-party libraries. All major web browsershave a dedicated JavaScript engine to execute the code on the user's device as to amulti-paradigm language, JavaScript supports event-driven, functional, and imperative programming styles. It has application programming interfaces (API) for working with text, dates, regular expressions, standard data structures, and the document Object Model (DOM). The ECMAScript standard does not include any input/output (I/O), such as networking, storage, or graphics facilities. In practice, theweb browser or other run time system provides JavaScript API for I/O. JavaScript engines were originally used only in web browsers, but they are now

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core components of some servers and a variety of applications. The most popular run time system for this usage is Node.js.

ChartJS

Chart.js is a free open-source JavaScript library for data visualization, which supports8 chart types: bar, line, area, pie (doughnut), bubble, radar, polar, and scatter. Created by London-based web developer Nick Downie in 2013, now it is maintained by the community and is the second most popular JS charting library on GitHub by thenumber of stars after D3.js, considered significantly easier to use though less customization than the latter. Chart.js rendersin HTML5 canvasandis widely covered as one of the best data visualization libraries. It is available under theMITlicense

MongoDB

MongoDB is a free open source No SQL database used for high volume data storage. MongoDB was released in February 2009 by MongoDB Inc. Unlike SQL databases, which use tables and columns, MongoDB uses collections and documents. MongoDB provides support to many different languages and technologies like C, C++, Node.js, Python, Ruby, etc. In this project, we will be using MongoDB with Node.js. For easy implementation of MongoDB with Node.js, the most important library is 'mongoose.js'. It makes CRUD operation with MongoDB database easier and simpler to apply. Also, there is a wide community that uses this combined tech stack which provides a lot of support for freshers. In this project, there will be a single database with two collections focused on Users' and Songsdetails[4]. The Node.js Restful API will be used to interact with the database collections and documents.

CSS

Cascading Style Sheets (CSS) is a style sheet language used fordescribing the presentation of a document written in a markup language such as HTML.[1] CSS is a cornerstone technology ofthe World Wide Web, alongside HTML and JavaScript. CSSS is designed to enable the separation of presentation andcontent,including layout, colors, and fonts.[3] This separation can improve content accessibility; provide more flexibility and control in the specification of presentation characteristics; enable multiple web pages to share formatting by specifying the relevant CSS in a separateCSS file, which reduces complexity and repetition in the structural content; and enable theCSS file to be cached to improve the page load speed between the pages that share the file and its formatting.
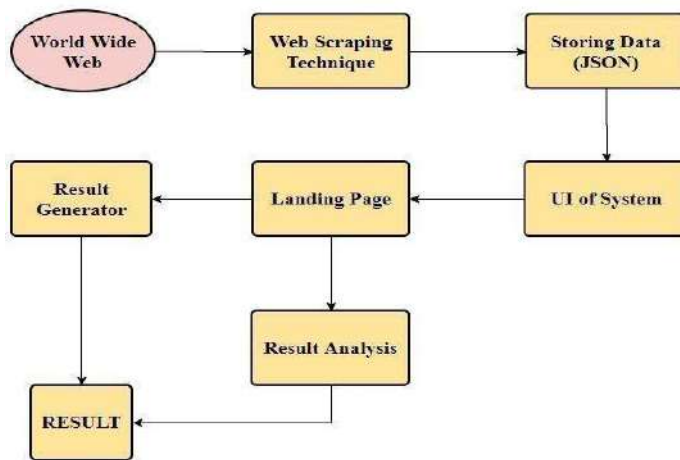
2.   Workflow

Fig.5. Workflowof the system

Our custom-designed web scraper scrapes the official website of IPU for the results. Itthen scrapes the result of an individual student of each branch and stores them in the database. This is a one-time process, that is done to get the data. Once the data is gathered, it is segregated and stored in Json format in the MongoDB database.

Now when the user enters his/her roll number, a get request is passed to the database which fetches the roll number and the result. All calculation is done on the front and the result is displayed. To visualize the data, we use charts. When the user enters roll number for visualizing and comparing, the get request fetches the data of two students. The data is then processed and passed in form of chart coordinates. These coordinates are then received and plotted in the front.

3.   Results and Screenshots

The application has two components i.e., Exam Result Generator and Exam Result Analysis. The following figure below, shows the home page for the Result Analysis component. A student Can enter his registration number and his peer's registration number, and as shown in Fig 3.1 the visualization in graphical format will be displayed alongside the grades ofstudents in all subjects as shown in Fig 3.2
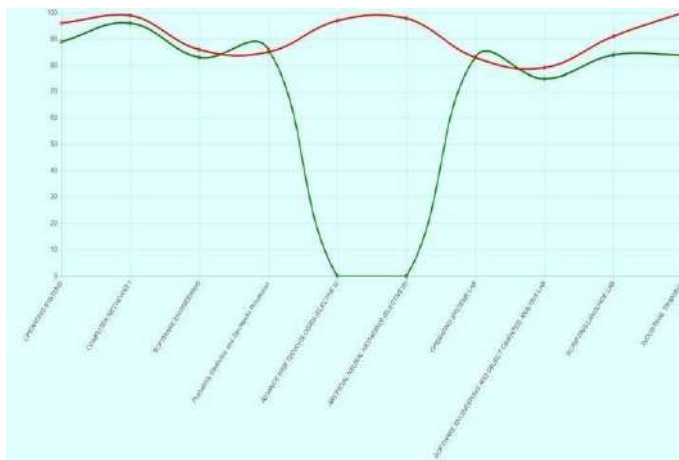

Fig.2. Home page of Result Analysis Page

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Fig.3.1. Grades of student   **Fig.3.2.** Analysis of result of two students with graphs

4. FutureScope

We can make a common portal for all colleges in Delhi NCR where students can come and put in their college name and roll number to access their results. We can enable peer-to-peer results compared withthehelpof graphs.Wecanincluderanksanddisplayuniversity/college/section ranks for each student.

5. Conclusion

Hence, we successfully completed our research on how to build an Exam ResultAnalysis system using the technologies mentioned above thereby solving the problemof students by providing a portal where they can see their grades, get calculated GPA andcompare their results with their previous semesters.

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Collaborative Coding: A novel approach to E-Mentoring in Online Programming Courses

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Abstract: Covid 19 had a huge and sudden impact on all our lives. The lockdown made it impossiblefor people to work together on common problems. This sudden change has affected the way students attended laboratories where they were encouraged to sit in groups of 2,3 to aid each other in the learning process. The teachers couldn't possibly monitor the students or even help them in a effective way. Code-Collab is an application where users can edit and compile their code online, though the main feature of this code was communication through websockets that enabled multiple users to work together. This way not only students could collaborate on projects or experiments but professors could also guide them if they are facing any problem while learning. Code-Collab is built to provide a free space for students to solve complex problems together and aid each other in the learning process.

Keywords: Pair Programming, Web Sockets, E-Learning, Competitive Programming, Computer Applications, Web based IDE0

1. INTRODUCTION

Coding classes have become more complicated due to the COVID pandemic. It is difficult for professors to analyze the approach of their students and therefore hinders the learning process of the students. It has become increasingly difficult for students to prepare for coding interview rounds. It is difficult for students to critically analyze their own code and they tend to fail in addressing their own mistakes. Beginner students often fail to recognize syntax-related errors [1]. Classroom teaching allows professors to helptheirstudents in identifying syntax errors, teach best practices of coding, understand and analyze the approach of their students and then help them in a more efficient way.

COVID-19 pandemic has forced professors and students to opt for online modes for classes. Which has caused many changes in the teaching techniques. It has also drastically reduced the amount of interaction between professors and students thus resulting in a huge drop in terms of efficiency and effectiveness. Professors find themselves stuck with online compilers which do not offer any medium to help or correct their students in real-time. Which causes a lot of wastage of time and resources.

Students face a lot of problems as a beginner in understanding a lot of small intricacies of programming languages like syntax building and writing clean code. In online teaching mode, students often send screenshots of their code and output to their professors and then their professors try to instruct them without understanding their approach.

Students preparing for their coding interviews often face a lot of problems because of a lack of assistance and guidance due to the absence of any medium through which their friends or professors can guide them properly. They often find themselves struggling with a single problem. Before the COVID-19 pandemic, students used to work in a group of 2,3 to learn to solve difficult and complex competitive problems. This has completely drained all the advantages of groupstudy.

2. RELATEDJOB

Pair Programming inEducation

Pair Programming is a strategy development program in which two or more engineers work together on the same project [2]. One of the developers works as a driver to run the program code. One acts as a sailor to update a code made in time. It is advisable that mistakes made by the driver may be identified by the navigator immediately.

Recently, there are studies [3-5] showing that the effectiveness of both programs can encourage students to learn planning skills in planning lessons. Especially when counselors with solid planning experience can help well-adjusted students [6]. In addition, as the industry uses a pairing strategy in many real-world activities, allowing students to master programming skills such as professional code review and collaborative development can benefit them from finding jobs in the future.

E-MentoringSystems

In order to use a two-way system in a university planning course, there are a few computer-based programs to provide a collaborative planning environment [7]. Systems are developed as a plugin tool in an existing integrated development environment (IDE) or as a standalone platform. In a typical case of using such systems, a student can use a computer asking for the help of a powerful interactive tool, and a mentor can also help the student with a computer. These studies show that such electronic guidance can improve efficiency in helping students learn planning skills for distance learning.

CodeChella[8] is a real-time teaching platform based on collaborative programs. It takes a visual tool to produce a practical graph of student programs, and if there are questions related to the program, teachers can support the graph to answer questions through discussion. However, the system should be tested based on input and output data to check for accuracy, and Code-Collab focuses on rational use only.

SCEPPSys [9] has been developed as an Eclipse IDE plugin to provide an interactive array for distributed peer editing. Students can use SCEPPSys to share their code editor to collaborate on or update the codes of others. However, the role of the educator is a spectator of all developmental progress, not involved in two programs. Students have to solve problems on their own and the instructor cannot help them withSCEPPSys.

EdCode [10] is a platform that allows students to share their code with questions to the instructors and ask for help. The instructors can review the code and send answers back to students. EdCode provides both real-time and asynchronous pair programming in case students may ask questions after the class session. However, EdCode only shares the text-based content (program code, questions, and answers), and either students or the instructors have to test the code by pasting it to their own IDE, which is inconvenient if one of the participants just happens to use a device that has no proper IDEinstalled.

CoVSCode [11] is a lightweight plugin of Visual Studio Code IDE developed for collaborative programming. It allows paired students to work together on the same project whether locally or remotely. The collaboration can be performed in real-time, and the notification is pushed to others once one of the participants modified the code. However, similar to the previously mentioned systems, CoVSCode also cannot provide the correctness check for the code. Besides, this study did not mention how the teachers were involved in the pair programming.

Code Helper[12] is a Web IDE that is utilized for e-learning in the classroom, and pairs single students at a time with the teacher to collaborate together. Although joining one at a time might turn out to be agitating at times and may draw away users. Code

helper can also provide a correctness check for the code. This study mentions active participation by the teachers and teaching assistants.

A. METHODOLOGY

Fig. 1 Text editor page

Development ofCode-Collab

Code-Collab is developed using web technologies and both the teachers and students can share program code through the web browser. In an online programming course, if there is a student who needs help from a teacher for solving his/her code errors, the teachercancreateasessionofCode-Collabandthestudentcanpar-ticipateinthesession to sharecode.

The code update is done automatically after each character of code is typed by the reader. Student Editor will call the socket emit function to broadcast the changes in the code Editor. Alternatively, the teacher can perform actions such as checking the program for compilation and use of input data. The reader can view changes such as the combined result, and the output of the execution. Real-time code updates and testing are available to both participants, meaning students can submit questions and testing programs, meanwhile, teachers can get real-timeresults.

As shown on the Code-Collab web page in Fig. 1, teachers and students can perform actions such as editing and sending code (1), entering custom input (2), changing IDE language(3), compiling and executing a program (4)), saving code in the user profile (5), downloading code on the local machine(6) for future reference, output section to display output of the program executed (7).

In order to test code, code must be compiled and used. Once the run button is clicked, the editor code will be sent to the compiler at the end and the compilation result will be returned to the editor. If the Submit button is checked, the code in the editor will be sent to the online judges for testing. Since this action calls the adjudication system an external module, the accuracy-test results will be displayed after the request is processed and the binary code is decoded.

A. UseCases

System name	System features			
	Teacher involved	*Web-based*	*Correctness check*	*More than 2 users can join the session*
Codechella[8]	Yes	Yes	No	NO
SCEPPSys [9]	No	No	No	NO
EdCode [10]	Yes	Yes	No	Yes
Code Helper	yes	yes	yes	No
CoVSCode[11]	No	No	No	Yes

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Code- Collaborator	Yes	Yes	Yes	Yes

Code-Collab was used in the Web technologies course held during the sixth semester of the 2021 academic year. This study is being conducted online due to the COVID-19 epidemic. Until this study was introduced, the study was still ongoing, and Code-Collab was used with only a few students. Usage conditions are divided into two sets of conditions: directing and programming.

In the first case, professors used Code-Collab to guide students who had errors and bugs in their code and were seeking online help for the course. There are ten students who have asked for help. with Code-Collab on two online occasions. Once students have shared their codes with questions aboutCode-Collab,

More time is reduced using Code-Collab compared to cases where Code-Collab was not used and teachers were required to copy students' code into chat tools, paste it into their teacher's editor, review code, and provide feedback to students using the chat tool again.

After the sessional exams, the professor helped the students solve the test problems in order to review the information. There are five problems in the test and each of them requires students to make an independent plan to solve them. The second condition is that a few students are recruited as volunteers and use Code-Collab to create program code as a pairarrangement.

For each test session, the instructor worked with one student in a Code-Collab session. Easy code sharing happens across every line of code typed by the student in real-time. Meanwhile, the teacher would monitor the learner's performance and assist the student when he or she had problems and then make appropriate comments as soon as the learner made mistakes.

In both cases, teachers and students use Code-Collab to share code, compile, create, and ultimately submit to online judges for testing. Since all development processes are done in Code-Collab, they reduce the amount of time you have to change tools.

COMMUNICATION

Benefits of Code-Collab on Online ProgrammingCourses

Table I compares Code-Collab with other similar programs introduced in Section 2. System features compared to Table I to introduce the effectiveness of each e-mentoring system in online planning courses.

Teachers are involved in using Code-Collab which can help students find and solve their problems faster. Such an electronic teaching method is more effective than allowing students to read for themselves. Code-Collab web-based design does not require the installation of additional software or plugins. It simplifies the use of Code-Collab so that administrative participation is not limited to devices and their locations by both teacher and students.

Additionally, due to contact with the online judge, the program code in Code-Collab can be automatically checked for accuracy. It reduces the number of times participants have to check the code on local computers. We also found code collaboration to be more effective than version end controlling like Git. The code quality in collaborative coding turned out to be higher and understandable by everyone.

The challenges of usingCode-Collab

Currently, there is only one session that multiple users can join and benefit from, although in some cases multiple sessions would need to be created in order to help students in either private sessions or other purposes. Such a drawback could lower the students who wouldwanttoaskforhelp personallyafter theclassbutcannotbecauseoftherestriction.

Code-Collab relies on teacher feedback on all student requests. A lack of professors will be too difficult to handle all requests if there are too many students asking for help at one time.

3. CONCLUSION

This paper embraces the concept of collaborative programming in education and developing a web-based IDE called Code-Collab. Two scenarios of using Code-Collab have proven to be effective in helping students solve their problems and guiding them in creating the right code in online codinglessons.

As online courses continue and the world is in the middle of the COVID-19 epidemic, it is necessary to upgrade Code-Collab to support multiple sessions for more students and professors at once. Apart from that, it is necessary to consider whether it increases the number of professors or provides better student planning skills as a teacher to ensure that all help can be addressed in the lessonschedule.

In the future, a list of questions about Code-Collab user information will be provided toanalyzetheviewsofteachersandstudentsinthiswayofteachingbyemail.

Constructive ideas from teachers and students can be helpful in improving the efficiency and effectiveness of Code-Collab.

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PORT SCANNING TECHNIQUES AND MODERN TRENDS

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Abstract. The best offence is a good defence this might be true but vice versa also stands true we all miss an important concept which is reconnaissance similarly reconnaissance can be seen as spying in terms of networking often stated as port scanning techniques hackers often use this as to check whether the port is open for attacking or not most open ports which are made public to better access between peers are most prone to getting attacked port scanning are mostly common tool used by hackers these days to access a wealth of information about a target including the traffic coming over their network how many hosts are on the network information about the services running on available ports and more. Moreover these scanning techniques can be useful to network administrators as to how exactly these technique works as to find fault in their product/services and services and a way to minimize loss. In this review paper we will discuss various techniques used in port scanners these days like full TCP scanning and TCP syn scanning and available flags used commonly in these techniques.

1   Introduction

Globally, technologies are increasing every day. The Internet is a vast network that connects large areas throughout the world so that people can send emails, download files, etc., and also use new technology. Scanning ports is an important information gathering technique, according to these scan statistics one can deduce their shortcoming in systems as to how hackers use these shortcomings to their advantage. However these days many who uses these scanning tools mainly for the purpose of finding shortcomings and helping other organization in overcoming them these individuals or groups are considered as ethical hackers. A hostile port scan can be considered as using scan reports to use open ports andtaking unauthorized access of users devices. These techniques consist of sending a message to a port and listening to its acknowledgement as response. The acknowledgement received can give the status of a port and its operating system and other relevant information.

However as previous work has shown evolving as networks are. As stated in [1] we can see newer techniques by exploring mimicry attacks at the system call itself. A mimicry attack focuses on its core attack sequence to find its natural mutationswithout changing its original goal. The original aspect of mimicry technique revolves around original sequence and its mutation, while trying to oppose this attack all mutation attack sequences are used to mask the original, by the time the attack is detected its too late to counter [2].

Generally port scans are widespread knows as activity on network often as part of mal-

ware attacks [3]. As the growth of these malware attacks continues so does the prevalence of port scanning techniques.

Significance of Port Scan

Port scanning is done for probing host network for open ports and other services and network auditors use port scans as a useful technique for recognizing precursors of attacks [4]. From a attackers viewpoint, a port scan is useful for gathering information regarding system. Thus port scanning is of considerable interest to both attackers as well as defenders. However attackers usually mask their identity and are hard to trace back [5].

2 Literature Review

Organization of paper:

Organization of the paper is as follows: Sections in literature review are divided into 3 section, in section 1 we present Port scanning and its types and in Section 2 we have various approaches to port scan detection we have seen thus far. In Section 3 we will discuss about research and findings.

Port scanning and its Types

Generally, machines are connected to a network which has 65,536 ports which are a combination of either only TCP or only UDP or a combination of both. An attacker generally uses below given techniques to initiate an attack [6].

These 65,536 ports can be categorized as
i.   Known open ports (0-1023)
ii.   Registered port for host network (1024-49151)
iii. Private port (49152-65535)

Normally a port scan does not specify whether the one who initiated the port scan is hacker or network administrator but it does specify weather the port is open or not and when it is vulnerable for attack. As stated in [6] port scan is generally performed on TCP port because they are connection-oriented service, while even UDP ports are vulnerable but since they provide connection-less services , they do not readily provide relevant information about host device, and also UDP port are easily blocked by network defenders such as firewalls.

Scanning Techniques:

i.   TCP connect() Scanning: connect() here represents the three-way handshake. Ifconnect() succeeds, a connection was made. This allows a basic type of port scan to attempt to connect() to every port on a system. If it succeeds, it flags every port as open which it was able to connect to [7].

ii. TCP SYN scanning: SYN scan which, instead of using OS's network function,SYN packets are generated which, if an open port is found it sends a SYN- ACK flag response when it sees and open port. This type of handshake encourages half open ports hence called half port scanning or just SYN scanning. All ports that are flagged with SYN-ACK flag responds with RST flagged packet, a rst flag packet also indicates closed port, all flagged ports are called as filtered ports [7].

iii. UDP scanning: UDP scanning targets UDP enabled ports, which generally provide connection less oriented service, which as we know are unreliable, ahost port sends UDP packets, a closed port responds with ICMP message.

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Ifthe port is filtered it falsely notes it as open port and if the port is open the target host does not respond [7].

iv. ACK scanning: This scan does not differentiate between the closed and open ports, but between filtered and unfiltered ports. All open and closed ports are considered as unfiltered ports. These type of scans are generally useful when we are dealing with firewalls and other network defenders [7].

v. FIN scanning: In unmaintained host network which lack any firewalls or network defenders, generally SYN scanning prevails but with the increasing and advancement in network defenders and firewalls SYN packets fail to bypass, hence we use FIN flagged packets. All the closed port on host responds with RST flagged response opposed to incoming FIN packet, and

vi. all open port simply ignores FIN packet [7].

vii. X-MAS scan: Similar to FIN scan, just instead of single FIN packet, URG, FINand PUSH flagged packets are sent in order similar to a Christmas tree [7].

viii. NULL scan: empty packets are sent to target host [7].

ix. Protocol scan: This scan finds which protocols like TCP or UDP are enabled othe port [7].

x. Proxy scan:main principle behind mutation based attack which basically mimics the original attack sequence by generating proxy or mutation attack sequence which work parallel to original attack sequence. When detected target host will note down proxy'sIP address as a source of original attack [7].

xi. Ping scan: when hundred's of ports are to be probed on a device or entire subnet, the first goal is to check whether the machine is up or not, this I possible only with ping scan as ping scan will either use real pings to check each and every port or it will use special TCP ping to probe parts which is usually open (i.e. port 80) [8].

xii. Stack Fingerprinting: It is the technique used by port scanners such as NMAPand QueSO which have implemented external databases for incorporating fingerprints (fingerprints are newly generated OS templates). Due to sheeramount of constantly increasing database, the amount of OS identification has flawlessly improved [8].

Modern Port Scanning Tools

Advanced Port Scanner:

Targets open ports readily, IP scanner provides domain name common name and version that is running on detected port. Port scanner uses multi-threaded approach to complete the scan fast. Port scanner tool allows executing commands remotely on the discovered system and easy access to shared resources.

NetCrunch:

NetCrunch [10] monitors the entire IT infrastructure without the agent. NetCrunch recognizes systems with IPv4 / IPv6 addresses. NetCrunch monitors network services, bandwidth, and traffic, flows, and , and routers from the switch. NetCrunch supports most of the operating system and monitors . This includes Windows, Linux and MacOSX. It monitors files, folders, web pages, WMI or SQL queries. NetCrunch collects Windows event logs, and 444 and monitor text logs. NetCrunch has rich user interface

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displaying network, topology, current network traffic, structure, traffic volume , average traffic, last a hours or 2 4 hours, detail view each node, status, dashboard display 444 top problem node, node slow response node, busy state Sends an alert to the user when a pending task needs to be performed on a node traffic network.

Nmap:

Tool was built by Fyodor. Nmap (Network Mapper) tool is UNIX and Windows based port scanners. Nmap [8] can also be used as a command-line program. Nmap enables in performing various types of scans in order to identify the services running in the targeted host and also identifies target host's operating system, MAC address, host name, net-bios name, and fqdn, it provides options to control the speed of the scan i.e., specifying the time to scan the target host.

Angry IP Scanner:

Angry IP scanner is a very fast IP address and port scanner it can scan ip addresses in any range as well as their ports it is manifold and lightweight no installation required it can be freely copied and used anywhere angry ip scanner simply pings every ip to check if its alive it optimally probes its host and determines scans ports etc theamount of data collected per server can be extended with plugins it also has additional features such as net-bios information computer name work-group name and currently logged on windows user preferred IP address range web server discovery browser customization openings etc.

Unicornscan:

It's widely known because of its asynchronous TCP and UDP scanning capabilities, along with non-common network discovery patterns that provide alternative ways to explore details about remote operating systems and services.

Unicornscan features

- Asynchronous stateless TCP scanning.
- Asynchronous UDP scanning.
- IP port scanner and service detection.
- Remote operating system detection.
- Enable multiple modules from command-line

Zenmap:

Zenmap is not a new port scanner but it's nmap with better gui implementation. Theedge it provides over nmap is its functionality and user friendly nature.

- Save scan results in a database.
- Search the results database.
- Compare current scan results with previous scans.
- Save port scan profiles for frequently used port discovery options.

Mitec:

It is a free multi-threaded ICMP, Port, IP, Net-BIOS, Active Directory and SNMP scanner with many advanced features. It is intended for both system administratorsand general users who are interested in computer security. The program performs ping sweep, scans for opened TCP and UDP ports, resource shares and services. For devices with SNMP capability available interfaces are detected and basicproperties

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displayed. In addition you have to edit results, save/load results to/from CSV and print network device list and any data in any section can be exported to CSV. It can also resolve host names and auto-detect your local IP range.

3   Conclusion

Each framework is helpless against port filtering. Never acknowledge the default establishment of working frameworks. Most default establishments have various ports open to permit a more noteworthy adaptability. Before a framework is put on the web, a port output ought to be performed against the framework. Assuming that more ports are open then, at that point, required, close those ports. The more prominent number of administrations that your framework offers, the more helpless the framework. Intermittently check the document and the run control records on your framework for unnecessary administrations. On the off chance that a framework has been compromised, aggressors might attempt to open up more ports on the framework so they can all the more effectively exploit the ports shortcomings. The more cautiousthe framework director is, the more safe their framework will be to entrance and the least logical they will be taken advantage of. There are a great many number of stealth scanning techniques available to the attacker and system administrator today. The number continues to rise as the security community continually aims to catch up to the latest method of stealth scanning and this trend shows no signs of stopping. The lesson learned is that security professionals must be as well equipped as possible to thwart attempted port scanning activities. They must be as current with emerging technologies as the people trying to attack their computers. Only through due diligence and constant learning can a security professional detect such complex activities such as port scanning. Security professionals must be prepared to combat stealth scanning attempts using any combination of techniques available to the attacker.

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Road Accident Severity Analysis and Prediction

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Abstract: In the light of 21'st century where vehicles have been largely adoptedand used, there has been a growing concern of road accidents whether that be dueto external factors or human carelessness. More than half of the road accidents are against vulnerable road users such as pedestrians, cyclists and motorcyclists.The objective of this paper is to do a comprehensive analysis of road accidents inNew Zealand & Australia and use the extensive data calibrated for the countriesto assess the road accidents and devise a prediction model for accidents. Thus, itis intended to gain some insights using optimized machine learning and classification techniques for estimation of road accidents severity to enable road safety in a more efficient manner.

Keywords: Severity prediction, Classification, Decision Tree

1. INTRODUCTION

The growth of countries and populations has given rise to various externalities, with this growth there has been an extensive growth in the number of vehicles that are there on the road, thus an increase in road crashes. Approximately 1.3 million people die each year as a result of road traffic crashes, based on economic, social, and environmental factors of the countries. Many efforts have been made to reduce the frequency and severity of traffic accidents. The most efficient way to tackle the problem is by means of an extensive program of road safety management in which road safety modeling is essential.

The modeling process attempts to adjust a model to the crash data, the geometric and operational characteristics of the road, details and conditions of the driver, and the environmental conditions, incorporating the most important factors. A rapid growth in urban populations, combined with more cars, trucks and public transport vehicles, makes the task of providing safe mobility a complex challenge.

The global average of road fatalities is 18.2 deaths per 100,000 people [7], with lower income countries suffering a higher prevalence and higher income countries seeing lower rates of fatalities. Australia ranks 15 out of the 31 OECD countries (Organization for Economic Co-operation and Development). Fig 1 (a) and Fig 1 (b) show the trend of deaths due to road accidents over an average of 25 years in Australia and New Zealand which are our primary areas of focus for this research.
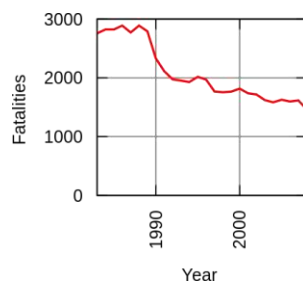

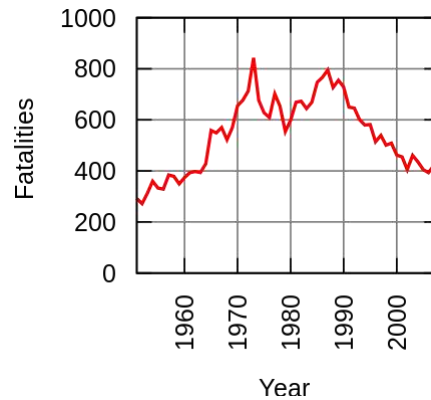**Fig 1 (a)** Fatalities due to road accidents in Australia from 1983 to 2008

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Fig 1 (b) Fatalities due to road accidents in New Zealand from 1951 to 2008

Traditionally, statistical modeling techniques have been used to predict crashes and classify their severity. However, the limitations of this approach have been widely explored, offering an opportunity to use new approaches, such as machine learning (ML) techniques. The objective of this paper is to present a solution via the use of MLtechniques to analyze crash data, predict crash frequency, and classify severity.

2. Data Description and Reliability verification

This section presents the data source adopted for this study. As the study of these countries hasn't been done before both taken at a time, in this section, we describe thestructure of data reliability verification for the same.

Data Description

The data being analyzed is based on road accidents of New Zealand and Australia from 2000 – 2020. This dataset has been obtained from Kaggle which is a vast online community with contributors from around the world providing vast verified datasets with easy access for further data analysis. The ratio of individual country data in the dataset is approximately 62:37 (see Fig 1) of Australia and New Zealand respectively.The data contains information about road crash with parameters such as location, time,vehicles involved, casualties and description of conditions such as severity, speed limit,weather and many more characteristics Fig (2). Statistical analysis of data reveals that over 61% of vehicles part of accidents are sedans followed by 3% 4x4 cars. Over 15.2
% of these accidents had involvement of some kind of inanimate object. The dataset
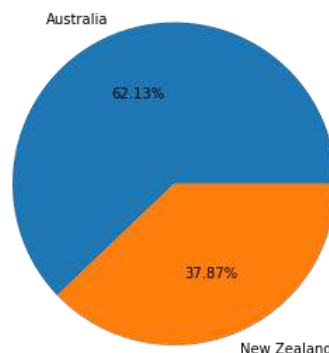
categorizes severity into 4 types which are property damage, minor injury, major injury and fatality About 59% of accidents involved are property damage while only 1.5% are fatality.

Fig 2 Country wise distribution of accidents

Table 1. Features used for accident prediction

Feature	Values
Speed limit	0 – 50, 50 – 80, 80 – 90, 90 – 100, 100-110
Midblock	Yes, No

Intersection	Yes, No
Road position horizontal	Curved View Obscure, Curved View Open, Straight, Unknown
Road position vertical	Crest, Dip, Level, Slope, Unknown
Weather	Fine, Fog, High wind, Mist, Rain, Smoke Dust, Snow, Unknown
Lighting	Darkness lit, Darkness dusk, Daylight, Other, Unknown
Traffic controls	Give way Sign, Manual Control, Pedestrian Crossing, Railway Crossing, School Crossing, Stop Sign, Traffic Lights, Other, None
Latitude & Longitude	-
Vehicle and their count	Sedan, Animals, Pedestrians, Trucks, Trains, Trams etc.

Data reliability verification

As no prior research has been done using this dataset, before moving forward with pre-processing of data we need to conduct its reliability verification. For this we consider the latitude and longitudes from the dataset and use visual plotting tools for intuitive analysis. Fig 2(a) and Fig 2(b) shows a plot of cluster of coordinates present in dataset on a real-world map. Through this we gain a macroscopic view of where our datapoints lie. For further verification we further went ahead and iterated through all the coordinates determining if all of them lie in the boundaries of Australia and New Zealand using comparison with the respective countries minimum and maximum latitude and longitude, which also gave us a positive result same as the map plot.

Fig 3 (a) New Zealand   **Fig 3 (b)** Australia

3. Machine Learning Paradigms

Machine learning approaches can be categorized into 3 types mainly that is supervised, unsupervised and semi supervised. Supervised learning is used for classification and regression-based problems where what we want to predict is already known and can be labelled. On the contrary to supervised when we want to predict unknown relations between given data, we use unsupervised algorithms where the labels of the result are not predetermined but a similarity in the data points is used to form clusters of data. Semi supervised is one where we use combination of both supervised and unsupervised to devise predictions.

In this paper we have used the popular python scikit learn library to execute the listed below algorithms and perform unsupervised learning to predict severity of accidents.

Decision Tree

It is a supervised learning algorithm which is most commonly used for classification problems. It can work both categorical and continuous dependent variables. This algorithm is based on most significant attributes/independent variables to make as a distinct group as possible. The parameter in play in this type of model are entropy (1),information needed (2) and information gained (3). Using these parameters decision tree algorithm chooses the most important parameters and keeps branching until for every branch we have a definite outcome.

$$Entropy = -\sum_{i=N}^{i=1} pi * log2(pi) \qquad (1)$$

$$Attribute\ Info\ =\ \sum_{i=N}^{i=1} \frac{pi}{p} * Entropy(pi) \qquad (2)$$

$$Gain\ =\ E_{parent}\ -\ E_{children} \qquad (3)$$

DBSCAN

Density-Based Spatial Clustering of Applications with Noise (DBSCAN) is a density-based clustering algorithm which takes a point and clusters them based on same properties. It relies on only 2 parameters epsilon and minimum points. This clustering starts by randomly selecting a point as center and then find all points falling in the epsilon range of this point all of which forms a cluster which in turn broadcast their own epsilon range to expand upon the cluster range. This process continues until thereare no more points in the range of all points inside the cluster.

This specific clustering algorithm was chosen because of its ability to determine the number of clusters to be formed on its own without needing to specify a number for clusters to be formed beforehand.

We use haversine metric to calculate the distance between the coordinates and cluster them at distance of 2km. This distance was purposely chosen to be small because of lack of computation power for higher values of epsilon.

4. Methodology

In this section we study the methods used for prediction study and discuss its application for forecasting traffic accident severity. The algorithms are implemented using python in this study. To ensure and improve the prediction accuracy, data pre - processing including data cleansing and data normalization is carried out beforeseverity prediction,

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after which we apply decision tree to predict the severity of the traffic accidents. To prepare a prediction model the pareto principle has been used where 80% of the available data inputs are used to train the model and 20% of the inputs are used to get the outcome and predict the rate of true positives, false positives, true negatives and false negatives to determine the accuracy of the prediction model.

Preprocessing

It is of great importance to understand the nature of the available data and try to perform in-depth data analysis. Data preprocessing is very useful for meaningful data analysis; what we need to do is data cleaning, data normalization, and data selection in different class before our prediction analysis is done.

Data Cleaning

Data cleaning is the process of identifying incomplete, incorrect, inaccurate, or irrelevant parts of the data and then replacing, modifying, or deleting the dirty or coarsedata from a record set, table, or database. As part of our statistical analysis, we found attributes like weather & lighting having over 10 % null values and traffic controls androad positions having over 23 % null values which were predicted by training a decisiontree model on rest of attributes as factors.

Another step we required was the binning of speed data. In our original dataset the speeds were present in both continuous and discrete forms which were all converted to 5 bins ranging from '0 – 50', '50 – 80', '80 – 90', '90 – 100', '100 – 110'.

And in last part of cleaning, we clustered latitude and longitude using DBSCAN with parameters of 2 radians to simplify classification. The parameters taken as input to determine the outcome in the end were speed-limit, midblock, intersection, roadpositions, weather, lighting, traffic-controls, location (latitude and longitude) andvehicle count. The severity of the accident versus the speed limit and lighting conditionscan be seen in Fig 3 (a) and Fig 3 (b) respectively.
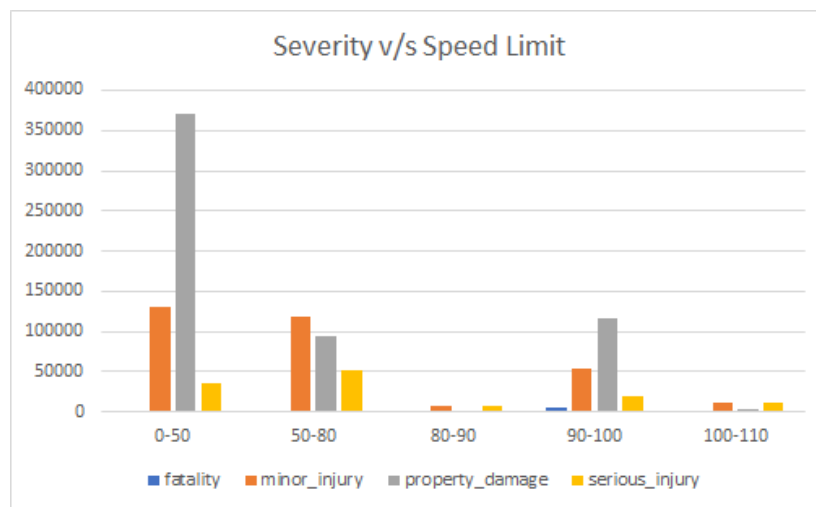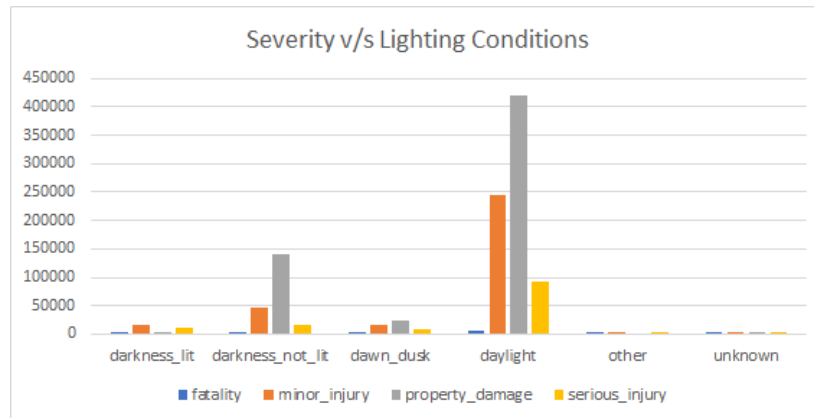

Fig 4 (a) Severity v/s Speed Limit

Fig 4 (b) Severity v/s Lighting Conditions

Performance

After processing the dataset, we applied decision tree on it with severity as our output and rest 28 attributes as factors. As the data is imbalanced with relation to major injury and fatality classes, we choose 2 techniques to overcome it which were oversampling and the other was to reduce the severity labels by merging major injury and fatality dataset into single class. Training model on both individually we got that even though oversampling gave us 81% accuracy, it's 5-fold validation gave us an accuracy of 74% and a deviation of 2%.

Table 2. Oversampling Method Confusion Matrix

	Property Damage	Minor Injury	Major Injury	Fatality
Property Damage	96682	14082	4408	693
Minor Injury	29308	73185	16268	2705
Major Injury	2860	13020	96376	4011
Fatality	38	1368	5112	109120

Table 3. Merged Classes Method Confusion Matrix

	Property Damage	Minor Injury	Major Injury or Fatality
Property Damage	22432	11466	3513
Minor Injury	7191	47190	351

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Major Injury or Fatality	9986	2515	5009

After further analysis we categorized the data into two that is minor injuries and serious injuries which gave us a binary outcome of 0's and 1's where 0 being a low severity rate while 1 being a high severity rate. In low severity property damage and minor injuries were considered whereas for high severity, fatality and major injuries were considered. Here by no oversampling of data was done and a decision tree was appliedover the data with these severity outcomes and an accuracy of 87% was obtained.

5. Conclusion

In this study we were able to do a prediction analysis of two counties both taken together. With basic cleaning of data, a decision tree gave us an accuracy of 60% but with further processing of data such as clustering and applying oversampling of data due to imbalance in the training data of the severity labels an accuracy of 81% was seen. With validation methods it was concluded that some overfitting can be seen in thedata as a k-fold validation gave us an accuracy of 74% with a deviation of 2%. To further improve the prediction, model the severity levels were reduced to a binary outcome which gave us an accuracy of 87%. The calibration curve (Fig 4), which showsthe deviation of the predictions from the ideal line of predictions as shown in the Figure. It can be seen the model can be further improved by using algorithms such as XG-boostand Deep Forest which require lesser parameters and can reduce issues such asoverfitting.
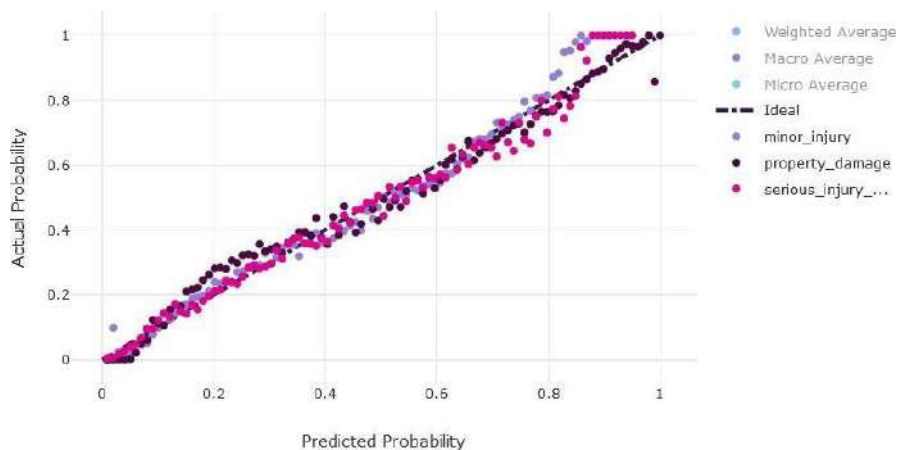
Fig 5 Actual Probability v/s Predicted Probability

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Fake Product Review Monitoring System

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Abstract - With the digital revolution more and more people are shifting to online stores from the traditional ways. In this new world, review of a product plays a vital role in deciding the fate of a product. One positive or negative review can change the product's performance in the market. With this high dependence on the product review it is likely that foul methods can be used to publicize or defame a product and hence end up making these online stores and products lesscredible.

A fake product review can be put up by the seller to glorify its product so that more and more people are drawn towards it and buy it. It can also be used by dissatisfied customers or competitors to create a deceptive image of the product to damage the selling capability of the product or harm the seller. Both these issues affect the customer directly and do not allow the right product to reach them. The reviews can either encourage or relegate a product; therefore, posting fake reviews has turned into a money-spinning business in the modern period.[5]

Keeping this issue in mind in this paper, we propose a framework to detect fake product reviews, both negative and positive. This is done by making use of IP address tracking by which the admin can track the reviews that are coming from the same IP address and remove them if they are found to not be legitimate. Opinion mining also known as sentimental analysis is also being used which takes into view a spam dictionary to identify spam words in the review[4]. For text mining we apply several algorithms and on the basis of these algorithms we get the desired result.

Keywords - Product Review, Fake product, opinion mining, machine learning

1. INTRODUCTION

Online shopping has grown tremendously.[9] The scope of e-commerce websites and online products has been skyrocketing in this covid era. People tend to opt for purchasing goods online if there's any availability of that product on websites rather than risking their health and going out to buy products. But this scenario comes with a drawback that people don't get the advantage to physically inspect the product, rather they would rely on the reviews for that product that were being posted by the other users on e-commerce platforms.

As demand for online purchasing has been increasing, people come across various reviews on different e-commerce websites. Most of the people go through these reviews before buying any product online. These reviews for a product may turn out to be positive or negative. The positive product review will grab much

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more attention from the customer than the negative reviews. Therefore, these product reviews can affect any business and they also have the potential to bring along financial losses or profits. There are many reviews posted by the customers to put forward their views regarding the product they have bought. But along with these true reviews, there are many fake reviews which can affect the purchase of a good product. This can work against the users as well because users can sometimes bombard the review section with extreme opinion comments which can work in favour or against the product.[6]

In this paper, we propose a framework to detect fake product reviews or spam reviews by tracking down the user's ipaddress. If the admin portal found out that a particular commodity has been reviewed multiple times by the same ipaddress then it allows the admin portal to delete those fake reviews. This would also affect the rating of that particularproduct.

In this framework, we also utilise a paradigm known as Opinion Mining that will help us to calculate the average rating of the product based on the sentiment of the review posted. Opinion mining is also known as Sentiment Analysis. In Sentiment analysis, we try to figure out the review of a customer through a piece of text. We first take the review and check whether the review is positive or negative or neutral using sentimental analysis. We use a predefined set of words to identify the spam words in the reviews.[7]

But due to multiple fake reviews posted by the buyer or the seller, the rating of the product can get affected negatively. So this model can help in eliminating fake reviews and bring the rating of the product to its original worth.

2. METHODOLOGY
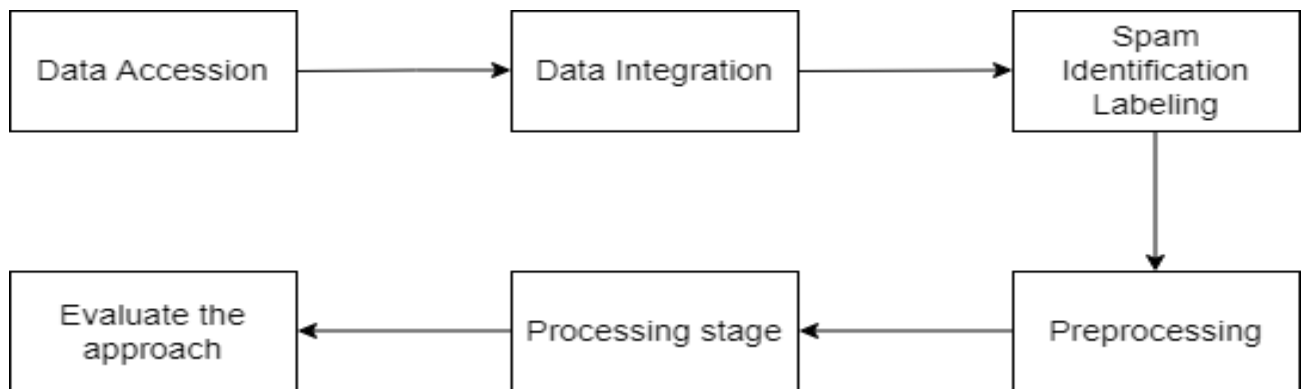
Figure 1. Understanding the steps involved in methodology at a glance

DataCollection:

This is a first step where we collect genuine and spam reviews data from online e-commerce websites or applications like Amazon, Flipkart with different characteristics and sizes.[1]

DataIntegration:

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In this step, we combine the data from multiple review source data sets into a coherent form

DataLabelling*:*

After Integrating the data from multiple resources, we manually label the data into 2 categories, namely, Spam Review and Genuine Review.(Fig 2)
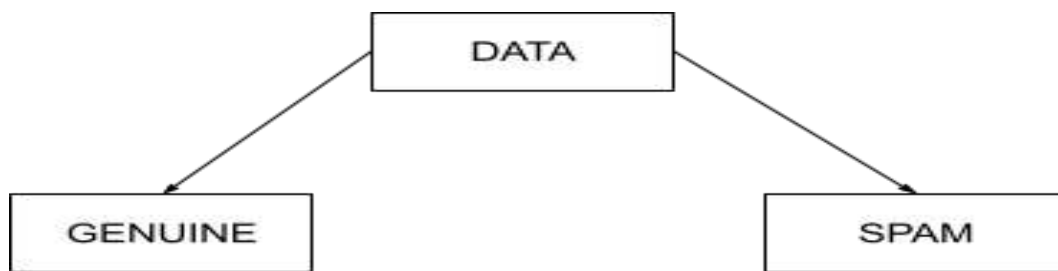

Figure 2. Classification of reviews into 2 types

2.4Pre-processing*:*

Before using the labelled data to train the model for classification we are required to make some pre-processing to handle the missing, noisy and inconsistent data. There are multiple pre-processing techniques such as case folding, dam character erase, tokenization, slang word handling, stop word removal, stemming and number handling.[3]

Processing Stage:

In this step, We need to train the data over machine learning models such as Naïve Bayes Theorem, Decision Tree etc for bi-classification.[12]

Modal Evaluation:

In this step, we compare the results of above models trained with different hyper-parameters to find out the best possible model for our solution.

3. EXPERIMENTALRESULT

Naive Bayes Theorem: [14]It is a popular classification algorithm. It is based on Bayes Theorem with strong and naive independence assumptions. It simplifies learning by assuming that features are independent of a given class. It can be used to classify text which can further be put into human readable form. It fast decisions making process compared to otherclassifiers, and the Naïve Bayes often works well on even a small amount of training data.[8]

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DecisionTrees:[13]A very specific type of probability tree which contains a root node, branchesan-dleafnodes.Testing an attribute is on every internal node, the outcome of the test is on branch and class label as a result is on leaf node. It is a type of machine learning algorithm which can be used for both Regression andClassification based problems.
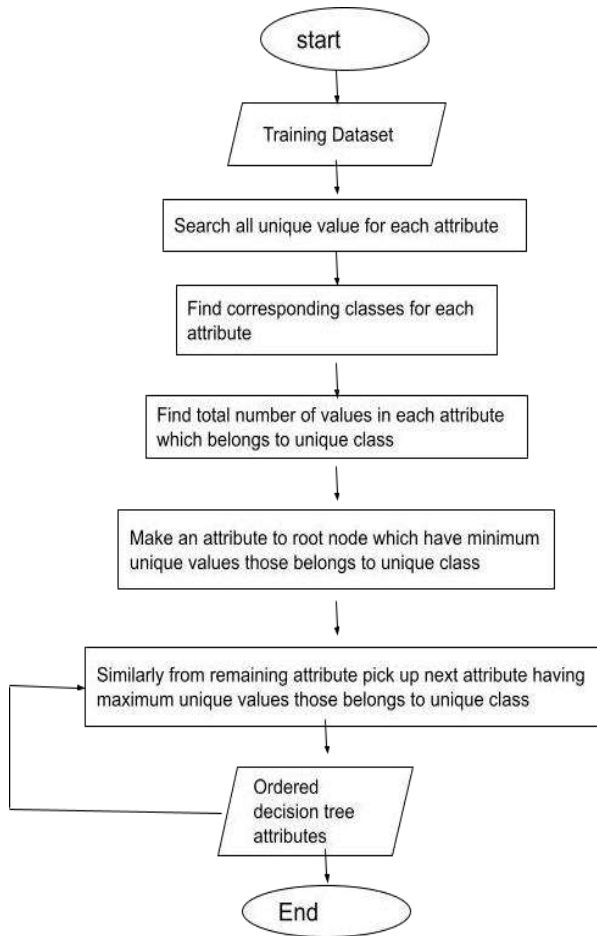

Figure 3. Understanding decision tree

We evaluated our proposed system by training our model using a dataset containing thousands of amazon product reviews that was downloaded from an open website.[12] Then the trained model was used to rate the product on a scale of 5 using the user reviews. The pre-processing of the review text is done by removing the stop words (which do not convey any sentimental meaning). This task of pre-processing is accomplished using the nltk library which contains Englishstop words.

In addition, we extracted other features from the reviews such as total capital character count, total number of punctuation found in each review, number of emojis (if any) in each review. We will consider all of these to measure the accuracy of the algorithm and performance of the model.

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We showcase the results for the experiments using Naive Bayes Algorithm as a classifier (Table 1).

Table 1: Results of the experiments

Classification Algorithm	Accuracy in the absence of features	Accuracy in the presence of features
Naive Bayes	86.67%	85.84%

ADVANTAGES

Maintaininggenuity
Lack of fake reviews will in turn help in adding real value to the product thereby users can recognize the authenticity of the product without a second thought. This will also add value to the platform since they will be perceived as more genuine and real.[2]

Savingmoney
Users will save money as a direct consequence of being able to recognize the authenticity of the product. They will be able to make accurate choices whether they want to buy the product or not instead of being manipulated by fake reviews.

4. CONCLUSION

With the growth in technology more and more websites are coming up selling millions of products and each product has millions of reviews and these reviews are the basis for the purchase of the product. With people and organisations trying to use these reviews to deceive the customers from buying the right product. Our research and the software following the model will help to monitor and remove these deceptive reviews and help customers choose the right product for them.

Our software will analyse the reviews by making use of IP address tracking and sentimental analysis and if a fake review is detected it can be marked and removed immediately hence providing the users with honest reviews and best products being delivered at their doorsteps.[10]

With more and more advancement in technology happening, new methods for sentimental analysis and tracking are being developed and with the swift shift of the crowd towards these web stores this model is very future proof and ready to be implemented.

5. FUTURE SCOPE

The direct success of a proposed model is defined by its implementation in real world scenarios and finding the solutions to its underlying loopholes that can cause the model to fail in future. Here some loopholes are mentioned about this project that can be resolved in the near future when this model gets implemented in e-commerce websites.

The admin has to manually block the spammer's account by tracking down his id which can prove to be a laborious task for the admin. So automatic blocking of the ip addresses can beimplemented[11].

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If the admin of the products recruits a social media managing team which can post fake reviews using different systems or ip addresses than our system will fail to track down the spam reviews

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Video synchronization for clients all over the network

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Abstract. This work here attempts to provide a solution to users anywhere around the globe to media from websites like YouTube or any other streaming service. With exponential growth in technology, it is still noted that watching and consuming media together with your peers or other clients all over the globe. The development of a streamlined approach with having an accurate stream to the very timestamp along with your video sharing will eventually in- crease user retention and be of more utility to consumers. Abstract and adaptive streaming over HTTP has been used as a standard for a long time and adjusts video quality depending on the network capability of the user but on video- sharing streams, this should not be a bottleneck for other users, since the stream share should be dependent on each user's capabilities. The approach as mentioned below discusses various strategies that were decided upon, why they were rejected and what draw-backs existing technologies have.

Keywords: Synchronization, Web sockets, RTC, Network, Multimedia.

1   Introduction

In the past year of 2020, we collectively saw a huge boom in video chat technologies; be it google meet, zoom, Teams, or any other platform. Even for education, these platforms were the most used [1].

The issue with teaching or presenting with these was that there was only a screen share feature which solely depends on the network of the person sharing, if that is not optimal then the other members in the meet are for sure going to face lag and choppy videos even if they have a good connection. We propose in this work to use synchro- nization of video with the help of web sockets so that whenever someone needs toplay a video, there is no single point of failure which may cause others to face an issue. Assuming, someone wishes to play a YouTube video on meet with video on, hewill need to screen share that but we are aiming, after thorough research and analysis for the usage of Web Socket to pass time stamps along so that videos can be synchro-nized.

The person who wants to share the video will be pasting the link, and the rest will be up on the server to handle the synchronization process so that everyone is at the same frame of the video. The server will peri-odically analyse and check where thehost is in the video and that timestamp will be broadcasted to each client, which the player at the front-end would synchronize. In order to avoid frequent time synchroniz-ing which might cause user experience issues we will allow the player to give **±2.00 seconds** of leeway. If the clients feel that for some reason automatic synchronizationis not up to the mark, there will be an option for them to man-ually jump to the host option which will allow them to manually get the timestamp of the host and the video player will automatically jump to that instance. We will be improving upon the cur- rent HTML5 video player.

2   Literature Survey

Websockets and WebRTC have been used extensively all over the internet to provide users with an open channel of network communication and a bi-directional communi- cation channel between the clients themselves. The data we are passing back and forthinclude encrypted video, audio, messages, timestamp of the video being played in the video player, and other metadata. Let's look into these concepts further –

Websockets

HTML5 brings websocket protocol to the table that helps in improving real-time communication and is a better alternative than the long polling technique. Due to its full duplex nature, it does not entirely rely on HTTP [2].

We will be attempting to use this to improve upon the existing synchronization processes that use long polling as their base.
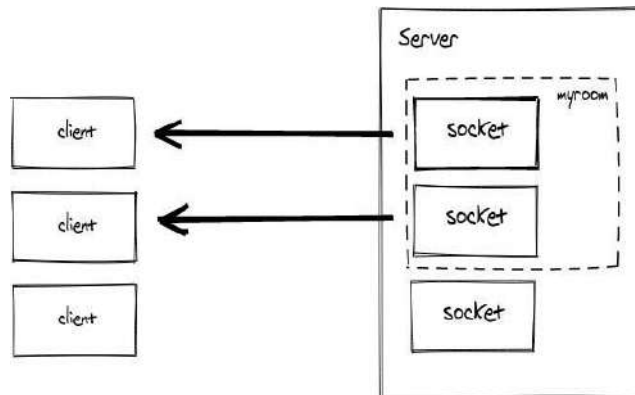

Fig,1. Technical diagram for working of websockets

This approach of using sockets allows us to create rooms that will allow only users to join in and share information over the network with the server maintaining the com- munication channel open.

RTC Connection

According to W3[3], allows peer to peer dynamic communication that will help to keep our connection "alive". As a part of HTML5, WebRTC is being used as a high- er-level API to abstract the RTCPeerConnection. Under the table, WebRTC uses a number of foundational technologies to provide these protocols to us.
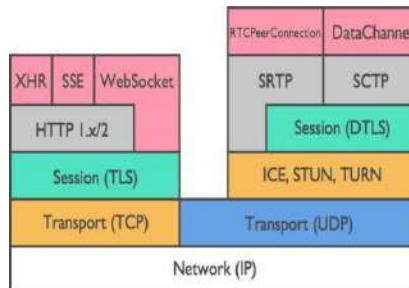
Fig. 2. Call stack for WebRTC

TURN, ICE and STUN are used over UDP to secure all data transfer and provide encryption to the system.

3   Methodology

The flow of information or the architecture that we propose is of the following man- ner –
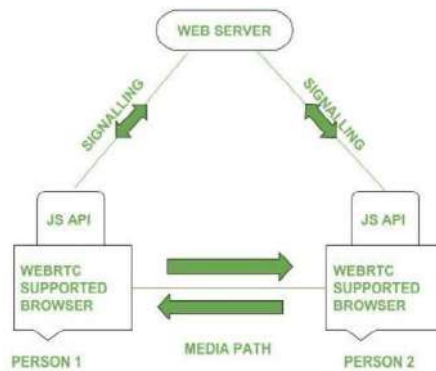
Fig. 3. Flow of the System

WebRTC is necessary for our proposal to keep the video chat functionality available and web server "signaling" through websockets is there to transfer the timestamps of the video to keep all clients at the same point through- out.

Memory Consumption of various approaches

Analysis was done on the amount of bandwidth consumption these different ap- proaches took and this gave us a clear idea what type of connection is suitable if you want to serve media to multiple clients at once and need to synchronize those as accu-rately as possible.

Elapsed time (in seconds)	Transport overhead in each time period			
	Polling	Long polling	SSE	WebSockets
30	6819	2273	974	846
150	6819	2273	57	1
210	6819	0	0	0
240	6819	2273	57	1
300	6819	0	0	0
Total(in bytes)	34095	6819	1088	848

Fig. 4. Transport overhead in each connection

The overhead needed for the network bandwidth for transporting requests is in bytes and it was evident that if you want a keep alive connection [4], we might need to take an approach that uses less network bandwidth and websockets was a clear winner. Although it takes comparatively higher bandwidth "when initiating" a connec- tion.The subsequent data is less.

Our Webapp's Structure

You can check out our website's structure here, the video is being played in the centerand, as you can see, it synchronized to the second.
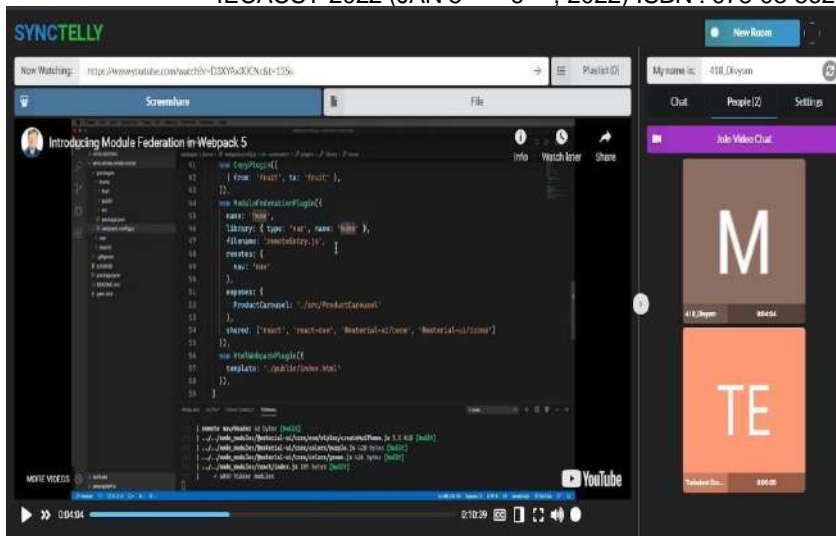
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Fig. 5. Upper view of main screen

The 'Join video chat' option enables user to jump into a video call and improves us-er's retention as well as their experience.
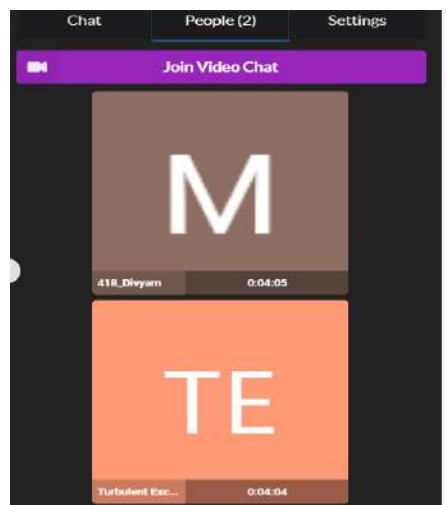

Fig.6. People in chat and how they're shown

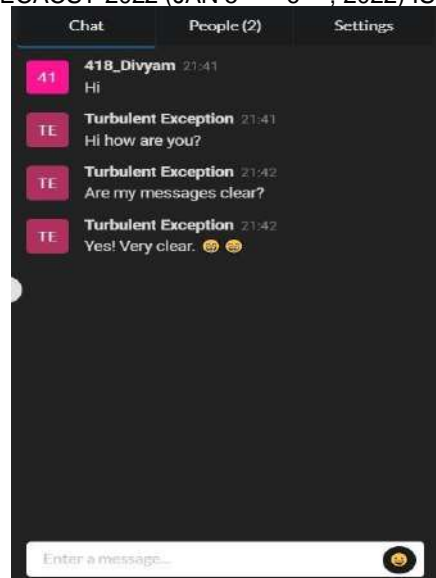You can also see that chat is working fine and is available for the current session only.

Fig. 7. Chat message window

In order to create unique room names that will be appended at the end of the URL, weare using a random name generator [6]. These ensure that no 2 rooms will have the same room name and unique URL will prevail avoiding any and all cases of conflicts in URL names. In case of a conflict, a new room id is looked for instead of bothrooms being purged as a security measure.

4   Result

At the end of this paper, we have discovered why video synchronization of clients over the internet is essential along with the most network bandwidth efficient manner we should approach it. We have also successfully developed the web application for the same and experienced low latency and lag free videos with not much data being used and instead of depending on the host's connection our web app's functionality depends on the client itself.

5   Future Scope

We can add the ability to encrypt the entire experience since currently only video call,chat and audio is encrypted. Encrypting passwords more strongly and adding a salt to it so that this web app can be even more secure is also a good approach. Allowing users to save rooms once signed in and we can make sure no one is able to access them apart from those with allowed to in the settings.

Using a database and cache service like Redis to allow uploading your files as well which will be broken down into blobs and shared then streamed to all clients from a fast server. Some extra features we can include are muting everyone, adding live sub- titles is also something that can be worked upon,

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Heart Disease Prediction Using Data Mining Algorithms

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Abstract – Heart disease, alternatively known as cardiovascular disease, encases various conditions that impact the heart and is one of the primary basis of death worldwide over the span of the past few decades. It associates many risk factors in heart disease and a need of the time to get accurate, reliable, and sensible approaches to make an early diagnosis to achieve prompt management of the disease. Data mining is a commonly used technique for processing enormous data in the healthcare domain.

Researchers apply several data mining and machine learning techniques to analyse huge complex medical data, helping healthcare professionals to predict heart disease. This research paper presents various attributes related to heart disease, and the model on basis of supervised learning algorithms as Decision Tree and K-nearest neighbour algorithm. It uses the existing dataset from the Cleveland database of UCI repository of heart disease patients. The dataset comprises 303 instances and 14 attributes. It is important to substantiate the performance of different algorithms. This research paper aims to envision the probability of developing heart disease in the patients. The results portray that the highest accuracy score is achieved with K-nearest neighbours.

Keywords: Decision Tree, Supervised learning, Unsupervised learning

1   INTRODUCTION

Over the last decade, heart disease or cardiovascular remains one of the primary basis of death worldwide. An estimate by the World Health Organization, that over 17.9 million deaths occur every year worldwide because of cardiovascular disease, and of these deaths, 80% are because of coronary artery disease and cerebral stroke [1]. The vast number of deaths is common amongst low and middle-income countries [2]. Many predisposing factors such as personal and professional habits and genetic predisposition accounts for heart disease. Various habitual risk factors such as smoking, overuse of alcohol and caffeine, stress, and physical inactivity along with other physiological factors like obesity, hypertension, high blood cholesterol, and preexisting heart conditions are predisposing factors

2   BACKGROUND

For heart disease. This efficient and accurate and early medical diagnosis of heart disease

plays a crucial   role in taking preventive measures to prevent severe cardiac problems.

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Data mining refers to the extraction of required information from huge datasets in various fields such as the medical field, business field, and educational field. Machine learning is one of the most rapidly evolving domains of artificial intelligence. These algorithms can analyse huge data from various fields, one such important field is the medical field. It is a substitute to routine prediction modelling approach using a computer to gain an understanding of complex and non-linear interactions among different factors by reducing the errors in predicted and factual outcomes [3]. Data mining explores huge datasets to extract hidden crucial decision-making information from a collection of a past repository for future analysi s. The medical field comprises tremendous data of patients. This data need mining by various machine learning algorithms. Healthcare professionals do analysis of these data to achieve effective diagnostic decision by healthcare professionals. Medical data mining using classification algorithms provides clinical aid through analysis. It tests the classification algorithms to predict heart disease in patients [4].

Data mining is the process of extracting valuable data and information from huge databases. Various data mining techniques such as regression, clustering, association rule and classification techniques like Decision Tree and K-nearest neighbour are used to classify various heart disease attributes in predicting heart disease. A comparative analysis of the classification techniques is used [5]. In this research, we have taken dataset from the UCI repository. The classification model is developed using K-nearest Neighbour for prediction of heart disease. In this research, a discussion of algorithms used for heart disease prediction, comparison among the existing systems is made. It also mentions further research and advancement possibilities in the paper.

Heart disease affects millions of people, and it remains one of the chief cause of cardiovascular risks in the world. Medical diagnosis should be proficient, reliable, and aided with computer techniques to reduce the effective cost for diagnostic tests. Jupyter Notebook is a software technology that helps computers to build and classify various attributes. This research paper uses classification techniques to predict heart disease. This section gives a portrayal of the related subjects like machine learning and its methods with brief descriptions, data pre-processing, evaluation measurements and description of the dataset used in this research.

3. MACHINE LEARNING

Machine learning is an emerging subdivision of artificial intelligence. Its primary focus is to design systems, allow them to learn and make predictions based on the experience. It trains machine learning algorithms using a training dataset to create a model. The model uses the new input data to predict heart disease. Using machine learning, it detects hidden patterns in the input dataset to build models. It makes accurate predictions for new datasets. The dataset is cleaned and missing values are filled. The model uses the new input data to predict heart disease and then tested for accuracy. Machine learning techniques are classified as:

Supervised Learning

The model is trained on a dataset that is labeled. It has input data and its outcomes. Data are classified and split into training and testing dataset. Training dataset trains our model while testing dataset functions as new data to get accuracy of the model. The dataset exists with models and its output. The classification and regression are its example.

Unsupervised Learning

Data used to train are not classified or labeled in the dataset. Aim is to find hidden patterns in the data. The model is trained to develop patterns. It can easily predict hidden patterns for any new input dataset, but upon exploring data, it draws Conclusion from datasets to describe hidden patterns. In this technique, no responses in the dataset are seen. The clustering method is an example of an unsupervised learning technique.

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Reinforcement Learning

It does not use labeled dataset nor the results are associated with data, thus model learns from the experience. In this technique, the model improves its presentation based on its association with environment and figures out how to discuss its faults and to get the right outcome through

Classification algorithms are define commonly used supervised learning techniques to probability of heart disease occurrence.

4. APPROACH METHODOLOGY

This research aims to foresee the odds of having heart disease as probable cause of computerized prediction of heart disease that is helpful in the medical field for clinicians and patients. To accomplish the aim, we have discussed the use of various machine learning algorithms on the data set and dataset analysis is mentioned in this research paper.

5. DATA SOURCE

For this study, We have used dataset from UCI Machine learning repository. It comprises a real dataset of 303 examples of data with 14 various attributes like blood pressure, type of chest pain, electrocardiogram result, etc. In this research, we have used two algorithms to get reasons for heart disease and create a model with the maximum possible accuracy.

6. ALGORITHMS

Decision Tree

Decision tree is a classification algorithm that works on categorical as well as numerical data. Decision tree is used for creating tree-like structures. Decision tree is simple and widely used to handle medical dataset. It is easy to implement and analyze the data in tree-shaped graph. The decision tree model makes analysis based on three nodes.

Root node: main node, based on this all other nodes functions.
Interior node: handles various attributes.
Leaf node: represent the result of each test.

This algorithm splits the data into two or more analogous sets based on the most important indicators. The entropy of each attribute is calculated and then the data are divided, with predictors having maximum information gain or minimum entropy:

Entropy(S)=∑i=1c−Pilog2Pi,Entropy(S)=∑i=1c **−Pi log2 Pi,**
Gain (S,A)=Entropy(S)−∑vSv∥S∣Entropy (Sv). Values(A)∣Sv∥S∣Entro py (Sv).Gain (S,A)=Entropy(S)−∑v Values(A) ∣

The results obtained are easier to read and interpret. This algorithm has higher accuracy in comparison to other algorithms as it analyses the dataset in the tree-like graph. However, the data may be over classified and only one attribute is tested at a time for decision-making.

K-nearest neighbour

The K-nearest neighbours algorithm is a supervised classification algorithm method. It classifies the data point on how its neighbor is classified. KNN classifies the new data points based on the similarity measure of the earlier stored data points.

K-NN algorithm stores all the available data and classifies a new data point based on the similarity. This means when new data appears then it can be easily classified into a well suite category by using K- NN algorithm.

K-NN algorithm can be used for Regression as well as for Classification but mostly it is used for the Classification problems. K-NN is a non-parametric algorithm, which means it does not make any assumption on underlying data.

7. CONCLUSION

Dependent on nearest neighbor. It is a type of instance- based learning. The calculation of distance of an attribute from its neighbors is measured using Euclidean distance [3]. It uses a group of named points and uses them on how to mark another point. The data are clustered based on similarity amongst them, and is possible to fill the missing values of data using K-NN. Once the missing values are filled, various prediction techniques apply to the data set. It is possible to gain better accuracy by utilizing various combinations of these algorithms.

K-NN algorithm is simple to carry out without creating a model or making other assumptions. This algorithm is versatile and is used for classification, regression, and search. Even though K-NN is the simplest algorithm, noisy and irrelevant features affect its accuracy.

8. RESULTS AND ANALYSIS

Aim of this research is to predict whether or not a patient will develop heart disease. This research was done on supervised machine learning classification techniques using Decision Tree and K-nearest neighbor on UCI repository. Research was performed on 8th generation Intel Corei5 having an 7750H processor up to 3.1 GHz CPU and 8 GB ram. Dataset was classified and split into a training set and a test set. Pre-processing of the data is done and supervised classification techniques such as Decision Tree and K-nearest neighbor are applied to get accuracy score. The accuracy score results of different classification techniques were noted using Python Programming for training and test data sets. Comparison of accuracy score of heart disease prediction in proposed model with different classifications.

The overall aim is to define various data mining techniques useful in effective heart disease prediction

Efficient and accurate prediction with a lesser number of attributes and tests is our goal. In this study, we have considered only 14 essential attributes and applied two data mining classification techniques, K- nearest neighbour, and Decision Tree. The data was pre-processed and then used in the model. K-nearest neighbour is the algorithm showing the best results in this model. We found the accuracy after implementing two algorithms to be highest in K- nearest neighbours.

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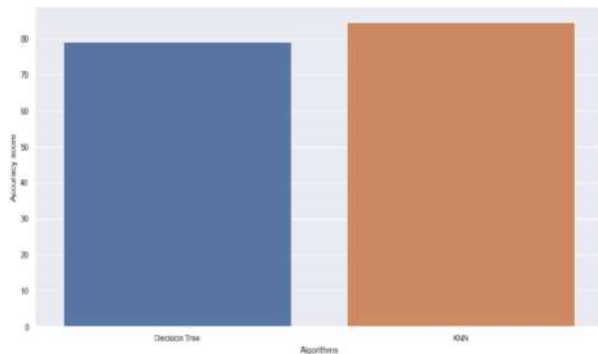The accuracy showed by both the algorithms is as follows.

Fig. 1. Accuracy of different Algorithms.

The accuracy obtained by **Decision Tree** algorithm was found to be **79.41%** on the contrary the accuracy obtained from **KNN** algorithm is **84.61%**.

We can further expand this research incorporating other data mining techniques such as time series, clustering and association rules, support vector machine, and genetic algorithm. Considering the limitations of this study, there is a need to implement more complex and combination of models to get higher accuracy for early prediction of heart disease.

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MUSIC PLAYER CHAT WEB APPLICATIONBASED ON SOCKET-IO & API

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Abstract. Music has been a way for people to reduce their stress and since we all have a variety of emotions music comes in all types of styles. Also, communication through the web is turning out to be absolutely necessary nowadays. Online communication permits the clients to speak with others in a quick and advantageous manner [2]. This web application combines the aforementioned necessities into asingle application. A music player with a chat application. A web app using Node, Express, and React to help us when we are studying, working, relaxing i.e.to listen to music and chatting with peers, friends, colleagues at the same time. We've noticed that most apps that we use when doing such things are on different platforms (ex: Spotify[8] on our phone/computer, Messenger on our computer[4], our phone's stopwatch), and that constant switching between platforms and devices would distractus. The app consists of a music player which will play music through Spotify API, a chat application made using socket IO and a timer for productivity. This proposal reduces the use of a lot of applications and will be the complete music-chat solution.

Keywords: API, Socket IO, React JS, Node JS, Music Player, Chat Application, HTML,CSS, Pomodoro Technique.

1   Introduction

The application development sector is advancing day by day. Innovative ideas are born each minute to ease people's work; if not big or groundbreaking, but constructive and leading towards a better tomorrow. Sound and graphics are two intriguing areas of technology which attract the music lovers to explore more into their depths.[6] With the new developments in technology the sophistication level in software has also increased. Also, with the idea of "keeping it simple", developing sophisticated applications is a challenge. The major player today in the field of music listening or streaming is Spotify. Similarly, the chatting application has huge impact on day-to-day life. There are numerous chatting applications available in this world. Each application has different additional features varying from other applications. These application organizations compete with each other and add some competing features during each release. They have reached people much and have an impact on people's life. People find a better application from an available internet application which they feel much reliable and secure. Some of the available charting applications that are available in these days are WhatsApp, Facebook, Instagram, Hike, etc. The aforementioned applications have billion users all over the world. Those companiesare one of the top companies in the world.

The project is aimed at developing a web application which can bare the hustle of switching between different platforms for music streaming and for chatting.

A user can create rooms with other users given the specific credentials such as room name, time-zone and user name/id. According to studies, most people listen to music while doing work, study and other focus-oriented stuff. To improve the efficiency, a timer is also added in the web application which is based on a technique calledPomodoro Technique which will be discussed later in section 2. In addition to that, the web application also has a specific dashboard for the analysis of music habits of theuser and the analysis of different playlists as well as the music the user is listening to. The user can create log into the website by his Spotify creds, listen to music, invite his friends in the same chatroom, they can share music as well as message each other. The web application uses different set of technologies like HTML, CSS, NodeJS, React JS for frontend and backend of

the application. Spotify API is used for the music streaming, authentication of user and the data analysis specified afore. Socket IOis used to create the multi-user chat.[1]

In this paper, we focus on real-time, music streaming, multi-user chatting withadd-ons like data analysis and timer. It is unpliable to do all these activities on differentplatforms and since we are living in a technology-driven era, a web application withthe combination of these different platforms would make the unpliable task pliable. More about the features is discussed in the section 2 of the paper.

2   Features Implemented

Music Streaming

Music has always been a medium for making connection with one another. Music streaming services have become the most popular method for consumers to listen to music. Streaming services offer consumers unlimited access to large catalogues of music. These services store the music in a server that users can connect to via their laptops and mobile devices.[6] Whilst connected to the internet users can listen toany song they wish, by selecting it on the application from which it can then be played. The technology of streaming services whether music or video has beengrowing consistently over the past ten years. The application uses Spotify Web API to play/stream different tracks.

Multi-User Chatting

The chatting application has huge impact on day-to-day life. People believe that communicating is an important activity in today's information society. We spend a significant portion of our life, either in work or leisure, communicating with other people, either face to face directly or via phone, email or micro-blog remotely. Therefore, finding more efficient ways for communication with others is an important area to research. The application uses Socket IO to successfully conducting the bi- directional way communication. Users can create rooms/groups in real-time and chat with each other.[1] To avoid confusion withing the network, room can be created in a time-zone specific way so that no two rooms with same names could collide and disrupt the communication.

Authentication

Authorization refers to the process of granting a user or application access permissions to Spotify data and features in the application context. The authentication set-up in the application uses the Spotify user's credentials. In order to login in the application must have an account registered with Spotify. So, the login page will authenticate the user's account from the Spotify's database and redirect to the dashboard of the application.

Analysis

The analysis of the user's music habits and the analysis of the track or playlist a useris listening to gives the insights and light on the impression of music in our choices and life. This feature could help to understand what type of music a user likes andhow many times a particular track or song is played by him/her.[4] The Spotify API will provide all this data in the form of pre-calculated values which includes for each track:
- Name
- URI (Spotify unique ID)
- Release date
- Explicit or clean
- Key
- Tempo
- Mode
- Danceability
- Valence

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- Energy
- Loudness
- Acousticness
- Liveness
- Duration
- Played number of times
- Week, month, day wise sorting
- Intrumentalness [3]

Timer

We used the Pomodoro technique and put the timer in the dashboard to increase the efficiency of whatever the user is doing.

The Pomodoro Technique is created by Francesco Cirillo for a more productive way to work and study. The technique uses a timer to break down workinto intervals, traditionally 25 minutes in length, separated by short breaks. Each interval is known as a pomodoro, from the Italian word for 'tomato', after the tomato- shaped kitchen timer that Cirillo used as a university student. The original technique has six steps:

1. Decide on the task to be done.
2. Set the pomodoro timer (typically for 25 minutes).
3. Work on the task.
4. End work when the timer rings and take a short break (typically 5–10minutes).
5. If you have fewer than three Pomodoro, go back to Step 2 and repeat untilyou go through all three Pomodoro.
6. After three Pomodoro are done, take the fourth pomodoro and then take along break (traditionally 20 to 30 minutes). Once the long break is finished, return to step 2.

3   Literature Survey

The application uses a variety of technologies as for frontend, we used HTML and CSS, for backend, we used ReactJS, NodeJS and used Spotify Web API and SocketIO for the music streaming, analysis and multi-user chatting respectively. Both Spotify Web API and Socket IO has been discussed in Section 4. React (also known as React.js or ReactJS) is a free and open-source frontend Java-script library for building user interfaces based on UI components. It is maintained by Meta (formerly Facebook) and a community of individual developers and companies. React can be used as a base in the development of single-page or mobile applications. However, React is only concerned with state management and rendering that state to the DOM, so creating React applications usually requires the use of additional libraries forrouting, as well as certain client-side functionality. Node.js is an open-source server environment. Node.js allows you to run JavaScript on the server. The HyperText Markup Language, or HTML is the standard markup language for documents designed to be displayed in a web browser. It can be assisted by technologies such as CSS and scripting languages such as Javascript. CSS is the language we use to style an HTML document. CSS describes how HTML elements should be displayed. We have used many research papers for our reference and knowledge as mentioned at the end of research paper.

4   Proposed Methodology

This music player requires the user to have a profile on Spotify to access the application. Each person has to input his/her login details before using the application.The API used is Spotify API. For the Chat Box, we used Socket IO for multi-user, room-type chatting. Firstly, the application will ask to login through Spotify credentials and upon successful validation or authorization the dashboard will pop up and we then can listen to our favorite music, chat along with our peers, friends, etc.and also use add-ons like pomodoro timer and analytics of user's listening habits and the track one is listening to.

Spotify API

Through the Spotify Web API, external applications retrieve Spotify content such as album data and playlists. To access user-related data through the Web API, an application must be authorized by the user to access that particular information.Register an application with Spotify. Authenticate a user and get authorization to access user data. Retrieve the data from a Web API endpoint. Any application can request data from Spotify Web API endpoints and many endpoints are open and will return data without requiring registration. However, if your application seeks access toa user's personal data (profile, playlists, etc.) it must be registered. Registered applications also get other benefits, like higher rate limits at some endpoints. Adeveloper can register his application on Spotify Developers Website to use theSpotify API.
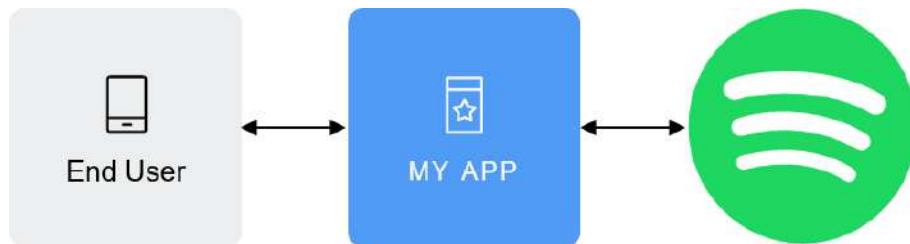
Fig.1. Spotify API usage Architecture.

Authorization. Authorization refers to the process of granting a user or application access permissions to Spotify data and features. Spotify implements the OAuth2.0 authorization framework. End User corresponds to the Spotify user. The End User grants access to the protected resources (e.g. playlists, personal information, etc.). My App is the client that requests access to the protected resources (e.g. a mobile or web app). Server which hosts the protected resources and provides authentication and authorization via OAuth 2.0. The OAuth2 standard defines four grant types (or flows) to request and get an access token. Spotify implements the Authorization + PKCE Extension, Client Credentials and Implicit Grant. We used implicit grant in our application.

The implicit grant flow is carried out on the client side and it does not involve secret keys. Thus, you do not need any server-side code to use it. Access tokensissued are short-lived with no refresh token to extend them when they expire. Our application must build a GET request to the authorize endpoint.[8]
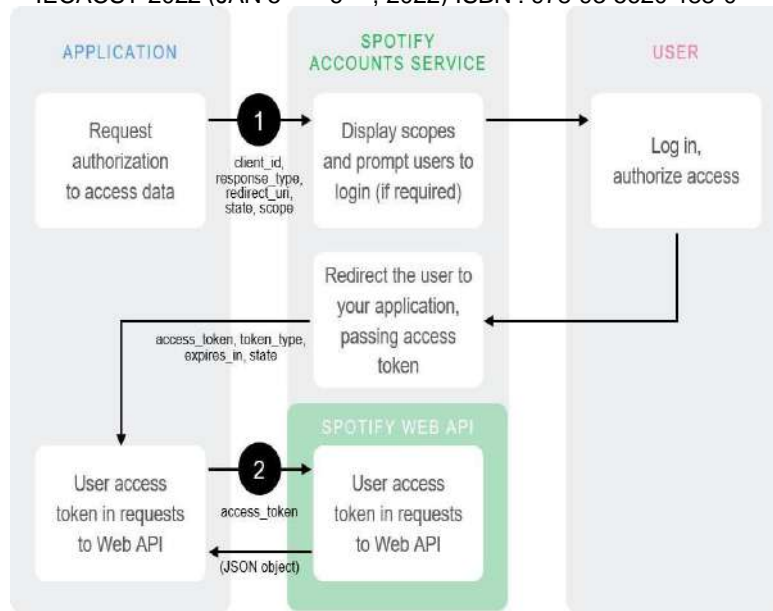
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Fig.2. Implicit Grant Flow.

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For authorization and further use, a valid access token is required in the format: Bearer<Access Token> to use the function and grab the data from Spotify Web API. The access to the protected resources is determined by one or several *scopes*. Scopes enable your application to access specific functionality (e.g. read a playlist, modify your library or just streaming) on behalf of a user. The authorization process requires valid client credentials: a client ID and a client secret. Once the authorization is granted, the authorization server issues an access token, which is used to make API calls on behalf the user or application.

Music Player and Analysis. Once the authorization is done, the music player will automatically fetch the data form the API to play the music and to show the analysis data on the dashboard itself. Spotify offer multiple, fully featured playback solutions depending on the needs of developers. Play music directly in the web browser, with the Web Playback. Use Spotify Connect to control and transfer playback between any of a user's active devices seamlessly. The Web Playback needs an access token from your personal Spotify Premium account, so the first thing we need to do is to create an application. The application contains your credentials needed to request an access token. Read metadata information about tracks, artists, or albums. Read algorithmically related artists to a particular artist. Read popularity explicit rating of tracks. Read the International Standard Recording Code (ISRC) of any track. Receive responses based on user's market, or a specific market. Explore audio features and in- depth audio analysis of tracks. With the Spotify Developer Platform, you're able to read calculated audio features of tracks to learn about its danceability, energy, valence, and more. For more advanced use cases, it is possible to read in-depth analysis data about tracks such as the segments, tatums, bars, beats, pitches, and more.

Mood: Danceability, Valence, Energy, Tempo. Properties: Loudness, Speechiness, Instrumentalness. Context: Liveness, Acousticness. Segments, Tatums, Bars, Beats, Pitches, Timbre, and more.

Chat Room using Socket IO

A chat application should allow both sending and receiving process in simultaneous way. Another important feature in chat application is group chat which is implemented in this application. It allows people to chat. Message will be sent to all the users in chat room along with the name of the user who has sent the messageUsers who are available in the chat room will receive the message. It is built on SOCKET IO tech stack. Socket.IO allows bi-directional communication betweenclient and server. Bi-directional communications are enabled when a client has Socket.IO in the browser, and a server has also integrated the Socket.IO package. While data can be sent in a number of forms, JSON is the simplest.[11]
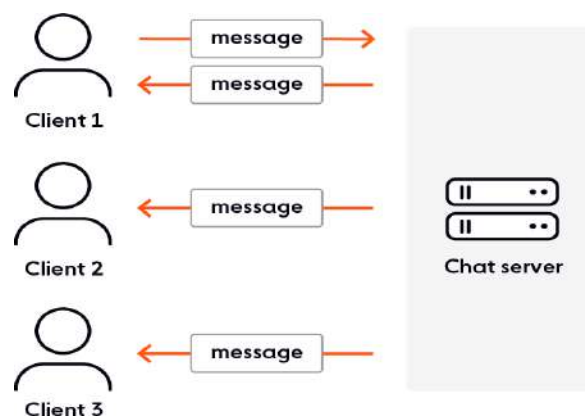

Fig.3. Socket IO client server flow.

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A server may be a computer dedicated to running a server application. A client is a software application code or a system that requests another application that is running on dedicated machine called Server. These clients need not be connected to the server through wired communication. Wireless communication takes place in this process. Client with a network connection can send a request to the server. With sockets, when the server receives a new message, it will send it to the client and notify them, bypassing the need to send requests between client and server. A simple chat application shows how this works. Also, very helpful conversing in groups and rooms.[10]

5   Architectural Design
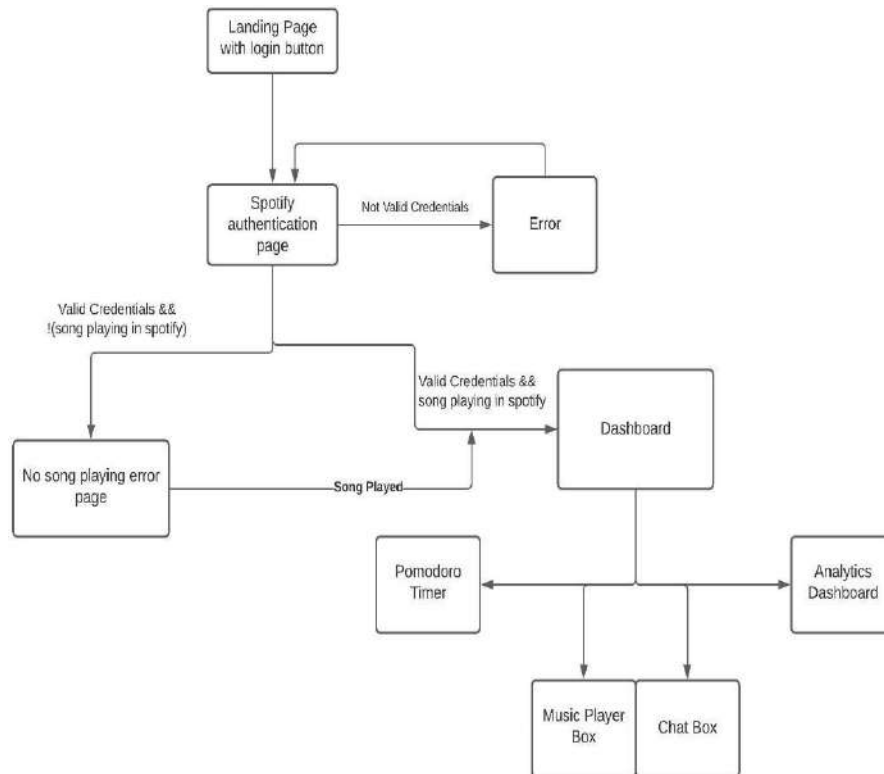
Fig.4. Block Diagram Implementation of the web application.

In our project there would be a landing page which is supposed to be the first page when the user lands to our website. Basically, it is a welcome page, to welcome the users, it consists of an image which gives an idea of listening to music and studying is fun. We have added a line for introduction in the center of the page. There is a login button, by clicking that button, we would be redirected to Spotify authentication page. Since we have added a login button for the user to click and continue with our app. Once the user clicks the login button, he reaches the Spotify authentication page, which checks if the user is already a Spotify user or not. If he's already a user, we would redirect him to our dashboard page. And if he's not a user, it'd do the usual authentication by sending user the OTP on his number and it would let him login into his Spotify account. As authentication is important as an access token is generated and it would be used in accessing the API, this step is important. Since it is a music web chat application, the user is supposed to play music on his Spotify application, if he's already listening to music, he will be redirected to our dashboard page. If he's not listening to music, we would show him a relevant UI with a message of guiding himto play a music. Once user plays the music, he'll be redirected to our dashboard page, and can access more functionalities.

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In our dashboard page, in the center the song we have selected from our Spotify app, will be playing, the song's image, length, basic music options will be shown. In the right side there would be a chat option, which will ask user to sign in to chat with their friends. User can write their name, room of their group and choose their time zone, hit click in and enter to group chat. There is a simple Greeting message to gain attention of user towards the pomodoro technique while they are listening to music and chatting. We tried to integrate the pomodoro technique in our project. The Pomodoro Technique is created by Francesco Cirillo for a more productive way to work and study. The technique uses a timer to break down work into intervals, traditionally 25 minutes in length, separated by short breaks. In the left side under the greeting message, we have shown a stopwatch of 25 minutes, if we click on that the timer starts ticking backwards. We have given users to chat among themselves in a group, which just requires their name, room (this should be same to join same chat, this should be common for all users) and their time-zone to know which user send which message at what time, to login. The admin sends a welcome message once we join the room and it notifies when another user joins and leave the room. In the chat we can send messages, share the songs we are listening to. If other user doesn't join the chat there would be a reminder of that part too. There is a scroller button for the user where he can click to go to analytic section. Where he can understand his taste in music statistically. In this section, he can find his songs which he has listened to in last 6 months or last 4 weeks, he can further know his favorite artists. This data is shown as a proper interface with artist's name, song, album cover- release date, acousticness, popularity etc. In the center of the dashboard page, we can find the song we have played on Spotify is being played here too. We kept the UI of music box simple, with basic features so that user can use it without any complications. There is the album cover in the center of the music box with music's name being shown. Since artist's name is mandatory so we have shown the artist's name, release date, and other simple music options.

6   Conclusion

The main objective of the project is to develop a music-based web chat Application. I had taken a wide range of literature review in order to achieve all the tasks, where I came to know about some of the products that are existing in the market. I made detailed research in that path to cover the loop holes that existing systems are facing and to eradicate them in our application. In the process, I came to know about thelatest technologies and different algorithms. We came up with this idea because we had to switch tabs to chat, listen to music and to check the pomodoro timer.

So, our app will help the people work, connect and even have fun in its own musical level. The web-application allows the users to chat within a room and to listen to their favorite songs alongside and they could also share the song they are listening to. The portability of the application has been achieved by using some of the latest React and Nodejs technologies. We installed various packages through NPM which madeour work easier.

As a result, the product has been successfully developed in terms of extendability, portability, and maintainability and tested in order to meet all requirements.

Future Scope

With the knowledge I have gained by developing this application, I am confident that in the future I can make the application more effectively by adding these services.

1   Extending this application by providing Authoriza-

tion service.

2   Creating Database and maintaining users.

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3   Increasing the effectiveness of the application by providing

Voice Chat.

4   Extending it to Web Support.

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Detecting Mangrove Forests in Sundarbans using different Image Classification Methods and Change Analysis

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Abstract. Satellite or Remote Sensing Images are taken from USGS Earth Explorer website of category Landsat-8 band Images of mangrove forest areas in Sundarbans. Different classification methods - unsupervised classification with k-means clustering, supervised classification using the maximum likelihood decision rule are used to classify the Landsat Images. Our results concluded that a supervised classification method is better than unsupervised classification in terms of accuracy calculated for each and every class of the image.

Further, we have calculated the change in mangrove forest cover over the past 6 years because various factors such as permanent erosion and deforestation have taken place and many reports pointed towards the loss of mangrove forest cover. We have done our case study as per the reports of the Forest Surveys of India (FSI) and concluded our results in percentage changes year wise and in the form of image visualization of the land affected

Keywords: Image Classification, K-Means Clustering, Maximum Likelihood.

1 Introduction

The Sundarbans Mangrove Forest is one of the largest forests in the world. It is around 137760 km², which is 0.1% of the earth's surface. The Sundarbans covers the area of both India and Bangladesh territory, which is around 10,000 km². It is considered as a site of international and national importance for the conservation of biodiversity. These forests have a unique kind of ecosystem that provides a wide range of different ecosystem services and contributes to socio-economic development of the neighbouring communities and the country. The main products of the Mangrove forest are timber, fishers and other non-timber forest products. Sundarbans is an asset and plays an important role at local, national and global levels by providing the advantage of absorbing carbon dioxide and other pollutants in air and water. Sundarbans offers protection to millions of people against cyclone and water surges, stabilizing the shore line, trapping sediment and nutrients. Over 3.5 million of people living around the Sundarbans are directly or indirectly dependent on these ecosystem services.

2 Study Area

The Sundarbans mangrove forest is located in the southern coast of Bangladesh and India. The Sundarbans forest covers an area of around 10,000 sq.km, in which the Bangladesh part of Sundarbans covers about 6000 sq.km and the Indian part of Sundarbans covers about 4000 sq.km. This study considers only the Indian part (i.e., 40%) of Sundarbans. This forest is located on the Ganges Delta created by the confluence of three mighty river systems, Ganges, Brahmaputra and Meghna, at the northern limit of the Bay of Bengal and it extends between approximately 21° 55' 59.99" N latitude and 88° 50' 59.99" E longitude. The region is characterized by a tropical climate with a dry season between November and April and a wet monsoonal period over the rest of the year. The climate in the Sundarbans ranges from 20 °C to 34 °C and the rainfall is extremely high. The total annual amount of precipitation is between 1500 and 2000 mm.

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Fig. 1. Study Area (Indian Sundarbans)

3   Mangrove Plantation and Deforestation

Coastal areas of Sundarbans are prone to cyclones and as a result of the last cyclone, there was a major landfall near Sagar island as a result on World Environment Day in 2020, Bengal Chief Minister announced to plant nearly 50 million mangroves in the Sundarbans [1]. Healthy mangrove forest vegetation is very important in Sundarbans, it works as a potential natural barrier to high-density cyclones that can have devastating impacts on the islands and even on delta areas including Kolkata.

Sundarbans of the Indian territory are spread over 9630 sq km, and around 28 percent of the Sundarbans has been damaged by cyclones over the years affecting mangrove population badly in the past few years. The loss of land due to erosion is leading to direct loss in the mangrove forests. As a result, affecting the livelihood in Sundarbans and climate changes [5].

4   Data and Methodology

Data

We have downloaded Landsat-8 images (band 1, 2, 3, 4, 5, and 7) from the websiteof the Global Land Cover Facility of USGS Earth Explorer. As described in the following sections, it was observed after trying with multiple band combinations that to best classify between dense(mangrove) and low vegetation(non-mangrove) can be achieved using B5/B4/B3(band 5/band 4/band3) combination. (Natural and False Color Composites) The stacked image generated by the combination of the bands mentioned above represents the natural color image in which the more dense and darker the color the more is the dense vegetation in that area. The image is shown below.

Fig. 2. Stacked Natural Color Image.

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Methodology

Following flow chart showcases the methodology of this study and the detailed study of the classification methods used, accuracy assessments and conclusions obtained are explained in the following sections.

```
┌─────────────┐
│  Landsat -  │
│  8 Images   │
└─────────────┘
       │
       ▼
┌─────────────┐
│   Image     │
│   Stacking  │
└─────────────┘
       │
       ▼
┌──────────────┐      ┌──────────────┐      ┌──────────────┐
│  Supervised  │ ───▶ │ Classifica-  │ ◀─── │ Unsupervised │
│Classification│      │    tion      │      │Classification│
└──────────────┘      └──────────────┘      └──────────────┘
                             │
                             ▼
                   ┌──────────────────┐
                   │Accuracy Assessment│
                   └──────────────────┘
                             │
                             ▼
                ┌───────────────────────────┐
                │Identify the most accurate method│
                └───────────────────────────┘
                             │
                             ▼
                ┌───────────────────────────┐
                │Visualizing Classified Images│
                └───────────────────────────┘
                             │
                             ▼
                     ┌──────────────┐
                     │ Conclusions  │
                     └──────────────┘
```
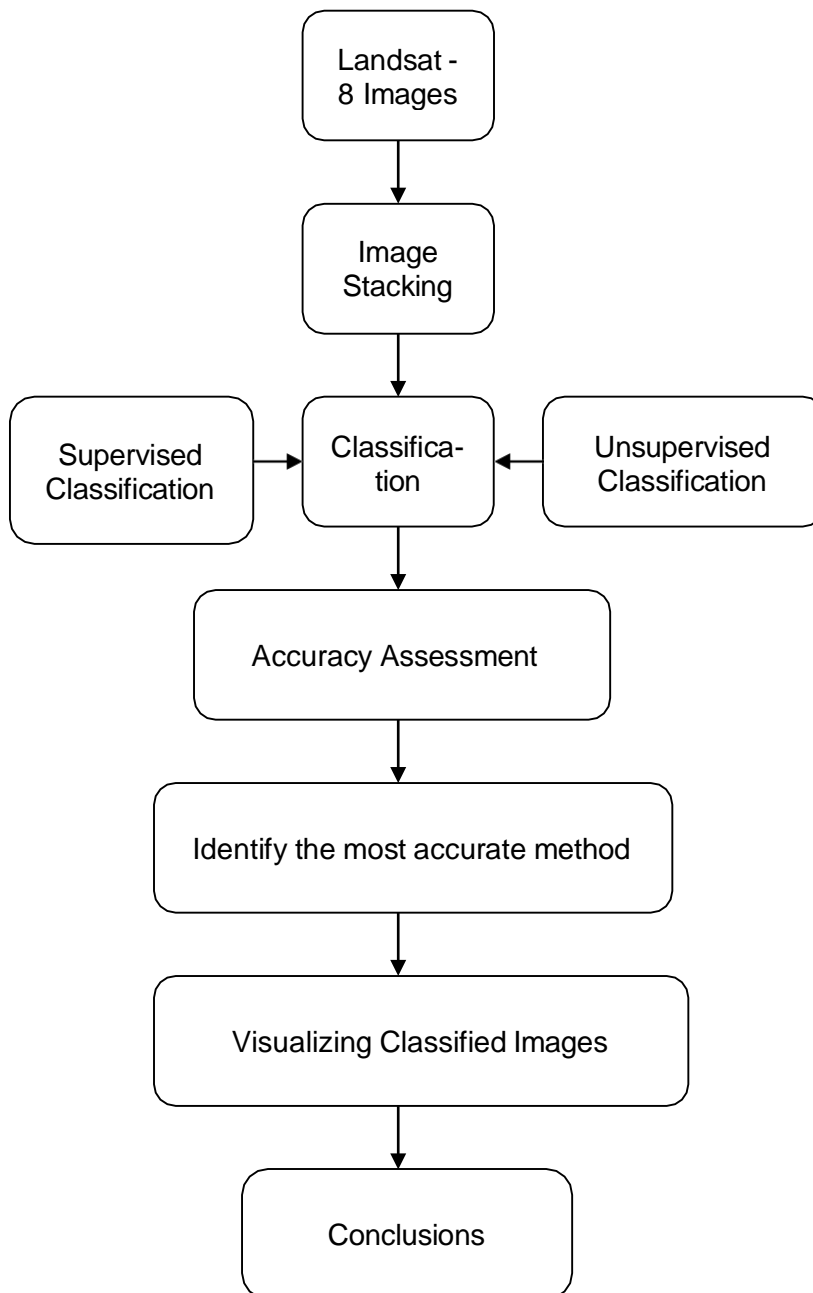
5   Image Classification

In reference to legend systems for land-cover mapping, such as the United States Geographical Survey (USGS) Land Use/Land Cover System Legend, we have classified the image broadly into five legends(categories): mangrove forest, low vegetation, bare land (crop land), land and water. Details of each category are mentioned below. In this study we compare the outcomes of supervised, unsupervised classification methods to find the best and most accurate way to extract mangrove forest in Sundarbans [7].

Supervised Classification

We observed that in most of the situations that when training data is provided accurately and precisely than the supervised classification will yield better results than the unsupervised classification. Here, we have employed supervised classification using maximum likelihood decision rule, which is widely used in satellite image classifications. The training pixels in terms of polygon shapefiles are closely chosen in reference to Google authorized sources such as Google satellite images, photographs, maps, etc. The number of training samples and size of each sample is chosen in accordance to the given classes. Usually, 3 samples per class are sufficient but if the class has higher variability across the image than more samples will be needed [7].

Unsupervised Classification

Image is classified using unsupervised classification. The algorithm used is called K-Means clustering which produce 20 user-defined classes with the maximum of 10 iterations. The resulting classes are then closely compared with the field data and appropriately merged so as to obtain the required five classes. The results and accuracy of each classification is discussed in the further sections [7].

Table 1. Land Cover Classes

Land cover/ class	Description
Mangrove Vegetation	Tidal Forests found near the sea shore.
Low Vegetation	Area consisting of small trees, plants, shrubs, etc.
Bare/Crop Land	Agricultural areas.
Land	Residential, industrial and commercial complexes.
Water	Areas of rivers, lakes, bays and estuaries.

Accuracy Assessment

Determining accuracy of the classified images is one of the key components to validate our observations. So, accuracy of classified images is carefully inspected in a step-by-step process by dividing the area into polygon shape blocks, then the comparisonis made on a random basis with the authorized sources such as google satellite images generated from Google Earth. After generating reference polygons, each polygon is visually inspected against a live google map, google earth images and local photographs.

In addition to visual inspection, the random sampling method using the reference data generated with polygons is employed to perform the accuracy assessment of supervised, unsupervised classification separately. Samples are chosen randomly for every different class and each sample is approximately of the size of 300 pixels. After completing the accuracy assessment, results generated in the form of an error matrix consist of the producer's accuracy, user's accuracy, kappa statistics and overall accuracy which are given in the following tables [2].

Table 2. Comparisons of all land-cover classes by different classification methods.

Type of classification	
Unsupervised	Supervised

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Class name	Area (km)	Area (%)	Area (km)	Area (%)
Mangrove forest	19,686.55	37.46	20,664.39	39.33
Water	22,028.06	41.92	21,187.98	40.32
Bare land	1,411.91	2.68	4,761.26	9.06
Low Vegetation	5,708.08	10.86	4,280.19	8.15
Land	3,664.15	6.97	1,646.78	3.13

Table 3. Error matrix showing classification accuracy of unsupervised classification.

Class	Class 1	Class 2	Class 3	Class 4	Class 5	Classified total
Class 1	372	0	3	0	0	375
Class 2	0	903	0	4	0	907
Class 3	0	0	118	4	0	122
Class 4	0	0	0	140	11	151
Class 5	0	0	0	26	90	116
Reference Total	372	903	121	174	101	1617

Overall classification accuracy = 78.37%

Note: Class 1, Mangrove Forest; Class 2, Water; Class 3, Bare Land; Class 4, Low Vegetation; Class 5, Land.

Table 4. Error matrix showing classification accuracy of supervised classification.

Class	Class 1	Class 2	Class 3	Class 4	Class 5	Classified total
Class 1	370	0	1	0	0	371
Class 2	0	894	0	0	0	894
Class 3	2	0	99	0	2	103
Class 4	0	0	1	121	0	122
Class 5	0	9	0	0	103	112
Reference Total	372	903	101	121	105	1602

Overall classification accuracy = 85.49%

Note: Class 1, Mangrove Forest; Class 2, Water; Class 3, Bare Land; Class 4, Low Vegetation; Class 5, Land

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6   Results

Results from classification methods

Each classification approach produces a classified land-use and land-cover image. However, land-use area for some classes derived in supervised approaches shows small differences in terms of distributions of pixels as compared to the unsupervised approach. The classified images obtained are shown below. (QGIS)
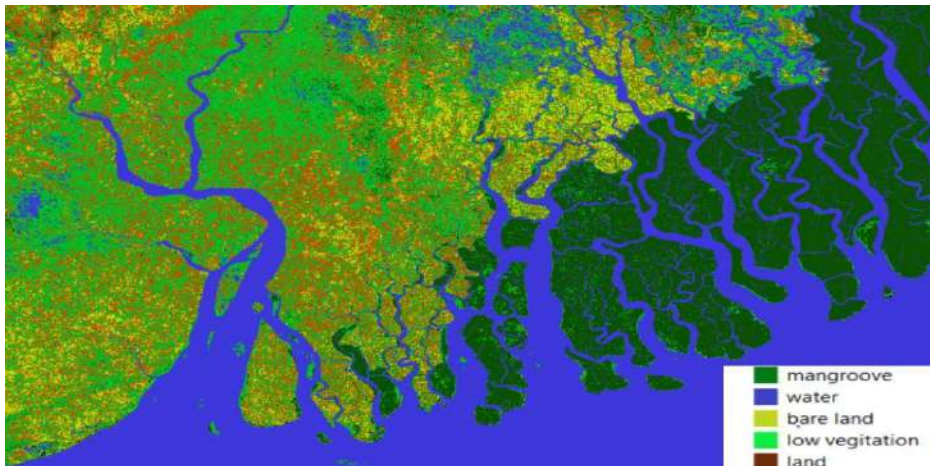
Fig. 4. Unsupervised classified Image.
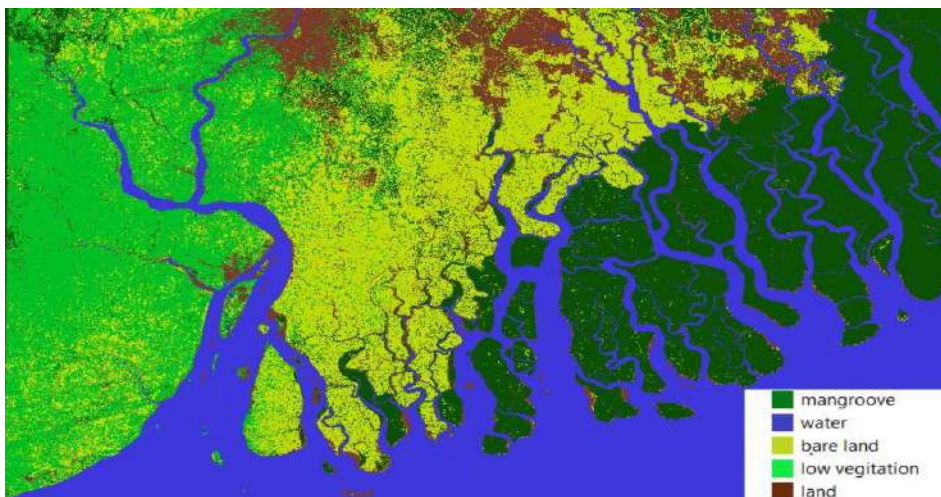
Fig. 5. Supervised classified Image.

Results from accuracy assessment

In addition to visual inspection, the sampling method to visualize and compare accuracy between supervised and unsupervised classification methods is also performed. Some outcomes of the samples identified are shown below. As a result, it is observed that some parts of crop lands, vegetation and land classes are mis-classified in the unsupervised classification results.

The accuracy of classification can often be degraded due to areas that are not uniform, especially due to the coexistence of mangrove, crop land and commercial land areas together as what is also observed more in unsupervised classification. So, it can be concluded after observing major accuracy and visual assessments that supervised classification produces better results than unsupervised classification methods.

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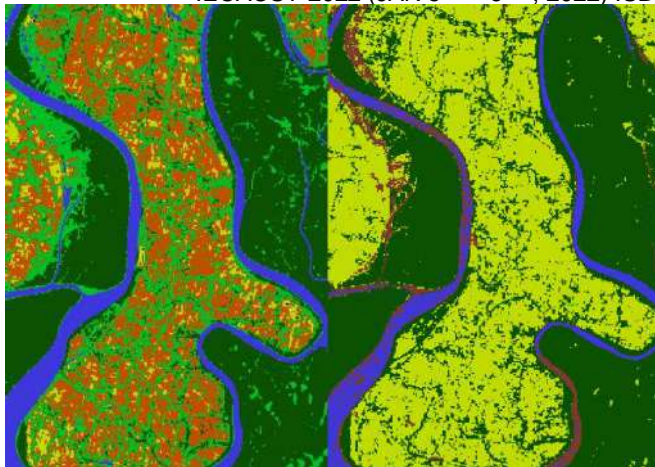
(a) Unsupervised   (b) Supervised

Visual Comparison: (a) unsupervised classification image; the red patches show some misclassified pixels as compared to (b) supervised classification image

The results of the random sampling method show the overall accuracy of the supervised and unsupervised classification method as 85.49% and 78.37% respectively. Therefore, we conclude that highest overall accuracy is obtained in the case of supervised classification method.

On closer observation of the error matrix and visual comparison of the two classified images [2], it was found that the image was mainly misclassified as natural (less dense) forest and cropland and main reason behind it can be non-uniform distribution and co-existence of multiple classes as it is quite visible also in the classified images.

Results of Change Analysis over the years

After successfully determining the best classification method we have classified different images of years ranging from 2015 - 2020 and we have concluded the following changes occurred in classes taken.

Table 2. Comparisons of all land-cover classes by different classification methods.

Class	2015	2016	2017	2018	2019	2020
Class 1	49.%	40.1%	39.3%	36.5%	43.2%	49.0%
Class 2	40.%	40.6%	40.3%	40.3%	39.8%	39.3%
Class 3	7.6%	8.77%	9.06%	8.77%	9.11%	5.63%
Class 4	1.0%	7.56%	8.15%	10.7%	3.72%	1.38%
Class 5	1.0%	2.89%	3.13%	3.55%	3.99%	4.53%

Note: Class 1, Mangrove Forest; Class 2, Water; Class 3, Bare Land; Class 4, Low Vegetation; Class 5, Land

As visible in the table mentioned above, there was a decline in Mangrove Forest cover from 2017 as a result of cyclones and erosion caused in the areas of Sundarbans. Other main reasons for decline of the

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Mangrove areas in Sundarbans are widening of the rivers and rise in water level in Bay of Bengal [5]. Visual results of the change observed in the Mangrove areas are shown below between the years of 2017-2018.

The following images are the result of NDVI segregation of 2018 over 2017.
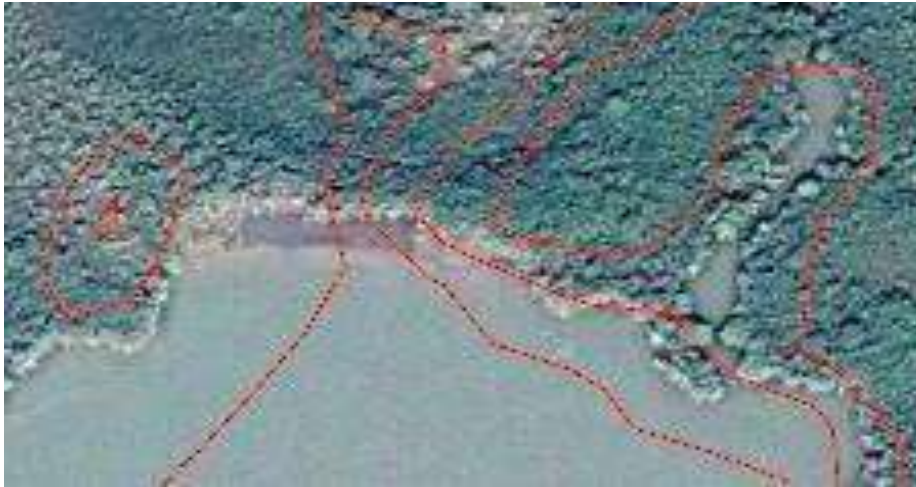
(2017)
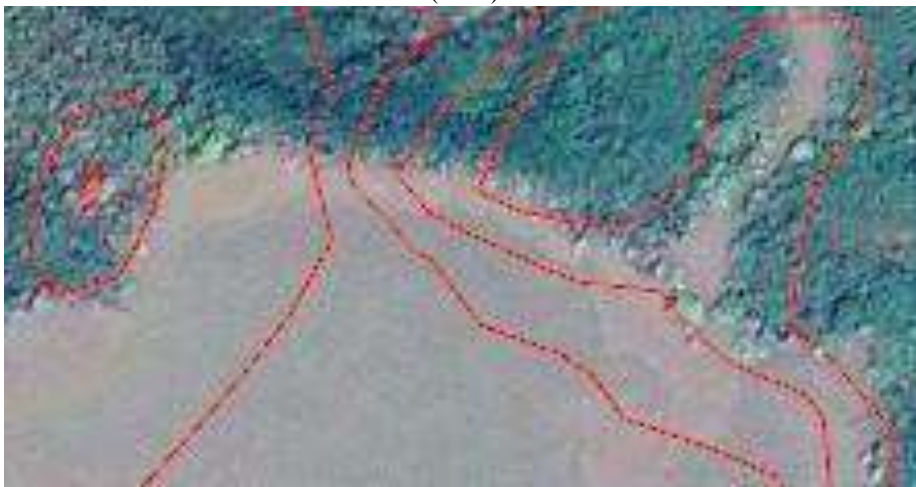
(2018)

Fig. 5. Difference in Mangrove area cover between 2017-2018 caused due to erosion.

7   Conclusions

In this study, we have observed effectiveness of the different types of classification methods for classifying the Landsat images generated from the USGS Earth Explorer website. It was observed that in comparison with the unsupervised classification using k-means clustering algorithm, supervised classification using maximum likelihood decision rule performed better and showed more accurate and precise results.

This study of remote sensing can help in providing future monitoring of mangrove over time. The findings of the research can suggest suitable techniques to classify and identify the changes occurring in the Sundarbans which can provide a strong base for future mangrove plantation and conservation acts.

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Effect of Parallel Processing on Image Convolutionagainst Sequential Approaches

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Abstract. Image Processing has proven its significance in both commercial andscientific areas. Traditional techniques to optimize these image convolution techniques have only been helpful in managing data on a smaller scale. Since the world is generating exponentially increasing amounts of data that need to beprocessed in a fast and efficient way, there arises a need for a highly parallelized, fast, and scalable architecture [1]. Therefore, this work focuses on the improvement of organizing and processing techniques to obtain maximum scientific-computing performance by tuning the traditional convolution algorithms for parallel processing. We used concepts such as convolution,which is the mathematical operation fundamental to many image processing operators. It provides a way of multiplying two arrays of integers of the exact dimensions such that the resulting array is of the integers of the same dimensionality as well. Parallel Computing, the process of breaking down moresignificant problems into smaller, independent, and often similar parts that are executed simultaneously by multiple processors communicating via shared memory, the results of which are then combined upon completion as part of an overall algorithm. The primary goal of this paper is to modify current convolution algorithms for parallel processing and compare the performance results.

Keywords: Image Processing, Convolution algorithms, Parallel Processing

1. Introduction

Convolution is the mathematical operation fundamental to many image processing operators. It provides a way of multiplying two arrays of integers of the exact dimensions such that the resulting array is of the integers of the same dimensionality as well. In an image processing context, one of the input arrays is normally just a grayscale image. The second array is usually much smaller and is known as the kernel[2].

Parallel computing refers to the process of breaking down larger problems into smaller, independent, often similar parts that can be executed simultaneously by multiple processors communicating via shared memory, the results of which are combined upon completion as part of an overall algorithm. The primary goal of parallel computing is to increase available computation power for faster application processing and problem-solving [3].

Increasing demands for computing power have led to rapid improvements in parallel processing hardware. Several techniques have been used to increase the speed of parallel computations at the algorithmic and architectural levels. Choosing the correct parallel algorithm can have a significant effect on the performance of certain parallel problems. Various applications have forced parallel programmers to develop new algorithms in order to meet performance requirements [4].

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Many algorithms in image processing have been found to have efficient parallel implementations. Convolution is a basic operation in image processing and computer vision. It has a multitude of applications, including image filtering and enhancement, image restoration, feature detection, and template matching. The result of image convolution computed at a pixel point is dependent only on the value of neighboring points. Because of this, the convolution operation can also be efficiently mapped to parallel computers.

The parallel implementation of the conventional convolution algorithm divides the image into small sub-images (blocks or stripes), then distributes the sub-images to each processor. Each processor obtains an up-to-date copy of its boundary region from neighboring processors and performs the convolutioncomputation on its part of the image data during each iteration. Finally, processors send their results to the master machine. The crucial part of the conventional algorithm is the communication and synchronization of the boundary region. It not only introduces communication overhead but also may increase the idle time between iterations if the computation and communication speed of each processor is not constant.

Such Parallel computing environments have been effective for high-performance computing in various fields where the demand for computation power is always on the rise. These environments provide an alternative to traditional computational environments. In this project, we will explore the development and results of the implementation of parallel image convolution algorithms.

2.   Convolution

The convolution topic arises in a variety of ways with images. Digital filtering, image smoothing, image sharpening, and some other image operations may involve convolution. In this section, we outline the basics of the convolution problem and thenanalyze its computational requirements. Finally, we give an example using a convolution kernel in an image processing application.

Convolution in Image Processing

Spatial convolution in two dimensions is a neighborhood operation and is defined by.

$$f[x,y] * g[x,y] = \sum_{j,k} f[j,k]\, g[x-j, y-k]$$

It can be described as a weighted sum of neighboring samples. Convolution is quite an expensive operation in terms of the amount of computation involved. Considering a square convolution kernel, the number of addition and multiplication operations increases with the square of the size of the kernel. We assume the image is of size N*N and the kernel is m*m. Each pixel of the input image requires m^2 additions, m^2 multiplications, and a single division to compute a normalized convolution.
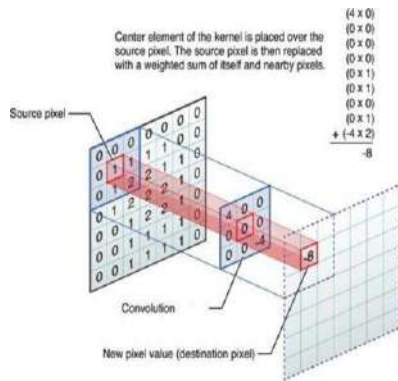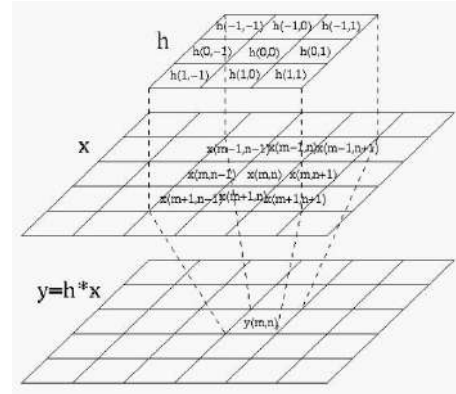
Fig.1. A single convolution layer   **Fig.2.** Strided Convolution

The computation time is:

$$t_c(2m^2 + 1)N^2$$

where t_c is the average time for a computation operation. If we perform the convolution with several kernels (assuming the number of kernels is K and all the kernels are of size m*m), the computation time.

$$t_c(2m^2 + 1)N^2K$$

Convolution can be computed directly on images in the spatial domain. Alternatively, it can be computed after the image has been transformed into the frequency domain.

For larger kernels, there is a considerable benet to be gained by performing the parallel convolution in the Fourier domain.

For this reason, we limit the discussion in this paper to convolution with small kernels. The next section presents an example of an image processing application.

Convolution in Edge Detection

Edge detection in terms of image processing aims to find key points in a given image where the brightness in given points varies or is not continuous. These points are then formed into curves and segments. Image edge detection is of formal importance to get only the most paramount data that is required for further processing of the said image. We decided to build a GUI application that implements various edge detection algorithms to image files. The application previews both the incoming image stream and displays the computed result with the detected edges.

Edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. It is used for image segmentation and data extraction in areas such as image processing, computer vision, and machine vision [5].

As with all techniques, edge detection has multiple approaches and algorithms. To preserve data from the image and get all the required points, it is quintessential that we have a clear and concise understanding of these algorithms. This poster dwells on various edge algorithms to show the stark differences in performance one algorithm can have over the other.

In real-time applications, the processing time is considered a big obstacle for

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its implementations. A High-Performance Computing (HPC) platform is necessary in order to solve this problem. The usage of hardware accelerators makes the processing time low. In recent developments, the Graphics Processing Unit (GPU) is being used in many applications. Along with the hardware accelerator, a proper choice of the computing algorithm makes it an added advantage for the fast processing of images.

The goal is to harvest the performance edge of HPC clusters and see how a larger set of input can affect the performance and thus lead to a different choice of the edge detection technique.

3.   Parallel Processing and Performance

Predicting parallel algorithm performance for a given problem is more complicated than predicting sequential algorithm performance. A parallel algorithm that solves a problem well on a particular architecture may perform poorly on another architecture. There are many factors that influence performance. The relative importance of these

factors will vary from algorithm to algorithm and from problem to problem. The performance model for a parallel architecture plays an important role in evaluating the scalability of different algorithms and choosing an appropriate algorithm.
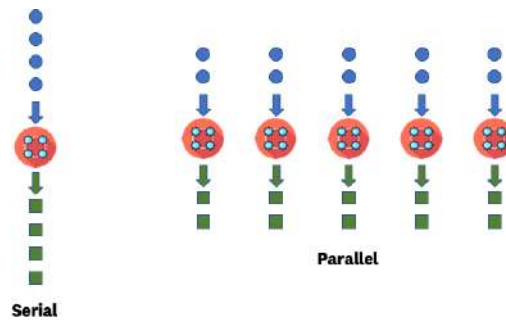
Fig.3. splitting up the image into several chunks and assigning processing cores to each chunkto accomplish much more in much less time

Many techniques have been developed to characterize the performance of parallel algorithms. We based our model on the homogeneous multicomputer parallel architecture model with irregular communication patterns. We use the performance metrics developed by Foster because they abstract away unimportant details, explain available observations, and predict future circumstances. For each algorithm, we discuss execution time, efficiency, and speedup. The execution time Tp is defined as the time that elapses from the start of the first processor executing on the problem to the end of the last processor completing execution. It includes computation time, communication time, and idle time. We assume uniform message routing distribution and neglect the idle time. Tp may be defined as:

$$T_p = T^i_{comp} + T^i_{comm}$$

where T^i, $T^i_{comp\,comm}$ is the computation time and the communication time on a processor, respectively. If an algorithm executes on p processors with time T_p and T_1 is its sequential execution time, the efficiency is defined by the ratio:

$$E = \frac{T_1}{PT_p}$$

The speedup is defined by the ratio:

$$S = \frac{T_1}{T_p} = PE$$

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4. Convolution Algorithms

The convolution algorithm used in the real-world application only works at the central part of the image that is in sight of multiple cameras, and what happens at the far edges is ignored. Therefore, we can safely ignore the complications at the edges and start the convolution from the pixel for which the kernel can access the required neighbors, i.e., pixel [6].

Traditional Implementations

In order to solve the convolution problems, the simplest approach is to loop over all the image pixels and all the kernel elements in one go. This algorithm is referred to asthe single-pass algorithm. This algorithm usually uses 4 nested loops, the 2 outer loops on the rows and columns of the image and the 2 inner loops on the rows and columns of the kernel.

An alternative comes into play when a separable kernel is used: the two-pass algorithm. Since a separable kernel can be decomposed into horizontal and vertical projections, it can be applied independently to the rows and columns of the spatial domain. For example, this reduces the number of multiplications per pixel to 10 for a 5X5 matrix. It has O(n) time complexity, while the complexity of a single-pass algorithm is O(n2), where n is the kernel width [7].

Parallel Implementations

The conventional parallel algorithm for convolution decomposes the input image into sub-images and distributes them among P tasks. Thus, for simplicity, we partition the input image into stripes in the horizontal direction. Each task is responsible for a sub-image of the size of N*N/P and performs the same computation on each pixel. The full input image is N*N, and the kernel is m*m. Because this algorithm does not replicate computations, we get

$$T_{comp}^{i} = \frac{1}{P}T_1 = \frac{t_c(2m^2 + 1)N^2K}{P}$$

Each processor needs to exchange two messages with its neighboring processors. The size of each message is

$$N\frac{m-1}{2}$$

Since many processors may need to send data over the same wire at the same time, the impact of competition for bandwidth may be severe. The preprocessor communication cost is

$$T_{comm}^{i} = 2K(t_s + t_b SN\frac{m-1}{2})$$

The variable ts represents the message startup time which is the time required to initiate the communication. t_b represents the transfer time per byte which is determined by the bandwidth of two processors between source and destination. S represents the number of messages needing to be sent concurrently over the same wireto indicate the effect of competition for bandwidth. S is determined by the network topology, communication pattern, and algorithm applied:

$$T_p = \frac{T_{comp} + T_{comm}}{p} = t_c\frac{(2m^2 + 1)N^2K}{P} + 2t_sK + t_bKSN(m-1)$$

$$E = \frac{1}{1 + \frac{2t_s + t_b S N(m-1)}{t_c(2m^2+1)N^2}P} \quad ,$$

we get the speed up:

$$S = \frac{P}{1 + \frac{2t_s + t_b S N(m-1)}{t_c(2m^2+1)N^2}P}$$

OpenMP Implementation

An OpenMP implementation of the image convolution algorithm is shown here.

Fig.4.

Fig.5.

Fig.6.

Fig.4,5,6. A deadlock-free approach for the forward-pass of the convolution filter.

The convolution filter operates over the entire image based on the kernel defined by the user. This operation is parallelizable by allowing different processes to manage different portions of the input image and then aggregating the results. In order to divide the image, we used a strip-based decomposition, where each process performs convolutions on different chunks of rows [8].

More specifically, we divide our input matrix such that each process is equally assigned a contiguous set of rows. Each process can calculate the convolution output for the tasks independently of the other processes, except for its top and bottomrows. These rows depend on other processes. This is because the kernel, which is localized onto these row elements, overlaps into a subgrid that is assigned to a different process. Therefore, we "pad" each subgrid with extra upper and lower rows. We then employ a message passing scheme to update these pad row values to populate the corresponding subgrid values correctly and completely. The number of required pad rows depends on

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the kernel size [9].

Since each MPI node is enumerated with an ID, we use these to control our message passing. We need our approach to be deadlock-free. And for that, every node that is sending a message must be paired with a node that is receiving at the same time [10]. Therefore, we let the odd-numbered nodes send their actual top and bottom rows while the adjacent even-numbered nodes receive. Then, we let the even-numbered nodes send their actual top and bottom rows while the odd-numbered nodes receive. This is done so as to ensure that each send is paired with a receive and that each process has all the information required to independently perform the convolution. Once all processes independently compute their subgrid outputs, this information is aggregated by the master 0th node to produce the final output of the convolution forward pass.

5. Conclusion

We examined several combinations of hyperparameters and observed speedup to see how parallelization affected performance. We varied input size, kernel size, and the number of forward passes in particular (iterations). The pattern is still linear, but the correlation is slightly smaller. With an image of roughly a hundred million pixels, it is easy to see how the parallel implementation began to overpower the non-parallel.

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Detecting COVID-19 with Chest X-Ray

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Abstract. COVID-19, a contagious disease that emerged in the Republic of China, has affected the lives of people across the globe as it triggers the physical as well as mental health of the infected person. Thus, to contain the spread of this disease, it is important to detect the disease & isolate the infected people at an early stage. And that is why new tools with the help of Artificial Intelligence & Deep Learning are being proposed that can help in the rapid detection of COVID-19 in patients. In this paper, we have applied the knowledge of Convolutional Neural Networks to distinguish between normal, viral pneumonia & Covid X-Ray scans compiled through various online sources. In the end, we could yield an accuracy of 95% in the prediction of the COVID 19 from the X-ray of the suspected patient.

Keywords: COVID-19 Detection, X-ray, Deep Learning, ResNet-18 Model, Convolutional Neural Networks, Coronavirus.

1   Introduction

From the very beginning, when we got to know about COVID-19, the World Health Organisation(WHO) has identified four major key areas that are crucial for reducing the overall impact of the disease. These are: to prepare and be ready; detect, protect, and treat; reduce transmission; and/or innovate and learn. A lot of significant efforts have been made for improving the COVID-19 diagnosis procedures. One of these diagnosing techniques includes a molecular diagnostic test based on a *polymerase chain reaction* (PCR). However, this is a precise procedure but it takes a lot of time to yield the exact results. Alternate to this, we have rapid tests like *real-time reverse transcriptase-polymerase chain reaction* (RT-PCR)[2]. These can be more rapidly deployed and yield faster results when compared to traditional PCR. But, many times, due to negligence, it can yield false negatives, which in turn leads to the spread of the disease.

COVID-19 testing has been a major issue throughout the pandemic whenever the wave has hit the region hard. Taking an instance of the second wave of the pandemic, patients had to wait for 3 to 4 days just to get diagnosed whether they are COVID-19 positive or not because of the excessive load of samples & the time taken by RT-PCR test samples to be diagnosed. On the other hand, CT Scans and X-Rays can also help in the diagnosis of the disease in a shorter duration. However, X-Rays are more commonly used instead of CT Scans as they are more cost-effective. And that is why we have also used X-Ray scans in our technique.

Deep Learning has changed the meaning of artificial intelligence and created new methods of using the available data effectively. Generally, CNNs yield high accuracy results in the field of image and object detection. That is why, have used CNN (Convolutional Neural Networks), also known as ConvNet to build this detection technique. CNN helps us to process information from the image that possesses a grid structure. For instance, images consist of pixels arranged in a lattice framework. Our brain can grasp information from images as each neuron works in its receptive field. With a network of many neurons, the brain covers the entire visual field. Similarly, CNN can process data in their receptive fields. We have used the ResNet-18 model for training procedures. It was the model that won the ImageNet challenge in 2015; It was mainly used to train extremely deep networks and it solved the problem of deep neural networks which was difficult because of the vanishing gradient problem.

We have trained this model in such a way that it can distinguish between Viral Pneumonia, COVID-19 & Normal X-Ray scans. It is important to train the model in such a way that it can make a difference between Viral Pneumonia & COVID-19 X-ray scans because many times these two can be confused with each other. This model yields an accuracy of 95% in the detection of the COVID 19 from the X-ray of the suspected patient.

2   Materials and Methods

Convolutional Neural Network yields better results when it is trained with a larger dataset, instead of being trained with a smaller one. And fortunately, we have a good quantity of datasets available that are required for yielding precise results. In the first step, the dataset was gathered from various sources. Then we used the image augmentation technique to improve the raining process. And then finally, the ResNet-18 Model of CNN[4] was applied to extract the detailed information from the Chest X-

Ray scans available.

Dataset

This project needs several images of Chest X-Ray scans to detect COVID-19 in a suspect. The dataset of Covid, Viral Pneumonia, and Normal X-Ray scans was collected through the Kaggle Dataset website. This dataset comprises 189 covid, 1311 normal, and 1315 normal scans. An example of the X-ray scans from the taken dataset is given in Figure 1.
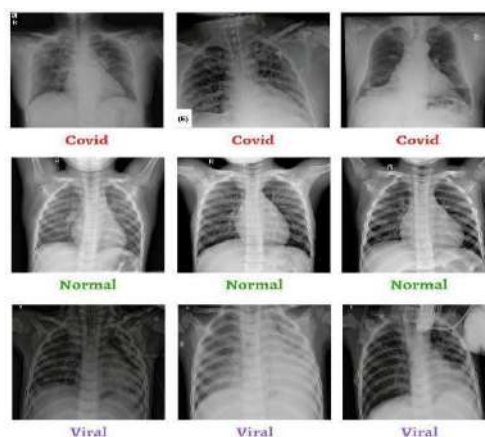

Figure 1: Samples from Dataset

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Image Pre-processing

One of the critical stages in the information pre-processing was to resize the X-Ray images as the image input for calculation were unique[10]. We carried out some image pre-processing technique to build the exhibition to our framework by accelerating pre-paring time. In the first place, we resized every one of our images to build processing time and to reasonable in Inception V3. In the image pre-processing step, we want to mark the information since the learning technique of convolutional neural organization squeezes into controlled learning in AI.

Convolutional Neural Networks (CNN)

Deep learning technology[7] is used in various fields where image and object detection is required. And one of the such widely used architectures of deep learning is Convolutional Neural Network (CNN). Firstly, it takes the input and then features from each layer are extracted for the learning process. This model has 4 main components:
(i) input layers (ii) convolutional layers (iii) fully connected layers and (iv) output layers. The evolution of CNN depends upon the software and the hardware[8]. The hardware affects both the time consumed and the performance.

ResNet-18[1] (Residual Network) Model is a convolutional neural organization that is prepared on over 1,000,000 pictures from the ImageNet data set. There are 18 layers present in its design. It is exceptionally valuable and effective in picture order and can arrange pictures into 1000 item classes. It is a model that diminishes preparing time and forestalls crumbling with the extending of t he organization. The organization has a picture input size of 224x224. The input value is added to the result in the layers after it.

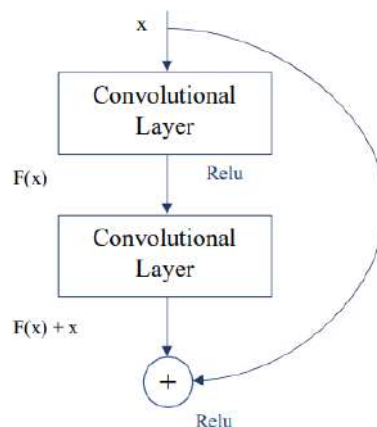An overall portrayal in regards to the addition of these squares, input(x), and yield are given[9] in Figure 2.

Figure 2: A general representation regarding addition of these blocks, input(x) and output.

Implementation

Implementation [3] of the model can be defined in a form of algorithm that consists of the following steps:
- To begin with, we load the dataset that contains 3000 images, approximately.
- Then we resize the images of our dataset to 224 x 224, i.e., the ideal required image size of the input.
- We have utilized the ResNet-18 network model with loads pre-prepared on ImageNet.
- The model is trained to extract the features from the images of the dataset.
- Finally, we pass another X-Ray image to identify whether the patient is detected with COVID-19 or not and furthermore if some other illnesses, like pneumonia, can likewise be predicted.

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3 Results

In the trial, 3000 Chest X-ray pictures dataset was utilized for training and testing, 2400 pictures for training (80%), and 600 for testing (20%). The model was trained with a bunch of 500 x-rays of individuals with Covid-19 and 500 ordinary scans, and a test set containing 56 chest radiographs split between individuals with Covid-19 and individuals without contamination.[11] The total informational index should spend on different occasions on a similar Neural Network to further develop the learning system.

Then, at that point, 10 periods are utilized to refresh loads of the CNN model[6]. The outcomes showed 95% preciseness.

To give more human-interpretable explanations, we led a few experiments on the chest X-ray pictures to assess the characterization execution of the network examined, let's consider the accompanying examples.

i)   The Chest X-Ray picture is characterized to contain an affirmed COVID-19 case with a likelihood of 99.60%, the picture is actually taken from the Covid-19 class as shown in Figure 3(a).

ii)   The Chest X-Ray picture is characterized to contain an affirmed COVID-19 case with a likelihood of 98.60%, the picture is actually taken from the Covid-19 class, as shown in Figure 3(b).
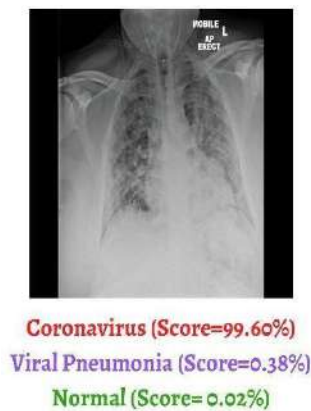

Coronavirus (Score=99.60%)
Viral Pneumonia (Score=0.38%)
Normal (Score= 0.02%)

Figure 3(a): X-ray depicts an affirmed Covid-19 Case with likelihood of 99.60%

Coronavirus (Score=98.60%)
Viral Pneumonia (Score=1.36%)
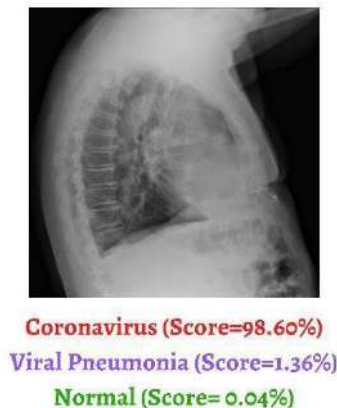Normal (Score= 0.04%)

Figure 3(b): X-ray depicts an affirmed Covid-19 Case with likelihood of 98.60%

Performance Metrics

In this section,[5] we have used four terms: TP (True Positive), TN (True Negative), FP (False Positive) and FN (False Negative). True Positive is for the number of images

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that were positive, and the model predicted them to be positive as well. True Negative is for the number of images that were negative, and the model predicted them to be negative as well. False positive is for the number of images that were detected wrongly as being positive. And, false negative is for the number of images that were detected wrongly as being negative. We utilized the accompanying measurements to ascertain our model's performance viably:

1. Accuracy: The accuracy worth of a model assists with recognizing it from different models and picking the best one for characterization purposes. In spite of the fact that it should be noticed that a high worth of accuracy isn't generally best as the proficiency of the model relies upon different measurements also. This model yields an accuracy of 95 percent. (shown in figure 4)

$$Accuracy = \frac{TP + TN}{Positive + Negative}$$

2. Precision: It addresses the proportion between accurately anticipated positive pictures and the absolute number of positive pictures. A high worth of precision implies a low mistake rate. This model shows that the Covid images have a precision rate of 100 percent whereas the pneumonia scan images showed a precision rate of 65 percent (shown in figure 4).

$$Precision = \frac{TP}{TF + FP}$$

3. Sensitivity: Sensitivity is also known as recall. It is the proportion of precise positive forecasts to absolute expectations. It ranges between 1.00 (best value) and 0.00 (worst value). The values above 0.5 are considered to be good to go ahead. In this model, the covid positive cases possess a sensitivity score of
0.68 and pneumonia scans possess a sensitivity score of 0.60 (shown in figure 4).

$$Sensitivity = \frac{TP}{TP + FN}$$

4. F1-Score: The weighted mean of Precision and recall is termed as F1-score. It assists with serving better assessment results when contrasted with accuracy, if there should be an occurrence of inconsistent classification appropriation. In our model, covid class possess an f1-score of 0.81 which is quite good. (shown in figure 4) And thus, our model possesses the ability to perform exceptionally well for the detection of Covid-19.

$$F1\ score = 2 * \frac{Precision * Sensitivity}{Precision + Sensitivity}$$

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	Precision	Recall	F1-Score
Covid-19	1.00	0.68	0.91
Normal	0.89	0.98	0.93
Viral Pneumonia	0.65	0.60	0.63
Accuracy	95%		

Figure 4: Performance Metrics

4   Conclusion and Future Work

Finally, with the development of this model as shown in Figure 5, we can say that we have another tool that can make the diagnosis of COVID-19 hassle-free for the suspected patients. Also, the performance metrics prove that this reduces the risk of yielding false negatives that might lead to the spread of coronavirus. This model will reduce the problems of carrying the samples & then getting them tested. Many times, the samples don't yield proper results because of negligence during the transportation.

In the future, more datasets can be added to improve the results more and this model can be deployed practically for use. Also, we'll develop an interface using which even the general population can check their results without facing many problems just by uploading the picture of their X-Ray scans. Thus, without much pain, a patient can get to know if they are positive and then take significant measures accordingly. Also, this will further connect him to a specialist nearby who'll guide the patient according to the severity of his case after seeing the reports.

Thus, there's no need to take the pain of looking for medical help & the interface will take all the care for the same. Also, the interface being online will make it easier to manage the data of the number of samples being tested and the number of patients being tested positive. This will stop unfair practices that might lead to the alteration of the data of active cases present in a region. Thus, management of data will also help to understand the statistics and positivity curve better.

Also, this model provides results within just a few minutes that will lead to an early stage detection of the virus in a patient. Thus, leading to early treatment being provided. A thorough approval would make the way for coordinating these calculations in work area applications or cloud servers for its utilization in the facility climate. Subsequently, its utilization, support, and an update would be practical and clear and would diminish medical care costs and further develop determination reaction time and accuracy.

So, CNN has incredible possibilities in identifying COVID-19 with exceptionally restricted time, assets, and expenses. However the proposed model shows promising outcomes, it is not the slightest bit clinically tried. This model requires further upgrades and clinical testing for it to work in clinical findings.
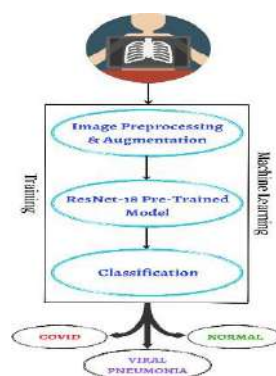

Figure 5: Representation of steps involved in creating the pre-trained model for the diagnosis of Covid, Viral Pneumonia & Normal X-Ray scans.

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How Social Media and other forms of mass media can spread Environmental Awareness

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ABSTRACT

Developments in the field of science and technology while paving way for too many revolutions on the one hand had resulted in serious environmental problems on the other. At this juncture, the role of social media becomes pertinent in spreading environmental awareness. This study aims to understand how important of a role can Social Media or other forms of mass media can play in bringing about environmental changes.

Keywords : Social Media, Environmental Awareness, Mass Media

1. Introduction

Social Media or in fact, mass media has a great role in promoting environmental education. Today, as environmental problems are escalating with the ever increasing rise in population, there is an urgent need to preserve the environment and improve it qualitatively.

The growing concern for the environmental issues is also evident from the fact that many national and international reports, conferences, campaigns, organizations had frequentlycome up for protecting and banning activities that endanger environment.

These include, UN Conference on the Human Environment, Stockholm Report 1972, Belgrade Charter 1975, Tbilisi Report 1977, Brundtland Commission (1983) and Agenda 21 of Rio Declaration 1992, Paris Agreement (2016) etc. to name a few.

The United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil in 1992, popularly known as the Earth Summit, adoptedf an action plan for Sustainable Development, Agenda 21. The Chapter 36 which is devoted to education, states that "Education is critical for promoting sustainable development and improving the capacityof people to address environment and development issues".

This shows there is a need to educate the masses about this grave issue. A good way todo so would be through the various forms of mass media like TVs, Radio etc.

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But with the rise of the internet came its huge reach and accessibility which made it oneof the best resources for people all over the world to find information. According to a survey done in 2021, there are there are 4.48 billion people actively using social media in the world. This figure was just 2.07 billion in 2015, that's an overall increase in users of 115.59% in just six years.

Unlike forms of mass media like Newspapers and TVs, in social media platforms the conversation and exchange of information works both ways. People can actively discuss topicswith other people and spread useful information to a wide audience.
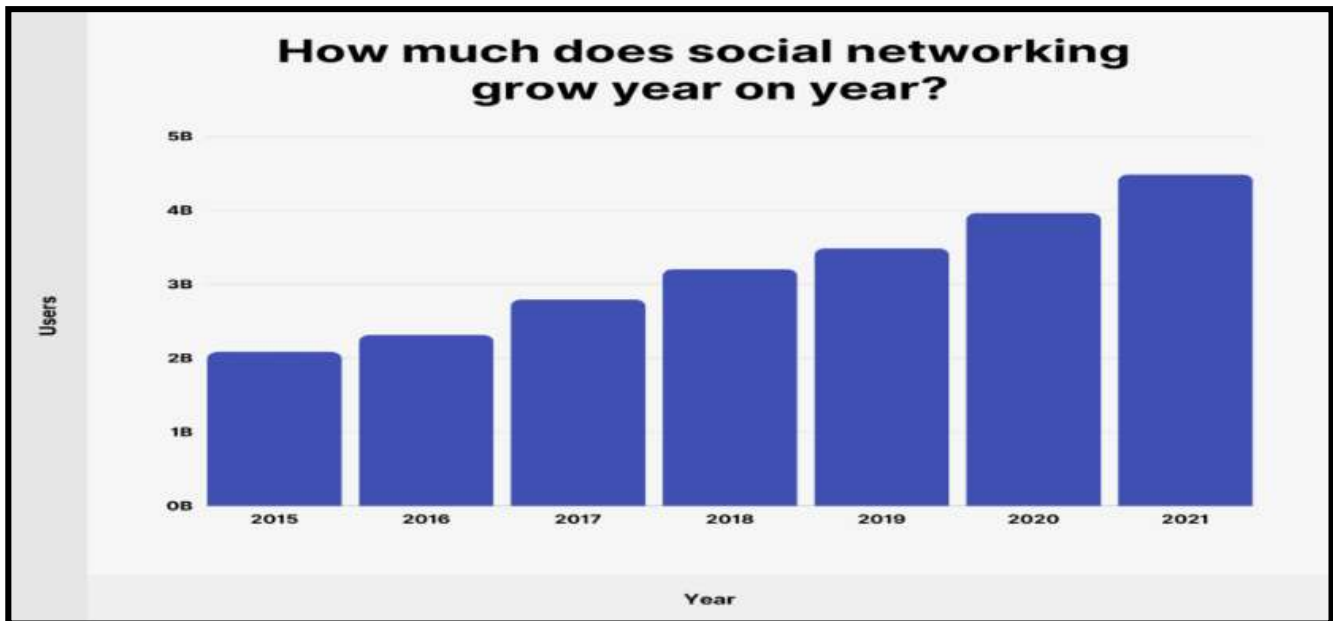

Fig. 1 : This chart shows the growth in the number of activeSocial Media Users in the past 6 Years

Studies conducted by Arcury et al. (1987); Ostman & Parker (1986, 1987); Brothers. Al. (1991); Hausbeck et. Al (1992); Chan (1996, 1999); Prathap & Ponnusamy (2006); and Kappor (2011) had also emphasized the importance of different types of media such as newspapers, radio, television and social media platforms, etc. in creating environmental awareness amongthe people of different communities belonging to urban and rural areas.

1. CASE STUDIES

#TEAMTREES Movement

We all know that we are living in the world of perpetual hassle and hard work to attain great

achievements in our lives. Hence, rarely of us get any time to think about our environmental situation especially about planting trees and afforestation. But planting trees is an indispensable thing without which we can't even stay at a normal level of healthy living. It is by planting trees we are able to maintain our atmospheric oxygen levelat a global balance.

Now the main agenda after reckoning about all of the possibilities for maintaining a healthy oxygen balance comes to planting trees and more trees. And to support this seemingly small but very important task, there comes the utilization of the internet orspecifically, Social Media platforms.

By implementing and persuading voluminous mass of people to gather together and help plant more trees with the help of virtual digital technology like websites , social media, andmobile apps to spread the campaign around the world. Social media helps alleviate the current situation by contributing towards encouraging people to plant trees by disseminating the word around the world. One of such example is #TEAMTREES.

Team trees website managed to plant over 9 million trees all around the globe just withthe correct use of the digital technology. The team is gaining new volunteers everyday and scoring wins for the planet. People are planting with them and even tracking their progress from start time to current time. The goal of #teamtrees is to plant as many as plants as possible all around the world. The goal of planting 1.5 million trees will help reestablish a sustainable water supply through protecting and replanting around springsand rivers.

Other Important Environmental Projects

There are several other environmental projects which have gotten a boost through social media. They have used these platforms to spread information and raise money, as well as gainvolunteers.

Mississippi River Valley Project

The Mississippi Delta was once a 24-million-acre forested wetland. Today only 4.4 million forested acres remain, mostly in small patches, leading to water quality and habitat issues. Tree planting efforts will improve critical habitat for threatened and endangered species andprotect the water quality of the rivers and streams within the delta.

British Columbia Canada project

In 2017, the Hanceville Fire raged through British Columbia, burning 240,000 hectares of land. Because of the extreme heat, portions of burned forestland cannot regenerate naturally and must be replanted. Replanting will ensure that area residents will continue to enjoy all the benefits of the forest, including clean air and water.

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California United States project

This reforestation effort aims to help residents recover from the many wildfires that have burned through California, including the Carr and Camp Fires. The 2018 wildfire season sawan estimated 8,000 fires burning through more than 1.8 million acres of forestland between July and December. Replanting will ensure that communities around the state won't face increasing challenges such as mudslides and degraded soil, water, and air quality.

Brazil Amazon rainforest

In the face of deforestation and devastation, the Arbor Day Foundation is dedicated to helping restore indigenous lands in the Brazilian Amazon. Our work with local partner Forest Trends will provide food security and income alternatives for thousands of indigenous people while contributing to conservation efforts and helping mitigate climate change. The country's Atlantic Forest has faced centuries of degradation due to agriculture, illegal logging, and development. This tropical jungle has lost nearly 90% of its original footprint. Restoration of this tropical landscape will mean clean water for more than 100 million South Americans.

2. Other forms of Media which can be helpful in spreadingEnvironmental Awareness

Newspapers and Magazines

Newspapers have always been an important form of media. Distributed every day early in the morning, it's usually the first source of news for most people. It also acts as a motivational source, for example, when they enlighten the farmers on the negative consequences of the use of pesticides, ways of introducing organic farming, new agricultural technologies, etc. As a result of these exposures and subsequent public pressures, local authorities, governments, industries and other units are forced to change their plans and practices, to strongly enforce laws and regulation, and to abandon those development projects whose environmental and social costs outweighs any benefits. Similarly, the environmental magazine like "Down to Earth" had been found to cover a broad variety of environment related topics (ranking from policy to science, from local to global level) and their scientific background.

Radio

Radio is cheap, most easily accessible and its signals cover almost whole of the country. It has been noted that Delhi FM was broadcasting two weekly programs on environment,

"KinareKinare" and "Ao Dilli Savaren" on being motivated by the Ministry of Environment & Forests. At the national level, the news on environmental aspects are very scarce and if they are broadcast they are most often at the regional level.

Television

Perhaps the most popular form of mass media after the internet, TV is now used for promotionby the Government is now increasing interest on environmental issues by allocating prime TV Slots to environmental programs. Most environmental documentaries shown on TV today attract few viewers because of the academic or obscure manner in which they are presented.

There are some channels like, Discovery Channel, National Geographic Channel and Animal Planet Channel which are broadcasting exclusively on endangered species, wildlife,sea life, etc. The programs like "Virasat" , "Race to Save the Plant", quiz show named "Terraquiz" , "Earth" was telecast by the Ministry of Environment & Forest in cooperation with Doordashan. In addition to that BBC's "Earth Report" offered exclusive information onenvironment and with the daily broadcast of "The New Adventures of Captain Plant" on Cartoon Network there was at least one program on environmental issues especially designedfor children.

3. Conclusion

Social Media plays an important role in forming the positive attitudes of the public towards the environment. Its rolein increasing environmental awareness of the population is an enormous one as it reaches a vast percentage of India's complex society. Thanks to the recent internet boom in India, more and more people are getting aware of these issues and are doing their part for the greater good. There is now a question whether modern education as provided would adequately equip the young generation to take up the future challenges of thetechnology-driven, environmentally-degraded globalized world.

With the use of social media, people around the world can connect, track, record, post,share, analyse, and motivate other people by their achievements.

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MANAGEMENT INFORMATION SYSTEM IN HOSPITABILITY

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ABSTRACT

Information systems assume a significant part in the creation, sharing, stockpiling and transmission of information in different fields. Hospital information management systems utilized in the wellbeing area effectively address the issues of doctors, executives, and patients in institutional cycles. Hospital information management systems guarantee that information is gathered in a right, total and related way. Hospital information management systems began to be utilized during the 1960s. These systems can be delegated incorporated and measured systems. Coordinated information systems are partitioned into hospital general information system, clinical information systems, management information system, and a data set management system. In another arrangement, hospital management information systems are believed to incorporate asset use and programming, monetary management, materials and office management and staff management systems. Hospital management information systems have purposes, for example, giving patient fulfillment, reinforcing inner correspondence organizations, diminishing expenses, and dependably putting away information in an advanced climate. The improvement of hospital information management systems in India depends on the Health Information Systems Project, which was upheld by the World Bank in 1990 and led by the Ministry of Health. The utilization of hospital information systems in wellbeing establishments has gotten progressively far reaching with the examinations directed under the authority and coordination of the Ministry of Health following 2000 years.

Keywords:- MIS(Management Information System), Solicitation Investigation.

1. INTRODUCTION

The idea of the MIS has developed throughout some stretch of time containing a wide range of features of the hierarchical capacity. MIS is a need of the multitude of associations. The underlying idea of MIS was to handle information from the association and present it in the form of reports at ordinary stretches. The system was generally fit for dealing with the information from assortment to preparing. It was more indifferent, requiring every person to single out the handled information and

use it for his necessities. This idea was additionally changed when a differentiation was made among information and information. The information is a result of an examination of information. This idea is like a crude material and the completed item. What are required are information and not a mass of information. Nonetheless, the information can be dissected in various manners, creating various shades and determinations of the information as an item. It was, thusly, requested that the system idea be an individual-arranged, as every individual may have an alternate direction. Towards the information this idea was additionally altered, that the system should introduce information in such a structure and arrangement that it makes an effect on its client, inciting a choice or an examination. It was subsequently acknowledged then despite the fact that such an effect was an invite adjustment; some kind of specific methodology was vital in the examination and revealing. Consequently, the idea of special case announcing was guzzled in MIS. The standard for a special case

The conditions that empower worldwide rivalry in the information society are the advancement of correspondence innovations and the significance of the managerial information streams and the be-tween institutional correspondence organizations. Along these lines, more accentuation is put on in-formation systems in the serious introduction of public administrations. Information systems are one of the methods by which public foundations can save monetary pointers, like time and cost. Since the 1960s, the utilization of information systems in the wellbeing area has gotten far and wide. Med-ical services are a need in guaranteeing the social prosperity and securing the public interest. Partic-ularly in the introduction of preventive and corrective wellbeing administrations, it is seen those information systems to give more prominent accommodation to patients and doctors through an elec-tronic data set. The job and significance of information systems in the wellbeing area have expanded in an intra-institutional correspondence, the stock of materials, and in-house and interinstitutional information moves to medical care staff. Information systems plainly show the consequences of in-stitutional execution of medical care establishments in the area just as sickness insights. It is conceiv-able to make different judgments of the information given by the information systems about the achievement pace of the institutional help conveyance. Hospital management information systems give an institutional structure comprising of various information about the clinical, monetary and administrative elements of a specific hospital. The primary uses of these systems are restricted to, the account of patient information and the charging of wellbeing administrations advertised. Today, new modules have been added to understanding management information systems like arrangement

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over the web, follow-up patients, and solicitation investigation and show results. In this way, it has gotten workable for specialists to communicate their solicitations straightforwardly to the research facilities by means of mechanization systems and to screen the outcomes on the web. In this regard, the principle issue of the examination is to characterize the job of hospital management information systems inside the utilitarian setting. The motivation behind the examination is to assess the improvement in India subjectively by setting out the significance and favorable circumstances of the hospital management information systems in the wellbeing area. In the initial segment of the examination, the turn of events and sorts of hospital management information systems are talked about. It is uncovered how the system has followed a formative line from the 1960s to the current day. Also, subsystems covered by hospital management information systems are tended to. In the subsequent part, the reason for hospital management information systems in wellbeing organizations is clarified. The advantages given by the management information systems in the wellbeing area are clarified. The last piece of the examination inspects the investigations on the utilization and advancement of hospital management information systems in India. It is portrayed how the Health Information Systems Project, started by the Ministry of Health activities during the 1990s, has been created with crafted by 2000 and later. The fundamental segments of hospital management information systems utilized in India are likewise referenced.

MIS

The Management Information System (MIS) is an idea of the most recent decade or two. It has been perceived and depicted in number manners. It is otherwise called the Information System, the Information and Decision System, the Computer-based information System. The MIS has more than one definition, some of which are give beneath.

1. The MIS is characterized as a system which gives information backing to dynamic in the association.

2. The MIS is characterized as an incorporated system of man and machine for giving the information to help the tasks, the management and the dynamic capacity in the association.

3. The MIS is characterized as a system dependent on the data set of the association advanced to give information to individuals in the association.

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4. The MIS is characterized as a Computer ñ based Information System

Thought there are various definitions, every one of them unite on one single point, i.e., the MIS is a system to help the dynamic capacity in the association. The distinction lies in characterizing the components of the MIS. Notwithstanding, in today is world MIS a mechanized .business handling system creating information for individuals in the association to meet the information needs dynamic to accomplish the corporate goal of the association. In any association, little or large, a significant segment of the time goes in information assortment, preparing, archiving it to individuals. Subsequently, a significant bit of the overheads goes into this sort of inefficient work in the association. Each person in an association is persistently searching for some information which is expected to play out his/her errand. Subsequently, the information is individuals arranged and it fluctuates with the idea of individuals in the association.

2. MANAGEMENT INFORMATION SYSTEM

The term management information system (MIS) showed up in U.S. naval force report on the utilization of PCs to build a solitary incorporated system to deal with all naval force assets. The MIS thought spread quickly all through the regulatory systems local area, energized by a spate of resulting reports and meetings supported by the American Management Association. MIS is each system, which gives information to the administrative exercises in an association. For about 10 years, from its acquaintance in 1959 with the finish of the 1960s, this expansive meaning of MIS spread quickly and was supported by mechanical companies, advisors, scholastic specialists, management essayists, and PC producers.

The expression "management information system" (MIS) is indistinguishable with PC based systems. Utilized comprehensively, it is viewed as the system fulfilling all the information requires of supervisors. MIS is the investigation of giving information to individuals who settle on decisions about the demeanor of important assets in an ideal, precise, and complete way at least psychological and financial expense for securing, handling, stockpiling, and recovery. Another definition accentuates the utilization to which the information is put, as opposed to the manner in which it is created: "A system to change over information from inward and outside sources into information and convey that information in a fitting structure, to chiefs at all levels altogether capacities to empower them to

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settle on ideal and successful choices for arranging, coordinating and controlling the exercises for which they are responsible. Others, nonetheless, give it more restricted degree. They consider it to be a system gathering and breaking down information and delivering reports. Its motivation is to assist directors with tackling organized issues. However, it ought to likewise satisfy various different purposes:

- It ought to give a premise to investigate notice flags that can begin both remotely and inside; this is the principle capacity of information base;

- It ought to computerize routine activities subsequently maintaining a strategic distance from human work in the handling undertakings;

- It should help management in settling on routine choices;

- It ought to give the information important to settle on non-routine choices;

- It should fill in as an essential weapon to acquire upper hands.

3. NEED OF MIS FOR INFORMATION SYSTEMS

Supervisors decide. Dynamic by and large takes a four-overlay way:

- Understanding the requirement for choice or the chance,

- Preparing elective course of activities,

- Evaluating all elective course of activities,

- Deciding the correct way for usage.

MIS is an information system that gives information as normalized reports and shows for the administrators. MIS is an expansive class of information systems intended to give information expected to viable dynamic. Information and information made from a bookkeeping information system and

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the reports created consequently are utilized to give exact, opportune and pertinent information required for successful dynamic by directors. Management information systems give information to help management dynamic, with the accompanying objectives:

- Pre-determined and preplanned answering to directors.

- Interactive and specially appointed help for dynamic.

- Critical information for top management.

- MIS is of crucial significance to any association, on the grounds that:

- It accentuates on the management dynamic, not just handling of information created by business activities.

- It accentuates on the systems structure that ought to be utilized for getting sorted out information systems applications.

4. HOSPITAL INFORMATION MANAGEMENT SYSTEMS AND THEIR TYPES

Information systems incorporate all the master labor force, PC organizations, system models and system information needed to perform different capacities like assortment, preparing, capacity, access and dispersion of information. It is conceivable to consider information to be as systems that mean to give exact, cutting-edge information where and when they are required. The exhibition of information management systems is firmly connected to the current highlights of the product, equipment, and information. Information gathered, put away and broke down in information management systems are assessed by standards like assurance, up-to-datedness, unwavering quality, and being pointless. However much as could reasonably be expected in the arranging of information systems in policy implementation, the prerequisites of vertical and even progressive levels in the public associations ought to be assessed Information management systems in the public area are utilized to screen the climate and to consider the communication of outside elements with one another and with public specialists.

The Hospital Information Management System is a system that hospitals gather and interaction all fundamental information is handled and gathered through PCs about medical care administrations and management. This information can be moved between the units by means of the robotization system in the electronic climate. It plays incorporating job diverse information that arises regarding clinical, monetary and management elements of the hospital. The hospital information management system is an institutional asset arranging system that has been privatized and expanded in quality as indicated by the requirements of the wellbeing area

Hospital information management systems keep a ton of information since hospitals have such countless capacities. In this kind of system, there is a wide assortment of information accessible from the labor force utilized by the patient to what the staff can make or do to follow the working of the hospital and encourage managerial assignments. The system gives inputs on patient consideration measures for hospitals. It helps us to remember the important assignments to perform and permits us to build up a finding and treatment convention that can be applied to a unique patient

5. USE OF HOSPITAL MIS

Activities to set up hospital management information systems in India started in 1990 with the death of the Ministry of Health and the World Bank's Health Information Systems Project. The improvement of the wellbeing information system is in the principle targets of the first Health Project dispatched in 1991, the advancement of the management information systems and the essential medical care information systems are the primary destinations of the second Health Project covering the years 1995-2001. Thusly, the Health Information Systems Project began in 1992 with the arranging stage. At this stage, issues identified with the quality and information legitimacy of the hospitals were assessed. Since 1995, hospitals' advantage in hospital management information systems has expanded and hospitals have started to exploit information systems more. In 1996, the information preparing division of the under-secretariat of the Ministry of Health was set up.

In the exact year, Hospital Information Systems Technical Specification Evaluation Commission was set up under the information handling office. Be that as it may, no normalization has been accomplished practically speaking. For this reason, the Ministry of Health arranged a report named "Buying Principles of Hospital Information Systems" and disseminated it to all hospitals. In 1999,

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the Ministry of Health attempted to make application programming inside the information preparing division and chose Ankara Education and Research Hospital as a pilot hospital. Nonetheless, toward the finish of 2003, this undertaking was halted. It has been concluded that the hospitals ought to get their information management system needs from private area organizations with their own well-springs of spinning reserves. In the exact year, "India Health Information System Action Plan" was made by India Health Information System Action Plan Working Group. In 2004, the service finished work on essential consideration administrations in the field of medical care. In 2005, SSK, BAĞ-KUR and the annuity reserve and the contracted hospitals were converged under the top of the Social Security Institution and this foundation checked the installment cycle of the patients enlisted through Medula (General Health Insurance) system. Moreover, the Social Security Institution necessitates that every hospital information system is coordinated with Medula over the Internet.

- Patient Registration-Acceptance: The individual information about the patient applying to the hospital is recorded in the related polyclinic. The patient's arrangement is taken.

- Patient Inpatient-Discharge Procedures: Patient confirmation strategies are trailed by nonessential supplies of patients in the hospital and medication use. After the analysis and treatment of the patient, release activities are completed.

- Patient Follow-up: It tracks methods performed on the patient's assessment, given meds, applied assessment, and treatment.

- Referral of the Patient: If the patient can't be treated in the hospital where the patient is alluded to, the patient is moved to another hospital.

- Central Hospitalization: It gives a hospital confirmation arrangement to the patients to be admitted to the hospital.

- Emergency Service: It makes a patient record to the hospital crisis office. It frames the discussion records of the patient. It records the treatment applied to the patient.

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- Human Resources: It is the systems where the information about the staff can be followed and made gathering preparing. It comprises of four modules as record, leaves, staff developments, and promotionsaccrual. In the system, consents for clients on the screen and exchange premise are characterized. Consequently, clients can just play out the tasks they are approved to do with the system.

- Voluntary Work: It tracks assessments and medical procedures done by specialists, working long stretches of staff, net wages acquired.

- Health Board: It tracks the consent and prescription reports given to the patient and moves this information to the e-wellbeing system.

- General bookkeeping: It keeps up broad bookkeeping and fixed resource system records as per the SSK educational program.

- Purchasing/Material: It characterizes the essential materials for the hospital and codes them. It gives stockpiling of materials in stockrooms and racks. It monitors the passage and leave developments by following the hospital stock status of the material.

- Appointment System by means of Phone: It empowers the arrangement interaction to be done 365 days/24 hours without an administrator. It reports, persistent stream information, for example, the every day number of patients calling, the quantity of arrangements, and the quantity of patients inspected every day.

- Laboratory: It deals with the auto-analyzer gadgets utilized in hospital research centers. It arranges the ideal tests to be performed for the patients in the proper hospital and auto-investigation gadget. In the wake of accepting the outcomes from the system and affirming to the lab administrator, the report is introduced to the patient.

- Pharmacy: It keeps loads of medications and extra supplies and gives the vital insights. It plays out the material orders, solicitations, and release of hospitalized patients. It follows the endorsed cycle of the outpatient center.

6. CONCLUSION

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Information systems are one of the underlying changes that public establishments have embraced lately. One of the essential prerequisites of the information society is straightforward and quick policy implementation. It is imagined that a particularly managerial construction will be successful in assistance arrangement. Medical services are one of the zones where the public area assigns the most assets. Above all else the states should guarantee the wellbeing of the family and society by and large, considering the public interest. For this, it is essential to fit preventive and restorative wellbeing practices to current advancements in information and correspondence innovations to guarantee the profitability of the medical services industry

Hospital information management systems will be systems that gather information from various sources, taking on elements of social affair information in hospitals and communicating information to regulatory units. Such a system comprises of programming, equipment, and the vital correspondence foundation and is set up both on paper and PC. It allows the productive trade of information with specialists and other hospital staff with associates all through their own foundations. Hospital information management systems have gained ground since the 1960s. These systems, which zeroed in on decreasing expenses during the 1970s, pointed toward uniting different components in an all encompassing manner during the 1980s. As indicated by this; all itemized information about patients is kept in a system. Thusly, doctors can make exact findings by arriving at the information about the patients immediately. The present circumstance offers a preferred position as far as cost and time by dodging superfluous clinical trials to be applied to the patient. The utilization of electronic patient records got inescapable during the 1990s. After the 2000s, it was expected to expand the nature of patient consideration in the wellbeing area through mechanical applications.

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BitTorrent and Blockchain: A case study

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Abstract

The paper presents a detailed introduction into BitTorrent and blockchain. The paper also deals with the working of BitTorrent and Blockchain and throws light on the various technologies used in their architectures, for example, peer-to-peer network (used by both BitTorrent and blockchain) and distributed ledger technology (used in the blockchain). The paper concludes with a comparative study between BitTorrent and Blockchain determining similarities and differences between the two.

Keywords: blockchain, BitTorrent, peer-to-peer, distributed ledger technology

1. Introduction

Blockchain:

According to IBM [6], "Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network. An *asset* can be tangible (a house, car, cash, land) or intangible (intellectual property, patents, copyrights, branding)."

It is one of the emerging technologies in today's world and with the emergence of cryptocurrencies, its popularity is growing day by day. But blockchain is not only limited to cryptocurrencies, it has a greater potential that can revolutionize the way data is stored on the web providing greater security and ownership to the user for theirdata.

BitTorrent:

BitTorrent is a file-sharing protocol which enables distribution of data, files and services over the internet in a decentralized and collaborative manner. It is peer-to- peer file sharing system and is one of the most common protocols used for sharing files, majorly video and audio files over the internet.

In 2019, it was a dominant file-sharing protocol. It generated a substantial amount of Internet traffic, with 2.46% of the downstream traffic and 27.58% of the upstream traffic.

Client-Server Architecture:

A client-server architecture is a computer network architecture in which there is a centralized server that serves to the requests sent by the multiple clients connected to it. The centralized server is basically a computing device that hosts, delivers and manages resources and services that are required by different clients at different or same time. When a request is received by a server, it sends back a response containing the valid information required by the client. It is also known as network computing model because all the requests and services are delivered over a networ|k.
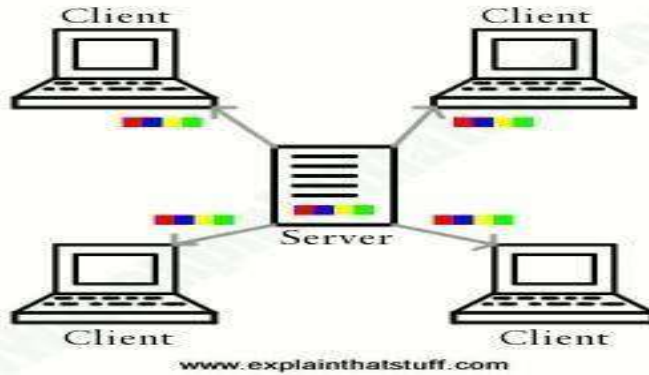
Figure 1. Client-Server Architecture

Peer-to-Peer Network:

In a peer-to-peer network architecture, there are multiple devices/computers connected to each other without the need of a centralized server. A peer-to-peer architecture consists of a decentralized network of peers (similar devices) that are both clients and servers. In a p2p network, there might be some peers that send more and receive lesser compared to others, known as Super peers and theremight also be peers that are exactly opposite called Edge peers.
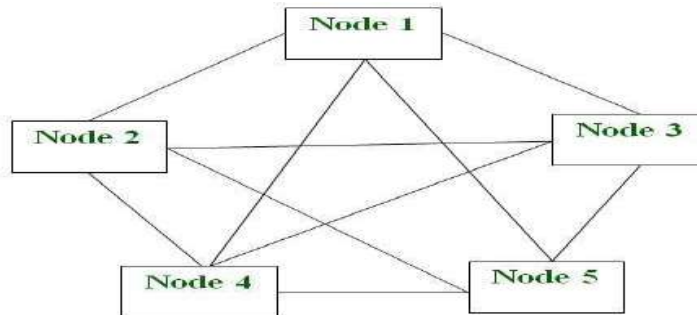
Figure 2. P2P Architecture

The purest form of p2p network architecture is completely decentralized. However, in some cases, there might be the need of central tracking server layered on top of the network so that peers can find each other, which is the case in BitTorrent.

2. **Functionality of BitTorrent andBlockchain**

Blockchain and BitTorrent both, use peer-to-peer network, i.e., both of them are decentralized, but the major difference lies in how these technologies work. Here is a detailed description of how BitTorrent and Blockchain work.

BitTorrent

BitTorrent Protocol enables download of large files at a faster speed using minimum Internet Bandwidth. This becomes possible because BitTorrent gathers pieces of the file that we want and downloads them simultaneously from the devices on the network that have already downloaded those pieces.

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The various components of a BitTorrent network are described below:

Torrent: Traditionally, a computer connects to a swarm by loading a ".torrent" file into a BitTorrent client. A .torrent file is a file that contains meta-data about files and folders to be distributed. It contains information such as filename, size, hashing info and URL of the tracker. Tracker use these torrent files to track all clients and their progress. Torrent files act as an index that allows computers to track information with the help of BitTorrentclient.

Swarm: It is the network of all the computers that are connected together at any point of time while downloading a particular resource.

Seeders: A computer that host the original file to be downloaded in its entirety. These are devices that initially provide the complete downloaded file to the swarm. These devices share files but don't download them.

Seeding: When others in the swarm have downloaded the file, they are encouraged to remain in the swarm to provide more of their upload bandwidth, so that other people can continue to download the file. This is called seedingand the people who provide the file are called seeders.

Peers: A peer is any BitTorrent client running on a computer, that is connected to swarm and is downloading some part of a file and uploading some other part to some other client. A peer does not have a complete file.

Leechers: These are users who quit the swarm without seeding after they finish downloading the complete file.

Tracker: A tracker basically acts like a central server, that identifies swarms and keeps track of the connected computers. It assists in the communication between peers using the BitTorrent protocol.

How all of this really works together?[7]

Initially, to start downloading a file, there needs to be an originating server, called the seed, that needs to share the complete file to the swarm. The file provided by this server is then split into pieces and sent out to the other users in the swarm that are trying to download this file.

Once the entire copy of the original file is distributed among the other downloaders, the seed can stop uploading and the download will stillcontinue as long as there are enough people downloading the file and all pieces of the file areavailable.

BitTorrent shares some of the file tracking work with the central server, i.e.,the tracker.
To enter a swarm, a device needs to upload a ".torrent" file into a BitTorrentclient.

BitTorrent client on a user's computer communicates with a tracker to find other computers running BitTorrent that have the complete file (seed computers) and those with a portion of the file (peers that are usually in the process of downloading the file).

The tracker identifies the swarm, which is the connected computers that have the complete file or a portion of the file and are in the process of sending or receiving it.

As soon as a particular device downloads a part of the original file, it starts uploading that part of the file, while simultaneously downloading the other parts of the file that it has not downloaded. All the clients work together as a swarm to share files.

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The tracker helps the client software trade pieces of the file with other computers in the swarm. The client receives multiple pieces of the filesimultaneously.

Eventually, every client receives the complete file, which is the ideal case and happens when all the pieces of the file are available till the last client in the swarm has ended up downloading the complete file.

BitTorrent has a **tit-for-tat** system. This means that in order to receive files, a device has to upload files to the swarm as well. This concept solves the problem of leeching, wherein someone downloads a complete file and simply leaves.

BitTorrent aims at increasing the download speed of all the users that are connected to the swarm. With BitTorrent, the rate of download depends on how many files the client is uploading. The clients who contribute more to the upload bandwidth receive more data than others who contribute lesser amount of upload bandwidth.
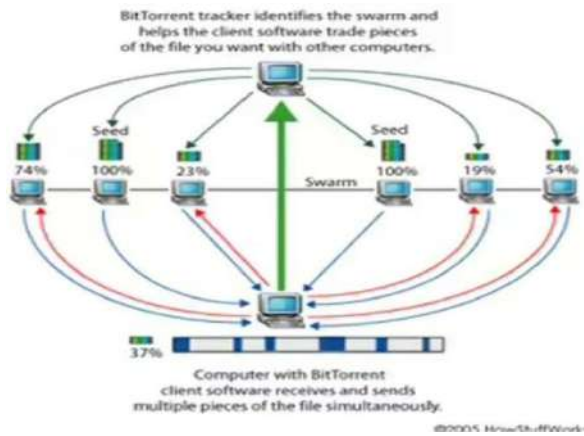
Figure 3.how BitTorrent works (image src: https://computer.howstuffworks.com/)

One of the disadvantages with BitTorrent is that it has been used to download to lots of pirated content by users all over the world. But this has been on a decline for the past few years as we can see on the chart below. But this is only one side of torrenting.
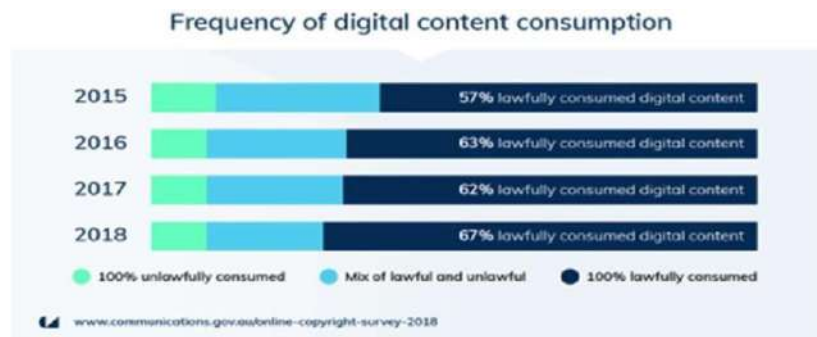
Figure 4. consumption of pirated content has been on a decline

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Torrenting has also been used for a lot of meaningful and collaboration purposes. For example, a company can use the power of torrenting for sharing files and data within an organization. Torrenting gave us a glimpse of how decentralization of data storage even before blockchain became popular.

Blockchain

Blockchain Technology was first popularized by a pseudonymous developer (or a group of developers), Satoshi Nakamoto, when he created world's first decentralized digital currency, BITCOIN.

According to Wikipedia, "a blockchain is a growing list of records, called blocks, that are linked together using cryptography. Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data (generally represented as a Merkle tree)"[8].

"The whole point of using a blockchain is to let people — in particular, people who don't trust one another — share valuable data in a secure, tamper proof way."[9]

---MIT Technology Review

It is a new method of record-keeping, i.e., it is a list of records that are stored publicly and in chronological method. It is a type of ledger, that is spread over a distributed network of computers, which is called a DistributedLedger.
Blockchain is basically a Decentralized Distributed LedgerTechnology.

Information in blockchain is not controlled by any centralized authority. The participants of a blockchain network have complete democratic authority to maintain data and to approve transactions that can happen on a blockchain.

To understand better about block chain, we need to understand the following terminologies:

Distributed Ledger Technology: Aledgerisa connected list of records of the transactions. In DLT, this ledger is distributed among all the participants ina

blockchain network and, this helps in eliminating the duplication of efforts that's typical of traditional business networks because transactions are only recorded once and are accessible by every user on the network.

[10] It refers to technological infrastructures and protocols that allows simultaneous access, validation, and record updating in an immutable manner across a network that's spread across multiple entities or locations.

DLT allows secure functioning of a decentralized digital database and eliminates the need of a central authority to keep a check against unauthorized manipulation.

Immutable Records [11]: The data in a blockchain is immutable because tampering a particular block of data results in alteration of data in all the blocks after that block. If a change occurs, or if a transaction record includes error, a new transaction must be added to reverse the error, and both transactions are then visible.

Smart Contracts [12]: Smart Contracts are used to speed up a transaction and are executed automatically when certain predetermined conditions are met. They typically are used to automate the execution of an agreement so that all participants can be immediately certain of the outcome, without any intermediary's involvement or time loss. They can also automate a work flow, triggering the next action when conditions are met.

Block: A block is a permanent record of transactions that are hashed and encrypted into a Merkel tree. A block contains a cryptographic hash of its previous block so that it can connect to its previous block.

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Every block is connected to its previous and next block, thus forming a chain. Every block in a blockchain is digital signed by a user's private key and thus it is highly secure and nearly impossible tohack.

Private Keys: It is a unique cryptographic key that is used to sign the transaction performed by a particular user on the blockchain network. Private key makes it possible to prove that we are the owner of that particular block of transaction. When you want to send value from your address, you "sign" a transaction with your private key. A hash function combines the transaction data with your private key to generate a transaction id.

Hash Functions: A hash function is a method to map any given input, whether it is number, alphabets or media files, into a unique value of fixed length. The output of a hash may be called a hash value, digest, or simply hash. The length of the hash generated varies depending on the hashfunction being used. It can be of length 32-bit, 64-bit, 128-bit or may be 256- bit depending on thealgorithm.

A Bitcoin's blockchain uses SHA-256 (Secure Hash Algorithm) hashing algorithm. SHA-256 Hashing algorithm was developed by the National Security Agency (NSA) in the USA in2001.

How does a Block chain work?[14]

IBM defines the working of Blockchain in three steps:

a. **Whenever a transaction takes place, it is stored on block containing all the details of the transaction.** This data block can store any information as per the choice of the user regarding the transaction and it is digitally signed by the user's private and public keys. This digital signature is a unique andsecure digital identity reference and the most important aspect ofblockchain technology. Every transaction is authorized by the digital signatureof theowner.
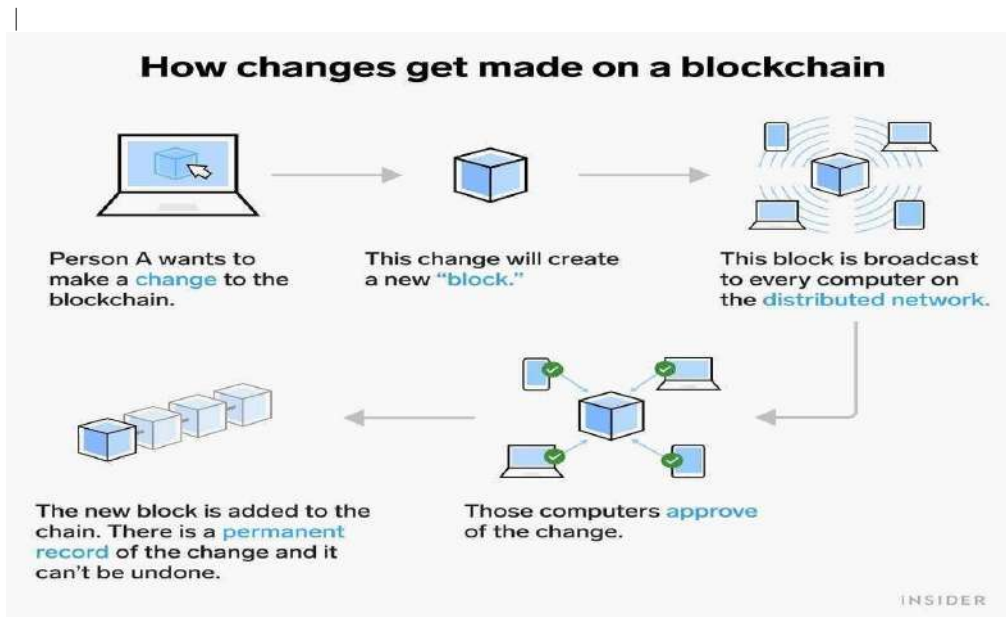

Figure 5. working of blockchain (image src. business insider)

b. **Eachblockisconnectedtotheblocksbeforeandafterit.**Theseblocks form a chain of data as an

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asset moves from place to place or ownership changes hands. The blocks confirm the exact time and sequence of transactions, and the blocks link securely together to prevent any block from being altered or a block being inserted between two existingblocks.

c. Transactionsareblockedtogetherinanirreversiblechainablockchain.
Every block that joins the chain strengthens the verification of previous

block and thus helps in making the blockchain even more secure. This makes the blockchain safe from tampering and thus makes it immutable.

The information contained in a digital ledger is highly secure and digital signature makes it even more secure and safeguards it from tampering. In a ledger almost anyone can see the data, but no one, not even a systemcan manipulate it in anyway.

3. **Similarity andDifferences**

Similarities

The first thing that is common between these two technologies is the use of peer-to-peer topology & decentralized and distributed architecture. P2p architecture is used to distribute information on the network in case of BitTorrent while in Blockchain it is used for storing information and communication between nodes.

Both of these technologies do not need a centralized server to operate. However, in some cases, a central tracker might be required in BitTorrent to track progress of downloads on devices but it does not contribute to sending any data to the swarm.

Differences

Both technologies BitTorrent and Blockchain serve different purposes.

Usage of p2p network architecture

Peer-to-peer network in case of BitTorrent is used to efficiently distribute files over a swarm of computers. It aims at improving the download speed for each computer on the network by collaboration of each of them to the download.

In case of Blockchain, peer-to-peer network serves the purpose of creating a robust and highly secure chain of transactions, that makes them immutable and tamper-proof. It helps in providing the users a greater amount of ownership for their data.

Usage of DLT

Block chain uses DLT i.e., Distributed Ledger Technology, to store data securely over the network and this same ledger is available to all of the users on the network. In contrast to this, BitTorrent is simply a file distribution system in which initially a single seed needs to contribute the whole file to the system and after the whole file is available on the network, the other users can also contribute after they have downloaded their part of thefile.

Data Replication

Blockchain Technology is about preventing double spending, i.e., with shared ledger, transactions in a blockchain are recorded only once and eliminates the replication of data that happens in traditional financial networks.

In contrast to this, torrenting is mainly about copying data, all the users on a network copy data from the originating seed. In a swarm of BitTorrent all the users communicate with each other to download a particular file or software.

Security

In terms of security, Blockchains are highly secure because DLT uses highly secure hash algorithms to encrypt data for example, SHA 256. Apart from this, there are too many entry points for hackers to enter the database because of Blockchain's decentralized nature. While data on a Blockchain is highly secure but blockchain networks might be vulnerable to phishing, routing attacks, sybil attacks, etc.

BitTorrent on its own is not unsafe or insecure and poses no harm to the system but in a swarm, there might be people who can put malwares or spywares with their uploads and this might affect the whole network that is downloading the data from the swarm.

4. **Conclusion**

BitTorrent and Blockchain are really distinct technologies. This is obvious when we see that there are much more differences in technologies, use cases and security of user data. Both of them are serving two different sectors. While BitTorrent is all about file download optimization using collaboration of users, Blockchain is about storing transactions and mainly used for financial purposes and has use cases for eliminating data duplication and providing near to complete ownership to the users for their data. Both of them serve really contrasting and really different use cases. We also saw some of the similarities which are basically usage of peer-to-peer network and non-usage of a central server.

5. **Future of BitTorrent withBlockchain**

BitTorrent was started in 2001 and till 2018 it remained only a file sharing platform over the web. BitTorrent owns uTorrent which allows users to download files and services over the web using p2p and collaboration with other users. In July 2018, BitTorrent was acquired by TRON. TRON is a blockchain start-up. It was established in March 2014 by Justin Sun and since 2017 has been overseen and supervised by the TRON Foundation, a non-profit organization in Singapore, established in the same year. It is originally an Ethereum-based ERC-20 token, which switched its protocol to its own blockchain in 2018.[14] Since its acquisition, BitTorrent has added various new tools, with a dedicated native cryptocurrency token, BTT, released in February 2019. BTT was launched on TRON's own blockchain, using its TRC-10 standard.BitTorrent, before acquisition did not enjoy a very pleasant reputation in the industry because majority of its users download pirated content on the platform. But blockchain can give BitTorrent a very required boost by highlighting the benefits of torrenting apart from piracy and to create a more responsible user base.

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Helmet & Vehicle Detection with Transformer and Vehicle Number Plate Recognition with OCR

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Abstract. Considering the overall state of road safety, it is necessary to automate the process of detecting the offenders, which will help in reducing the number of increasing road accidents worldwide. Through this research, we aim to detect two-wheeler riders without helmets and extract their vehicle number. The approach first captures the real time image of a vehicle and identifies two-wheeler riders and checks whether the riders are wearing a helmet or not using a machine learning model trained with Detection Transformer (DETR). If any riders are found not wearing the helmet, their vehicle number plate is processed using optical character recognition (OCR). In future, this model can be integrated with a Webcam or a CCTV to serve real time inputs.

Keywords: Helmet Detection, Machine Learning, DETR, OCR, CNN, OpenCV

1 Introduction

Despite strict laws in place for riders without helmets, there are an increasing number of offenders in every city and there is always a risk and possibility of untoward incidents/ accidents arising out of riding two-wheelers without a helmet. Therefore automating the process of identifying the offenders might help reduce the risks of severe injuries during accidents, and ensure better roaddiscipline.

Our research aims to develop a machine learning model using Detection Transformer [1] to detect two-wheeler riders not wearing helmets and differentiate with the riders wearing it. After identifying an offender, our model detects their vehicle number from the image using Optical Character Recognition, OCR. OCR converts images containing text or number to actual text after locating the vehicle number plate. Once characters are recognized then number plate search isterminated.

This research focuses on analyzing the helmet and vehicle detection with a different approach using Detection Transformer for a better result and accuracy. Therefore ensuring an enhanced automatic system for road safety measures which will help in reducing the number of road accidents.

2 Related Studies

In past years, many studies have been made in the field of road safety to automate the process of detecting and classifying helmets and vehicle license plates. These studies use different approaches to serve the efficient solution, therefore relevant researches and works are discussed in this section.

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Romuere R.V. e Silva [3] proposed a method in which he employed the wavelet transform (WT) as the descriptor and the random forest as the classifier for vehicle classification and to detect helmet, the circular Hough transform (CHT) and the histogram of oriented gradients (HOG) descriptor were applied to extract the image attributes, and the multilayer perceptrons (MLP) classifier was used to classify the objects. The result for helmet detection accomplished an accuracy rate of91.37%.

Prajwal M J [5] proposed a more sophisticated computer vision model that encompasses Image Processing, Convolutional Neural Networks and Support Vector Machine to classify helmets and human heads without helmets. Hough transforms are used to detect objects. Optical character recognition (OCR),isused to detect number plates.Themodelwasabletoensure92%accurateresults.

C.Vishnu[4]inhisresearchproposedanapproachwhichusesadaptivebackgroundsubtraction on video frames to get the moving objects and then uses Gaussian mixture model and Convolutional Neural Networks to select motorcyclist and helmets. The model was able to ensure 92.87% accuracy in theresults.

Noel Charlie[6], after detecting and classifying each video frame, used a DarkNet 53 based Convolutional Neural Network algorithm, YOLOv3, to check if a rider is wearing a helmet or not. The model was able to achieve 80% accuracy rate.

All the above research and works focus on predicting a set of bounding boxes and category labels for each object of interest. These detection techniques address set prediction tasks in an indirect way, by defining surrogate regression and classification problems on a large set of proposals, anchor, or window centers. Their performances are significantly influenced by post processing steps to collapse near-duplicate predictions, by the design of the anchor sets and by the heuristics that assign target boxes to anchors. To simplify these pipelines, we have used Detection Transformer, which directly predicts (in parallel) the final set of detections by combining a common CNN with transformer architecture.

3 Methodology

In order to implement helmet detection and number plate recognition, we have defined 5 object classes to be detected. The objects we targeted are – Helmet, No Helmet, Two-wheeler, Person, and License Plate. We labeled all our images using bounding boxes to specify (x, y, height, width) for all classes present in that image, and for all their instances.

ImageDataset

For training our model, we collected 175 images such that our defined classes can be labelled in each image. Then, after resizing all our images to 300x300 pixels, we labelled each image defining a set of bounding boxes on objects present in that image using LabelImg tool. Thus the created dataset was used to train our model. Figure 1 shows the example of a labelled image from the dataset.
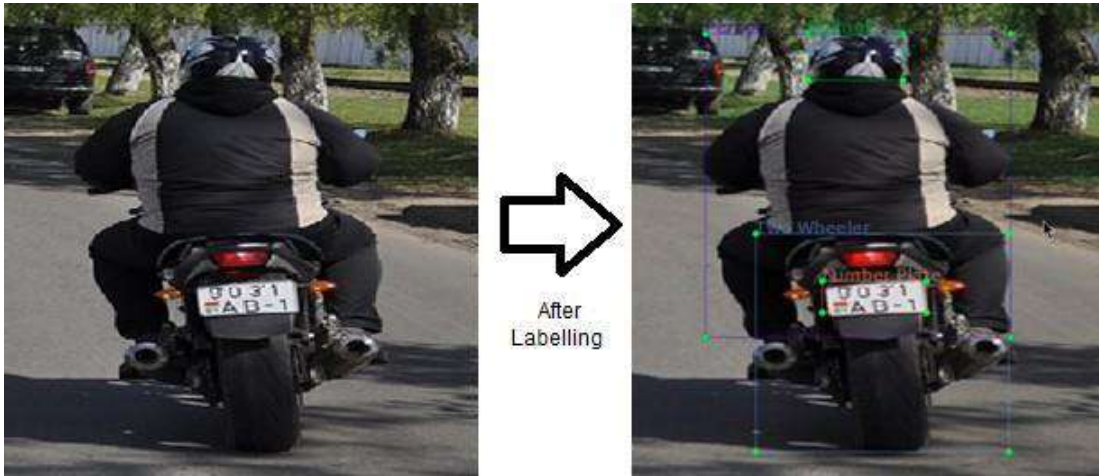
Figure 1. Labelling of a raw 300x300 pixels image

Training Model withDETR

For training our model with DEtection TRansformer (DETR) we have processed our image dataset for 50 epochs. DETR, on taking each image as input, uses a ResNet (Residual Networks), a CNN algorithm which creates 300 patches of the image and sends the resultant matrix of these patches for posembbeding. Then this sequence is predicted using a popular transformer [2] architecture based on encoder-decoder. The self-attention mechanisms of transformers explicitly model all pairwise interactions between elements in a sequence. DETR predicts all the defined objects at once, and then its set loss function performs bipartite matching between predicted and ground-truth objects. During training, bipartite matching uniquely assigns predictions with ground truth boxes.
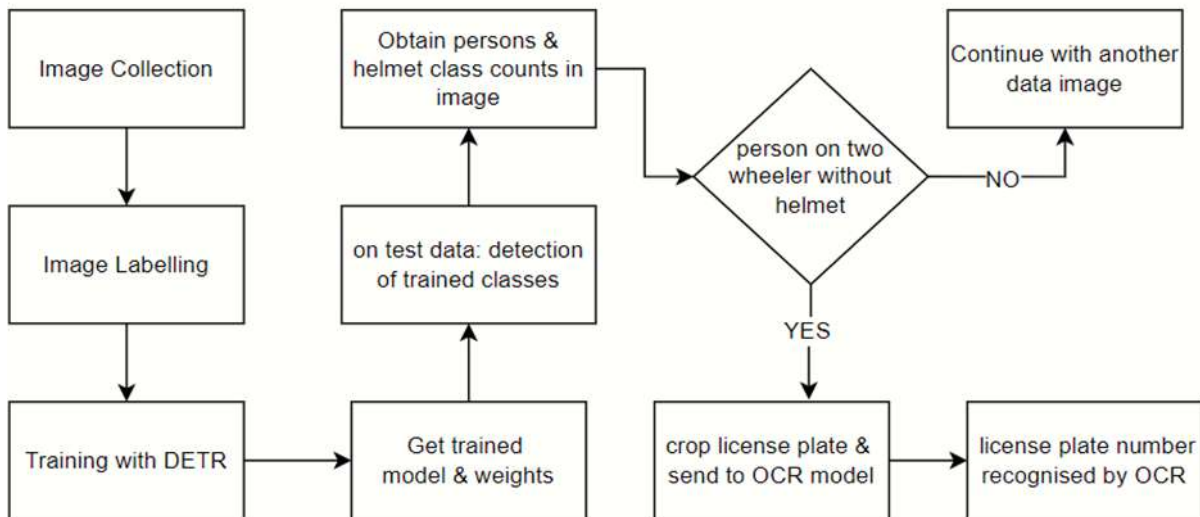
Figure 2. Diagram shows all the steps involved in the process of detecting all the defined classes with a given input image, DETR is Detection Transformer and OCR is Optical Character Recognition.

Helmet and VehicleDetection

After training our model with DETR, it generated final weights which were then used to load our model. For testing the trained model we fed input images for detecting all the trained classes in each image. On determining the presence of a person riding a two-wheeler without a helmet, the system proceeds to extract the vehicle's license plate. In case the helmet class is detected, we provide the next data image for it tocontinue.
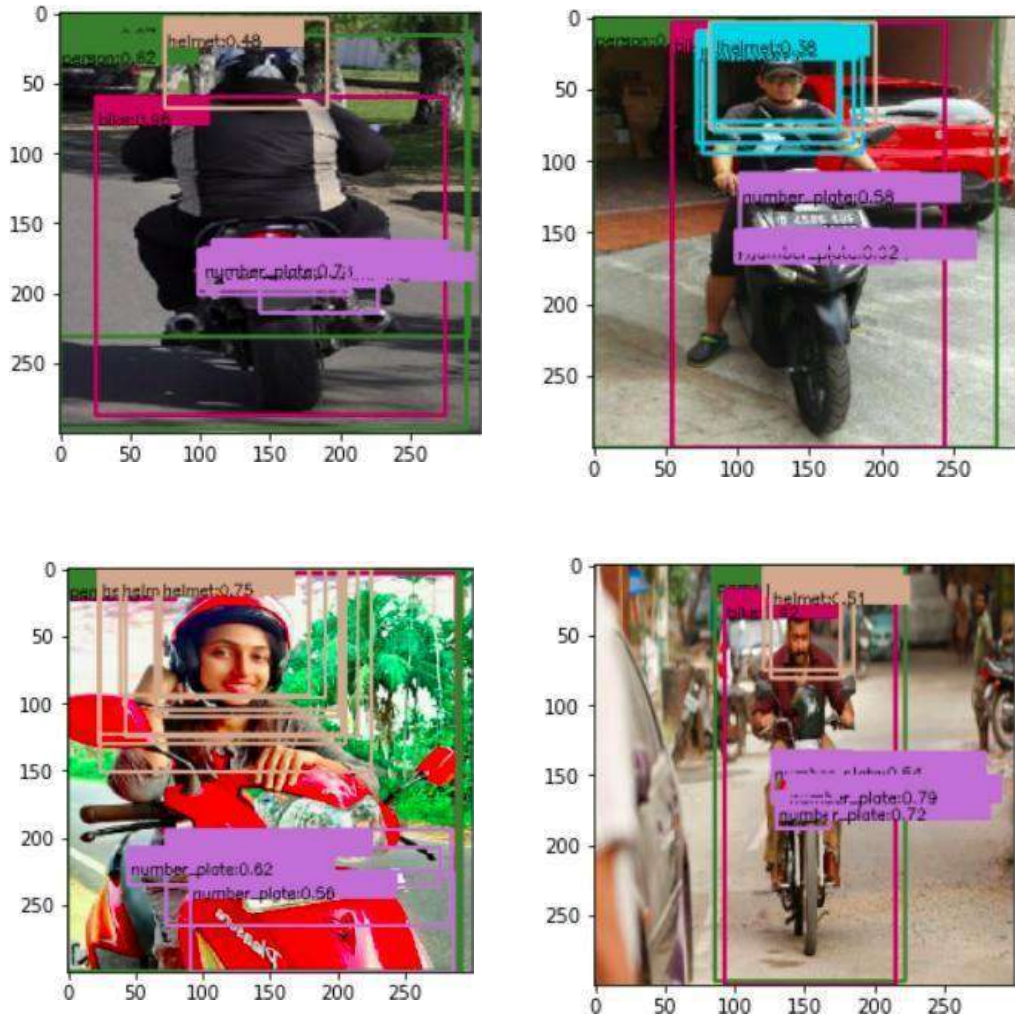

Figure 3. Showing tested results of trained model

Vehicle Number PlateExtraction

When the system recognizes a no helmet class, the image is further processed for detecting the license plate of the vehicle. First the image is read and changed into a gray scale image using openCV. Then after some noise reduction and edge detection, findContours function is applied which returns the rectangular (x,y) coordinates of the boundary points of the number plate. At this point the number plate is converted into text usingeasyOCR.

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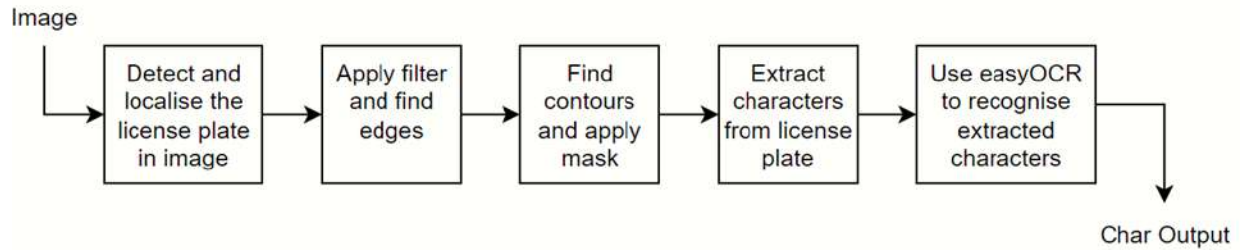
Figure 4. Step involved in detecting the License Number Plate
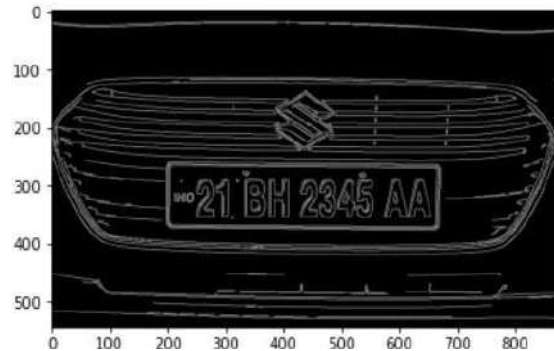

Figure 5.1 Shows the Gray Scale image

Figure 5.2 Masked Image

Figure 5.3 Shows detected license number

4 Results

For evaluating the performance of our model, some known metrics like F1 Score have been used. The F1 Score matrix is based on the weighted mean of precision and recall metrics. It's value ranges from 0 to 1, where 1 depicts the highest accuracy (100%). Charts in Figure 6 depicts various parameters using which these metrics were formed and calculated.

In the stage of detecting all five classes using DETR, which directly predicted a set of image features (in parallel), our model hit the accuracy rate of 0.8374. Whereas for just the No Helmet class, we got a score of 0.559 due to having a very small dataset.
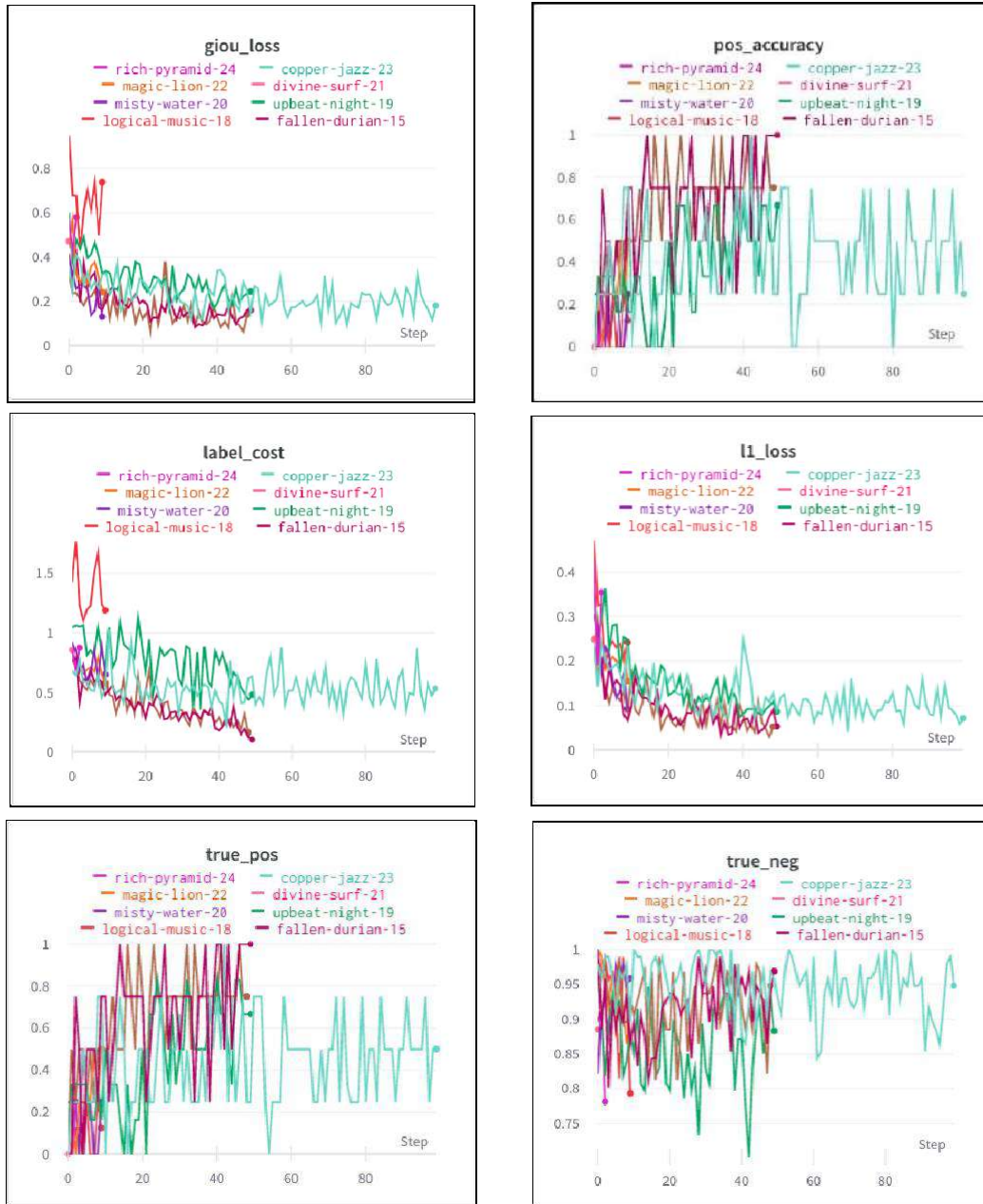
Figure 6 Depicting various performance charts of evaluation metrics

5 Conclusion

This research addresses the detection of two-wheeler riders without helmets. Further, it focuses on detecting and reading the vehicle's license plate number which can be used to store information about the offenders. Our study analyzes that the attention based transformers like Detection Transformer (DETR) can be effectively used for real time object detection

The limitation of our final results can be optimised further by using a bigger and better quality of dataset and the future study can be done by integrating the model with a live webcam and testing over moving objects.

At last the results obtained are satisfactory and concludes that the model can be installed in real time reducing the tedious job of identifying traffic rules violators on public roads.

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Dealing with Missing values in Big data using Computational Intelligence Techniques

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ABSTRACT :- We live in era of Big data. Big data represents large amount of data. Big Data is a extensive term for collection of large-volume and multiplex data from the variety of sources. Big data plays an important role in decision making for strategic planning in various domains such as medical and healthcare, education, management, business etc. To extract relevant information and for proper utilization of big data, an appropriate data analysis is required. One of the main challenge in data analytics is missing data. There are various common methods available for handling missing values like – mean, mode, median , regression etc. depending on the nature of data or data type. However there is a need to develop some other data imputation methods for efficient processing of data. In this paper , We have discussed the computational intelligence Techniques i.e. Genetic algorithms, Fuzzy logic , neural network for missing data imputation.

Keywords- *Big Data , Big data analytics, fuzzy logic, data imputation, genetic algorithm., Neural networks, missing value.*

1. Introduction

Big data represents enormous amount of data. Big data is a comprehensive term for large volume and complex data from variety of sources. Big data plays very important role in development of organization for Strategic-Planning and to take competitive advantage. To extract big value, big data needs analyzing and processing of data. Big Data analytics here comes into role. Big data analytics involves examining and understanding the big data. It is the process of collecting, organizing and analyzing large sets of data to discover useful information. The big data analysis pipeline includes multiple stages ranging from Data acquisition, information extraction and cleaning, data integration , analysis, interpretation [1].Big data can be described in the form of several v's as its characteristics and challenges as well. [2].

Quality data is one of the key requirement in big data processing. One of the main concern regarding the quality of data is missing values. Missing data is a critical problem in big data analytics.

In this paper, We have discussed the different techniques to handle missing values in big data. The layout of the paper is as follows-. Section 2 presents the common methods used for handling missing data. Section 3 explores the Computational Intelligence techniques like genetic algorithm, fuzzy logic for missing data imputation. Section 4 concludes the paper.

2. The problem of Missing value and Common solution Methods -

Data analysis is required to discover the hidden knowledge from a huge volume of data. Quality of data is a key concern for fruitful data processing. Data quality can be measured in three dimensions- timeliness, complete, accurate. Incompleteness of data is a usually happened as the data is generated, entered, or collected with missing values due to obvious reasons of non-interest and non-availability. Quality of data is degraded due to the presence of missing values. The nature of missing values can be of different types like-

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MCAR,MAR,NMAR. In MCAR i.e. Missing Completely At Random, probability of a missing value for a variable is unrelated to the variable's value itself or to any other variable in the data set. In Missing At Random (MAR), the probability of missing data of a particular variable could depend on other variables in the data set but not on the variable's value itself. In NMAR, missing data depends on the variable itself and can't be predicted from another variable in the dataset. [3]

Missing values can be handled in two ways- Deletion and ignoring methods and Data Imputation methods.

Deletion/Ignorance of missing values is recognized as the simplest way in handle missing values. Various traditional methods of deletion have been discussed in [3] The listwise deletion algorithm was proposed where an entire record is excluded from the data set if any value is missing. The pairwise deletion method was also proposed where the method computes the correlation between missing and complete data to pair the correlated values and it only delete the un-correlated values.

In data imputation methods, the missing values are estimated/predicted based on those values that are available[4]. It can be model based or non-model based. Some examples of these techniques are - Mean Imputation where the missing value is replaced with the mean of all reported values for that attribute. Like mean, mode and median can also be used according to the data type.

Hot-deck imputation where the missing value is replaced with a value from another similar case for which that value is available.

Mean, median or mode imputation only look at the distribution of the values of the variable with missing entries. If we know there is a correlation between the missing value and other variables, we can often get better guesses by regressing the missing variable on other variables. Regression Techniques that estimate a missing value using a regression equation-based model derived from previously observed complete cases.

The another method is Neighbor-based imputation. K-nearest neighbour (KNN) imputation is an example of neighbour-based imputation. For a discrete variable, KNN imputer uses the most frequent value among the k nearest neighbours and, for a continuous variable, mean or mode is suitable.

if we are dealing with time-series data, we can also use interpolation of observed values before and after a timestamp for missing values.

None of these methods gives an optimal solution to the problem of missing data. The deletion of records is applicable when the number of incomplete records is small. The biggest drawback of this method is the amount of information lost in the process. The other methods either reduce or exaggerate statistical power and as a result, lead to biased estimations.

3. Computational Intelligence techniques for Data Imputation –

In this section, We have explored the Computational intelligence techniques such as genetic algorithm, fuzzy logic and neural networks and other pattern recognition for missing data values.

Genetic Algorithm-

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Genetic Algorithm (GA) is an optimization algorithm that is based on natural selection, inspired by the theory of genetics.

It starts with an initial set of random solutions called population. Population evolve through successive iterations to obtain new and improved generation. During each iteration of the algorithm, each solution in the population are tested to see whether they give a valid solution. This testing operation is nothing but the fitness functions to achieve the objective. A new generation is formed by selection according to the fitness values. The generation undergo one or more genetic operations such as crossover and mutation. Again fitness function is applied to test its fitness. This process continues until either the solution is found or a certain termination condition is met.

The general process of GA as described by Goldberg [5] is as follows-

1. Initialization of initial population- The initial population is normally created randomly or based on some heuristics which is assumed to give solutions. Each individual solution in the population is called a chromosome. A chromosome is encoded form of solution that consists of several genes.

2. Evaluation of population-Evaluate the fitness of each chromosome on the population. The fitness is usually the value of the objective function in the optimization problem being solved.

3. Reproduction and Selection - In this process, chromosomes are selected to be put into new generation. A selection scheme is utilized to choose the chromosomes. The selection scheme could be proportionate selection, ranking selection, tournament selection etc, According to their fitness values, some of chromosomes are reproduced and some are eliminated in such a way that Chromosomes with higher quality i.e. higher fitness value have higher probabilities of being selected and chromosomes having small values die off. Some of the parent chromosomes are included in the new generation so as to keep the population size constant.

4. Perform crossover. This process allows two chromosomes to exchange information and produce two new chromosomes. Firstly, the parent chromosomes are selected randomly from the generation. Then the Crossover operator combines sub parts of two parent chromosomes and produces off spring that contains some parts of both the parent. These new chromosomes are returned to the generation.

5. Perform mutation-

This is performed to the new chromosomes produced by crossover. This operation is the random change of some elements /gene in a chromosome. Each gene will be considered for mutation with a certain probability.

Steps 2 to 5 are repeated until a chromosome is found for the objective function or the termination condition is met.

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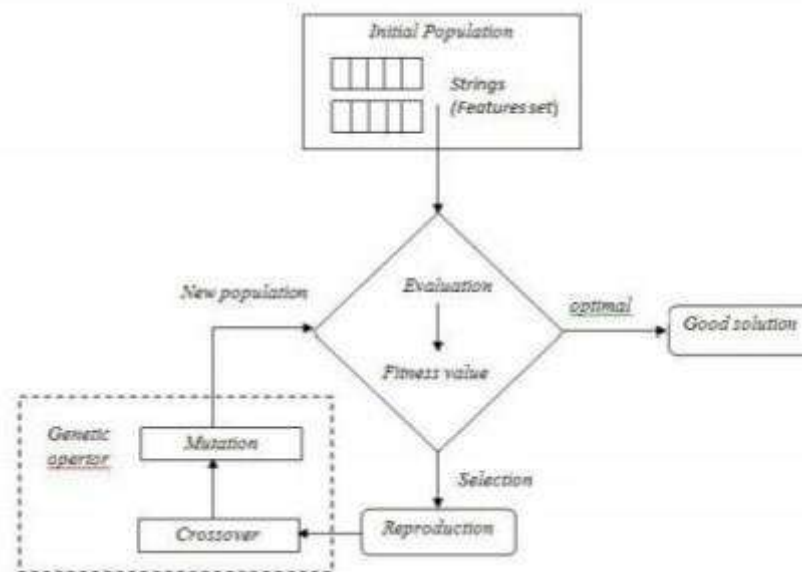
In context of handing missing data, Genetic algorithm can be used to optimize and predict missing data by finding an approximate solution interval. Several studies in literature of imputing data have used GAs to understand and improve data to avoid bias in decision-making.

GA provides a wide search space to optimize imputing and create complete data. Similar solutions have been presented in [6][7].

The authors proposed a genetic algorithm (GA) based technique to estimate the missing values in datasets. GA is introduced to generate optimal sets of missing values and information gain (IG) is used as the fitness function to measure the performance of an individual solution. Their goal is to impute missing values in a dataset for better classification results. This technique works even better when there is a higher rate of missing values or incomplete information along with a greater number of distinct values in attributes/features having missing values[7].

Fuzzy Logic-

Fuzzy logic is a powerful problem-solving methodology.Fuzzy set theory has been used most frequently in intellectual systems because of its simplicity and similarity to human reasoning.

Fuzzy provides a method to define conclusions from vague, ambiguous or imprecise information. Fuzzy logic helps to deal with the uncertainty of information.

Fuzzy system comprises of four main components: a fuzzification element, an inference system, rules and adefuzzification Fig.shows the generalized block diagram of fuzzy system.

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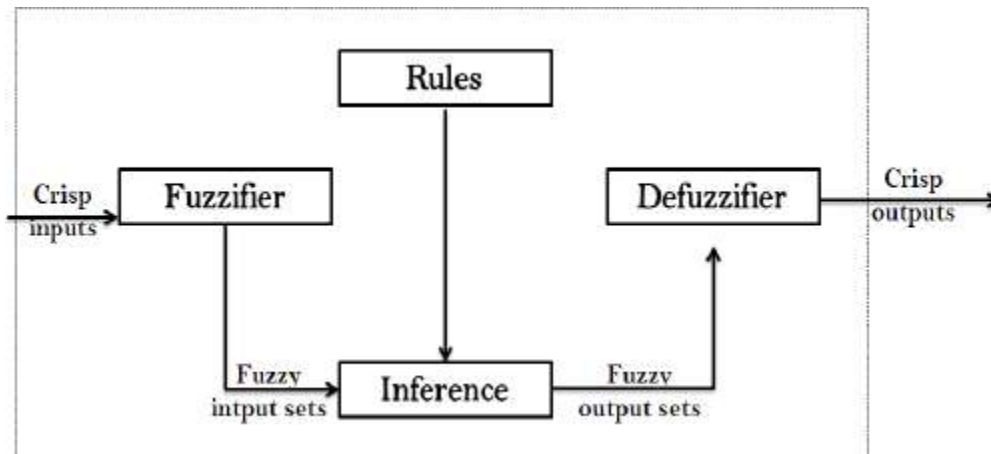
Fuzzy control system consists of four main components: a fuzzification process, an inference system, rule-base and a defuzzification. Firstly, input variables and membership functions are defined and input data is converted to a fuzzy set using fuzzy linguistic variables, fuzzy linguistic terms and membership functions. This step is identified as fuzzification. Then , an inference is done based on a set of rules and fuzzification output data where an implication formula is used to evaluate the individual if-then rules and fuzzy ouputs are generated . Lastly, the resulting fuzzy output is mapped to a crisp output in the defuzzification step.

Fuzzy inference is the process of formulating the mapping from a given input to an output using fuzzy logic. The mapping then provides a basis from which decisions can be made, or patterns can be determined

The fuzzy logic can be proved as an efficient method to solve the problem of missing data. We can represent the relation of variables in the form of If –else rules and then can apply fuzzy logic to find the missing pattern. The solutions of handling missing data have been presented in [8][9].

In [8] to handle missing data, the Fuzzy Gaussian membership function and the Fuzzy Triangular membership function are proposed in a data imputation algorithm in order to identify the best imputation for the missing values where the membership functions have been used to calculate weights for the data values of the nearest neighbor's and then imputation process has been applied.

Neural Network-

Neural Network are artificial systems that were inspired by biological neural networks. One of the most impressive features of artificial neural networks is their ability to learn. These systems learn to perform tasks by being exposed to various datasets and examples without any task-specific rules. The idea is that the system generates identifying characteristics from the data they have been passed without being programmed with a pre-programmed understanding of these datasets.

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Artificial neural networks can modelhuman brain learning process by adjusting the weighted connections found between neurons in the network..

One of the main characteristics of neural networks is that It Can work with incomplete information once trained. Thus, It can be used to handle the missing value in an efficient way.

In [10], a methodology has been proposed for feeding neural networkswith missing data. The idea is to model the uncertainty on missing attributes by probability densityfunctions, which eliminates the need of direct completion (imputation) by single values. In consequence,
every missing data point is identified with parametric density which is trained together with remaining network parameters.

4. Conclusion

Big Data concerns large -volume, complex, growing data sets with multiple, autonomous sources. Big data brings big insights. The most fundamental application for the Big Data is to explore the large volumes of data and extract useful information or knowledge for future business actions.An appropriate processing of big data can result in informative, intelligent and relevant decision making in various areas, such as medical and healthcare, business, Education and management.

Missing data is a widely recognized problem that affects data processing. In this paper, We have discussed the problem of missing data. Datasets are often characterized by incompleteness.The missing values problem is a problem that is often encountered by researchers and can cause several difficulties in decision making. It exists in all types of data analysis. The common practice is to omit the missing value record or to impute the missing data using the average of the observed values.These methods have their own drawbacks. The Computational intelligence techniques like fuzzy logic, neural network ,Genetic algorithm can provide good solutions to handle missing values in big data. Our future research direction is how to grow the use of computationalintelligence for missing data imputation

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Cyber Abuse and Toxicity Identification Model

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Abstract. Hate speech, offensive language, racism and other types of abusivebehavior have become a common phenomenon on many social media platformsincluding Twitter and Facebook and this is due to their willingness and opennessto host contests of sensitive or controversial topics. With the fear of online abuseandbullyingmanypeoplegive-up on perceiving different opinions and stopexpressing themselves on such social media platforms. These platforms had notadequately addressed the problem of online behavior, and their responsiveness totheeffectivedetectionandblockingofsuchinappropriatebehaviorremainslimited.
In fact, up to now, they have entered an arms race with the perpetrators,who constantly change tactics to evade the detection algorithms deployed bytheseplatforms.Suchalgorithmsare typically custom-designed and tuned todetect only one specific type of abusive behavior, but usually miss other relatedbehaviors.Todeterminewhethera"flag"shouldberaisedonaspecificcommentisstillachallengingandtime-consumingprocess,therefore manyplatforms are still looking out for more efficient, moderation solutions. Theirmain focus is how to make this process of identifying abuse in comments anautomaticprocedureasitwillnotjustsavethetimebutwillalsoensuretheuser'ssafety.

Keywords: Toxic comments,MultilabelClassification,Distribution,Algorithms.

1. Introduction

Dealing with toxicity online and curbing harassment has been a growing problemsince social media and online conversations have become a part of our everyday life.It is almost impossible to engage in online conversations without witnessing toxicbehaviorlikeunwarranted harassmentordisrespect.Thedigitalworldhasthepotentialofbecomingacommunity which fosters growth, sympathy, and educationbylearningfrompeople,butishinderedbyuserswhotakeadvantageof thisin-person disconnect. Social media platforms, online news commenting spaces, andmanyotherpublicforumoftheInternethavebecomeincreasinglyknownforissues of abusive behavior such as cyberbullying and personal attacks. These types ofcomments havegivenrise to severe anxiety problems and depression among thepopulationofdifferentagegroupsinteractingontheseso-cialmediaplatforms.

Dealing with such online toxicity, harassment is the new challenge waitingaheadofuswith therapidgrowthofthiseraofsocial media. However,determining whether a comment or post should be "flagged" or not is stilldifficult and time-consuming, and many platforms are still searching for moreefficient moderation solutions. Automating the process of identifying abuse incomments would not only save websites time but would also increase usersafetyandimprovediscussionsonline.

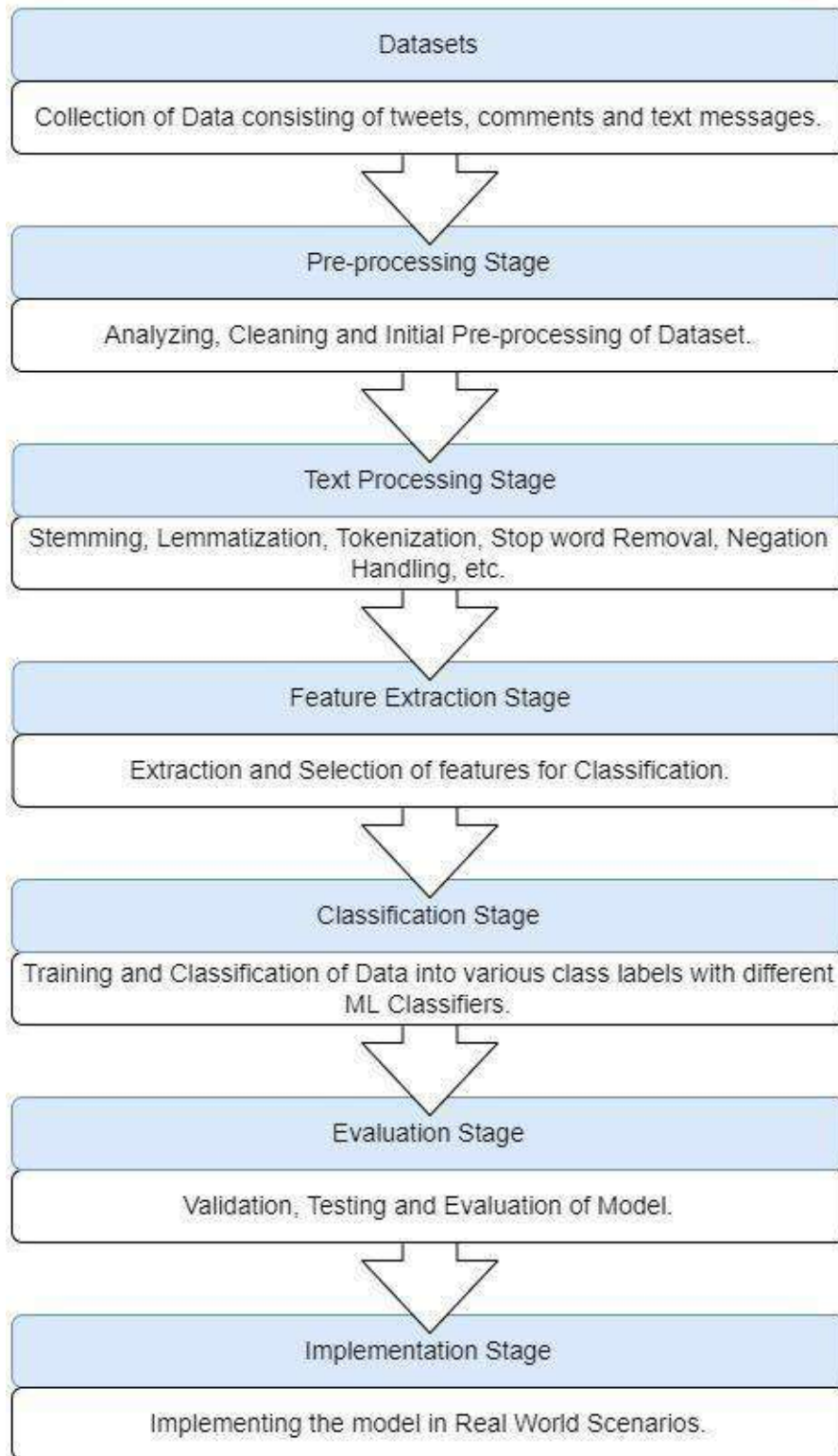**Fig.1.** Detailed Flow Chart of Our Model Design

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2. Implementation

TheDatasets

The dataset consists of the training set, which has approx. 1,59,000 data samples andthe testing set which contains approximately 1,53,000 data samples. Each row of theda-tasets contains 8 fields which includes 'Id' that uniquely identifies a comment ,'Com-ment_Text' which is the actual text data, and the remaining six fields consists offol-lowingLabels:

toxicse-
vere_toxi-
cob-
scenethreat
insultiden-
tity_hate

The label can be either 0 or 1, where 0 denotes a NO while 1 denotes a YES value fora particular text comment/tweet.The drive is mounted and the dataset is loaded andun-zipped in the google Collab. All the important packages and NLP toolkit librar-ieswereinstalledandimported.

Table1. Aglimpseofthedata

	id	comment_text	toxic	severe_toxic	obscene	threat	insult	identity_hate
0	0000997932d777bf	Explanation\nWhy the edits made under my usern...	0	0	0	0	0	0
1	000103f0d9cfb60f	D'aww! He matches this background colour I'm s...	0	0	0	0	0	0
2	000113f07ec002fd	Hey man, I'm really not trying to edit war. It...	0	0	0	0	0	0
3	0001b41b1c6bb37e	"\nMore\nI can't make any real suggestions on ...	0	0	0	0	0	0
4	0001d958c54c6e35	You, sir, are my hero. Any chance you remember...	0	0	0	0	0	0

AnalyzingandvisualizingtheData

1. Understandingthedatainformation.

Table2.Datainfo

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 159571 entries, 0 to 159570
Data columns (total 8 columns):
 #   Column         Non-Null Count   Dtype
---  ------         --------------   -----
 0   id             159571 non-null  object
 1   comment_text   159571 non-null  object
 2   toxic          159571 non-null  int64
 3   severe_toxic   159571 non-null  int64
 4   obscene        159571 non-null  int64
 5   threat         159571 non-null  int64
 6   insult         159571 non-null  int64
 7   identity_hate  159571 non-null  int64
dtypes: int64(6), object(2)
memory usage: 9.7+ MB
```

2. Analyzingthevariousstatisticalmeasuresandvariationsofthedifferentclasslabels.

Table3. Variationsinthedataset

	toxic	severe_toxic	obscene	threat	insult	identity_hate
count	159571.000000	159571.000000	159571.000000	159571.000000	159571.000000	159571.000000
mean	0.095844	0.009996	0.052948	0.002996	0.049364	0.008805
std	0.294379	0.099477	0.223931	0.054650	0.216627	0.093420
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
50%	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
75%	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
max	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000

3. Checkingformissingornullvalues.
4. Analyzingthecorrelationamongdifferentclasslabelsand their visualizationusing-headmap.

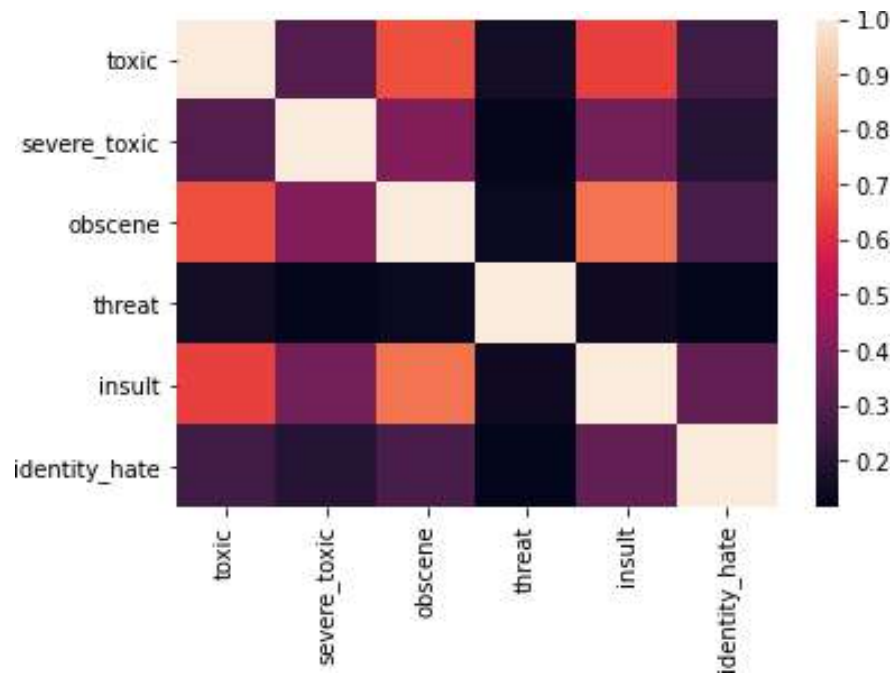|	toxic	severe_toxic	...	insult	identity_hate
toxic	1.000000	0.308619	...	0.647518	0.266009
severe_toxic	0.308619	1.000000	...	0.375807	0.201600
obscene	0.676515	0.403014	...	0.741272	0.286867
threat	0.157058	0.123601	...	0.150022	0.115128
insult	0.647518	0.375807	...	1.000000	0.337736
identity_hate	0.266009	0.201600	...	0.337736	1.000000

Fig.2. Heatmap for correlation among class labels.

5. Checkingtheskewnessforthefeaturestounderstandthedistribution.

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Table4. Skewnessoffeatures

```
toxic             2.745854
severe_toxic      9.851722
obscene           3.992817
threat           18.189001
insult            4.160540
identity_hate    10.515923
dtype: float64
```

6. Analyzingandplottingtheno.ofdatavaluestounderstandthedistributionofcommen-
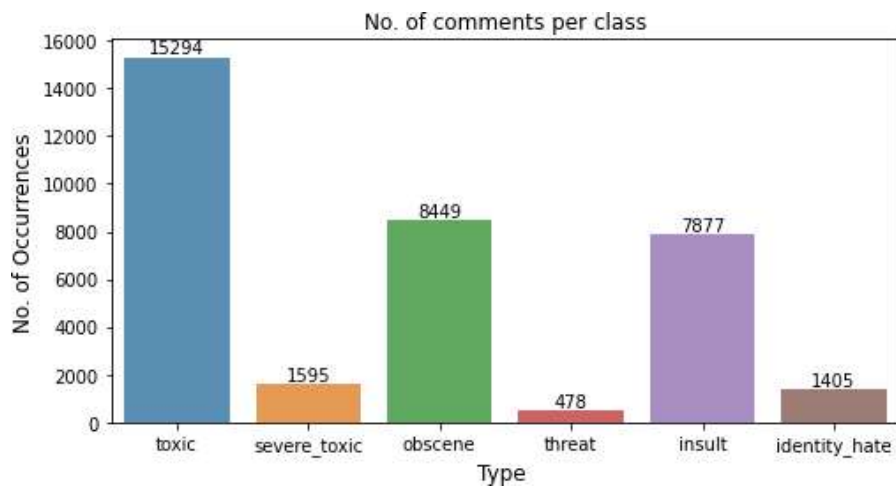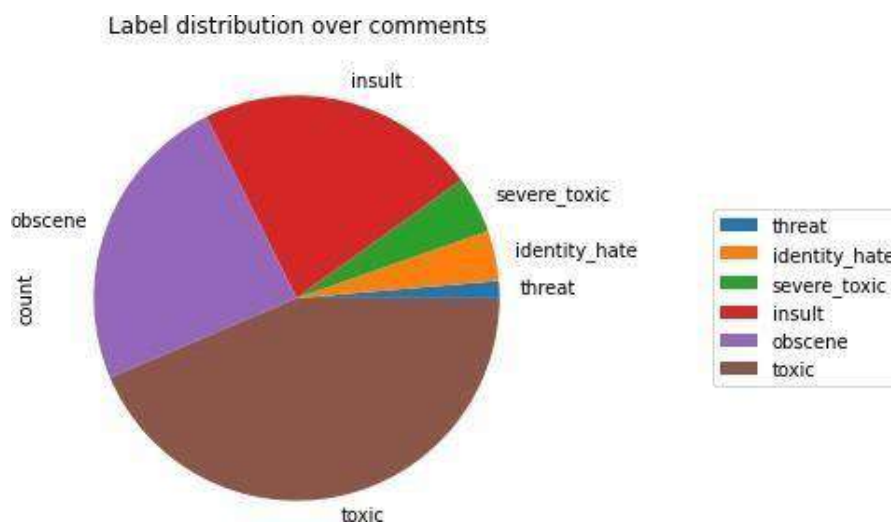tsovereachclasslabel.

Fig.3. Bar Chart

Fig.4.VisualizationofDistributionofcomments withthehelpofapie chart.

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Text Processing

1. Removing all numbers with letters attached to them.
2. Converting all strings to lowercase characters.
3. Replacing punctuation marks with white spaces.
4. Remove all '\n' in the string and replace it with a space.
5. Replacing email addresses with 'email'.
6. Replacing URLs with 'web address'.
7. Replacing money symbols with 'money symbols'.
8. Replacing 10 digit mob. Nos. (formats include parentheses, spaces, no spaces, dashes) with 'phone number'.
9. Removing all non-ascii characters.
10. Removing stop words from the text data (Stop words are those words which don't add any meaning to the data for classification such as he, she, as, or, and, etc.)
11. Stemming/Lemmatization of the text data.(It is a process of generating the root form of the inflected words, for eg. Playing/plays/played -> play.)

Balancing the data

The data was largely imbalanced with most of the instances being negative for each category, so we created 6 different dataset for each category by merging the positive and negative instances yourself in a ratio that maximizes the ratio of positive instances to min 30%.

Training the Data

1. We will be using the Binary Relevance method for multi label multi class classification, it is relatively simple in computational complexity and easier to implement, however it treats each label as an independent class without taking into account any correlation between classes, but since there is no significant correlation, it is best suited for our use case.
2. So, for this ,we Separated our dataset into 6 different datasets for each category. Each dataset contains Text comment and one class label to apply multi label multi class classification.
3. Each dataset was split into training and test sets in the ratio 80:20.
4. After splitting the dataset, we want to summarize our text and extract numerical data from them.
5. Vectorizers are used to extract numerical information from text data. It converts text into vector form. We use CountVectorizer, TfidfVectorizer for this purpose. It returns a sparse matrix.
6. The TfIdf Vectorizer picks the most frequently occurring terms i.e words with high term frequency or tf.
7. then it also measures of how unique a word is i.e. how infrequently the word occurs across all documents (inverse document frequency or idf).
8. So, the product of tf & idf (TF-IDF) of a word gives a product of how frequent this word is in the document multiplied by how unique the word is w.r.t. the entire corpus of documents.
9. Different ML algorithms will be applied to perform the multi label classification and they will be evaluated on different performance metrics to arrive at the optimum model.

Running ML models on the data and Deployment on Flask App

We will be using some Machine Learning Models to help us predict the probability that a comment is toxic and we will be able to choose the best model using cross validation , basically using a train , test, split and comparing the f1 scores and then wewill be deploying it on a flask app.

1. First we import all the relevant packages and pre- processing packages. Importing tools to split data and evaluate model performance.
2. We are using f1 score because it is arguably better than accuracy metric alone and it factors into account false positive and false negative rates.
3. We also used accuracy score as an evaluation metric to compare betweendifferent models.
4. Importing the ML algorithms and related packages.
5. Now, we create a simple function that takes in a dataset and allows the user to choose a dataset ,toxicity label , vectorizer and number of ngrams.
6. Inside the function, we Split the data into x and y datasets . For the x values we take the comments and for the y value we take the column which detects the comment toxic.
7. Split it into 80% training data and 20 % testing data.
8. Then, Create a Vectorizer object and remove stopwords from the table to learn the vocabulary dictionary and return the term- document matrix .
9. Now , we will initialise all the model objects for various machine learning models and fit models on the training data.
10. Trained our model with different algorithms including KNN, Logistic Regression, BernoulliNB, MultinomialNB ,LinearSVM and Random Forest.
11. We then calculated the F1 Score and testing accuracy for every model and each of the individual binary categories to compare between different models.
12. The function returns 2 dataframe objects, one containing the F1 Score of each model and other containing the Accuracy score for each model for a particular category.
13. We repeated the same for each category and stored the result in a dataframe (table available in result & analysis section).
14. The F1-Score and accuracy score for various models was also visualized in a line graph to better compare between the models.
15. SVM produced the best result with Random Forest being close second for different subclasses and across all categories. However, the Random Forest classifier has a predict_proba () function and Linear SVC does not, so we need tooutput a probability score for each comment.
16. So, we applied CalibratedClassifierCV over our SVM model to calculate prediction probability for each label class.
17. The SVM model for each category was later dumped using pickle to be used further in the flask application.

3. Result andAnalysis

1. TheF1scorefordifferentcategoriesofabusivecommentindifferentmodelswasasfollows:

Table5.F1scoresofdifferentmodels

	Log Regression	KNN	BernoulliNB	MultinomialNB	SVM	Random Forest
F1 Score(toxic)	0.901737	0.538194	0.767709	0.881148	0.906705	0.872124
F1 Score(severe_toxic)	0.883838	0.515571	0.845915	0.858238	0.917167	0.915375
F1 Score(obscene)	0.924564	0.584167	0.796259	0.899019	0.933637	0.915033
F1 Score(insult)	0.908056	0.504913	0.784393	0.893485	0.912478	0.897714
F1 Score(threat)	0.756098	0.732283	0.857143	0.714894	0.859259	0.853933
F1 Score(identity_hate)	0.824716	0.246575	0.827878	0.713287	0.873810	0.871194

2. Thegraphforthesameis:

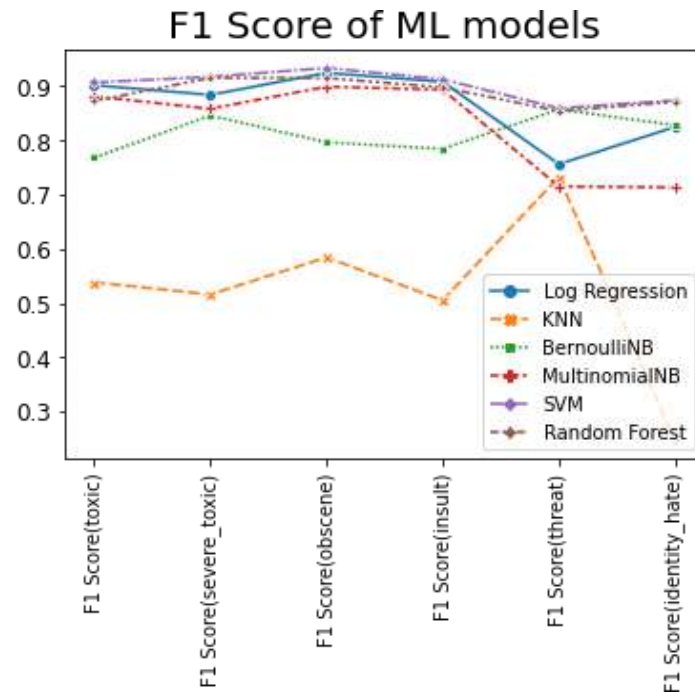**Fig.5.**Graph comparing F1 Scores

3. SVMprovidesthehighestF1-ScoreacrosscategoriesfollowedbyRandomForest.
4. TheAccuracyscorewhichiscalculatedbyusingtruenega-tiveandtruepositiveoutcomesfordifferentcategoriesunderdifferentmodelscomesout tobe:

Table6. Accuracyscoresofdifferentcategories

	Log Regression	KNN	BernoulliNB	MultinomialNB	SVM	Random Forest
Accuracy Score(toxic)	0.906765	0.599746	0.729400	0.886365	0.909877	0.882794
Accuracy Score(severe_toxic)	0.928848	0.784996	0.884764	0.914153	0.946636	0.945089
Accuracy Score(obscene)	0.927151	0.593344	0.756899	0.899756	0.935065	0.918222
Accuracy Score(insult)	0.911423	0.604911	0.744354	0.894979	0.914492	0.902872
Accuracy Score(threat)	0.884837	0.869482	0.925144	0.871401	0.927063	0.925144
Accuracy Score(identity_hate)	0.910207	0.748062	0.894703	0.867571	0.931525	0.928941

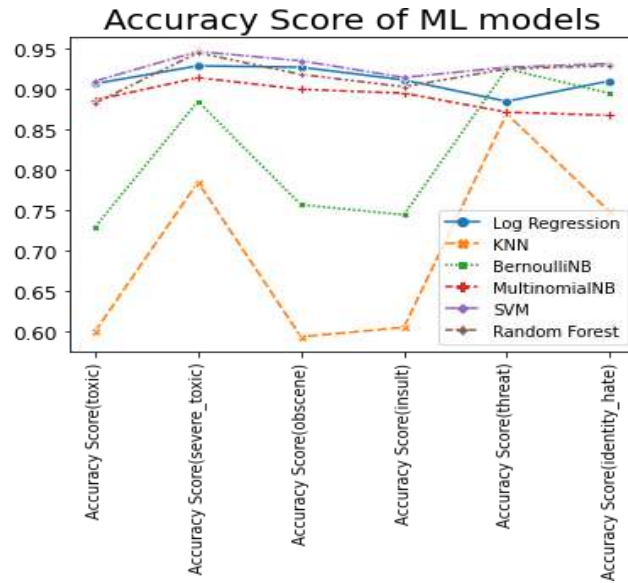5. ForbettervisualizationofaccuracyscorefordifferentmodelsWeplot-tedagraphofaccuracyscores:

Fig.6. Graph comparison ofAccuracy Scores

6. We can see from the table and the graph, SVM provides the highest accuracy-Scores across categories followed by Random Forest and log regression
7. So, we decided to move ahead with SVM

3.1SupportVectorMachinemodel(SVM)

The Training Accuracy, Testing Accuracy, F1-Score, precision score and recall scoreforourLinearSVCmodelwithCalibratedClassifierCVis:

	Train Accuracy	Test Accuracy	F1 Score	Precision	Recall
toxic	0.981473	0.911490	0.908658	0.894614	0.923151
severe_toxic	0.993229	0.948183	0.920333	0.921429	0.919240
obscene	0.989550	0.937297	0.935852	0.909605	0.963660
insult	0.988215	0.918000	0.916889	0.911622	0.922217
threat	0.998077	0.930902	0.870504	0.823129	0.923664
identity_hate	0.994022	0.937984	0.888631	0.860674	0.918465

So, our model achievedaccuracy scores of 91.15% for toxic category, 94.82% forseveretoxiccategory,93.73%for obscene category, 91.80% for insult category,93.09%forthreatcategory,93.80%foridentityhatecategoryrespectively.

4. Conclusion & Future Work

Hate speech, offensive language, racism and other types of abusive behavior have become a common phenomenon on many social media platforms including Twitter and Facebook and this is due to their willingness and openness to host contests of sensitive or controversial topics. In future, our project can act as a standalone application as well as integrated with different social media platforms depending on their security & privacy policies and can serve as an important step towards ensuring that internet and social media becomes a non-toxic platform.

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For future work, the proposed work will be extended to experiment with our model and the pre-trained word embedding techniques like Glove, Word2vec, and FastText trained on toxic comment dataset. Many enhancements may be possible to our model by adding consideration based instruments for better detection of toxic comments. Different users use different numbers of online platforms for discussions, so developing different models for each platform is not an efficient way to handle this problem; therefore, it is required to build a solitary framework that works over various platforms.

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Impact And Challenges On Cloud Adoption In The Government Organizations Of India

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Abstract

Cloud computing is a popular practice involving the internet which has the most powerful architecture of computation. Cloud is a combination of integrated and networked hardware, software and internet infrastructure.It's is the on-demand delivery of database/storage, compute power, applications and other IT resources through the internet with pay-as-you-go basis. When it comes to embracing the cloud, major transformation in technology requires people to change and has cultural as well as technological challenges. Governments around the world including India are struggling to managemassive amounts of data that need to be processed and utilized properly. In this paper we have provided the detailed opportunities, challenges and impact so far of cloud reception in the public authority associations of India. We discuss and compare the major impactsand challenges on cloud adoptionin various sectorsof India.

Keyword

Cloud Computing, Technology adoption, Indian Markets

1. Introduction

The term "cloud computing" refers to the delivery of hosted services over the internet. Infrastructure as a [1] Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) are the three basic forms of cloud computing services (SaaS).

It is possible to have a private or public cloud. A public cloud is described as computer services made available to anyone who wishes to use or buy them through the public Internet by third-party providers. Anyone with access to the internet can purchase services from the public cloud. Internal cloud or corporate cloud are other terms for a private cloud. Instead of the wider public, a private cloud provides computer services to a private internal network (inside the enterprise) and selected users. The purpose of cloud computing, whether private or public, is to give enterprises and the IT industry remote access to data centers and the ability to handle tasks.The name "Cloud Computing" comes from the fact that the data will be stored in the "cloud" and that the client will not need to be in a specific location to access it.

By utilizing the provider's numerous cloud services, the customer can store information on remote servers and access it from any location via the internet. People are unaware that cloud services are used on a regular basis. Sending and receiving emails, listening to music, viewing TV channels, editing documents, playing multiplayer games, and many other activitiesrely on cloud computation and storageservices.
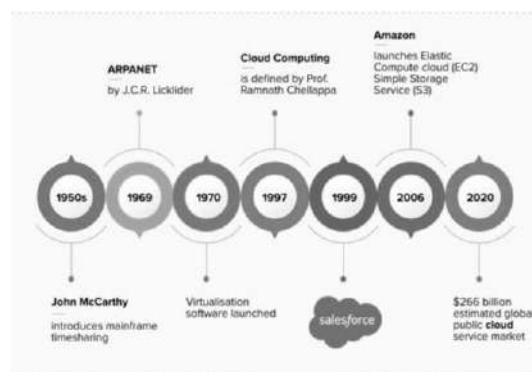

Figure 6 Evolution of Cloud Computing

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Just until a couple of years prior, relatively few would have guessed how huge CloudComputing would be by 2019. In this competitive world that combats network issues, avails top-notch services on the internet with better functionality without the trouble of including any additional cost of infrastructure and software, you need Cloud Computing. Cloud Computing in India has a critical presence over the web world and is quickly developing to a fully-fledged environment. Cloud computing facilitates consumers as well as business foundations to utilize applications without installing them and get access to their own records and personal files across the web.

Security is regularly viewed as the best test confronting. With advantages of cloud, there comes risks attached with it such as, APIs and interfaces hacking, authentication issues and credential risk, organizations' data breaches and much more.

End-user spending on public cloud services in India is forecast to total $7.3 billion in 2022 [2], an increase of 29.6% from 2021, according to a recent forecast by Gartner, Inc.

2. Opportunities for India

In India, cloud computing has a large presence on the internet and is gradually evolving into a fully-fledged environment. Cloud computing allows individuals and businesses to use software without having to install them and to access their personal files over the internet.

All sectors in India, including education, SMEs, healthcare, and government, are striving to move forward and will profit greatly from cloud adoption.

1. Cloud-based education services can be used to provide education through remote and virtual classrooms, increasing literacy rates by more than [3] 75% from existing levels.

2. The health-care industry is likewise progressing quickly, and the cloud can be used to construct a national citizen health database.

3. An agile government is one that adapts to the rapid changes in citizen and employee service expectations. The cloud has proven its potential to digitize governance while remaining cost-effective

4. Because the resources are outsourced to a cloud provider, and the needed capacity may be met on demand, the system is simpler, more flexible, and has faster scaling potential than a traditional computer system.

5. Both developed and developing countries have implemented e-government globally. Many studies show that e-government increases not only public administration efficiency but also good governance practices such as enhanced transparency, reduced administrative corruption, improved service delivery, improved civil service performance, citizen empowerment, and government financing.
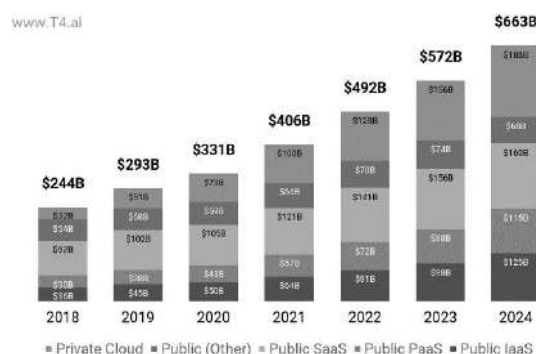

Figure 7 Global Cloud Computing Market Size

3. Challenges

1. The government's loss of data control is the first obstacle. This can be a major issue because trust is a major factor in cloud computing adoption, and because data is housed in the cloud, the government must ensure that it is protected at the same degree as if it were held locally.

2. The second issue is security and privacy, which has a big impact on cloud computing trust since the government and its data are distinct, and the data can be accessed over an open network like the Internet. Security is cited as a major barrier to cloud adoption by [4] 66% of IT professionals. We've discovered that the feeling of reduced security is the most difficult obstacle to overcome. Public cloud service providers, on the other hand, invest significantly more in security than any single firm or government department could. Moving to the cloud does not reduce security; rather, it improves it. For example, Microsoft invests $1 billion each year in cybersecurity for its Azure cloud platform, which successfully defends against 7 trillion cyber assaults per day. Similar efforts are being made by Amazon and Google to safeguard the security of personal and corporate data.

3. For data-intensive computations, because client PCs are geographically separated from the cloud, which could be thousands of kilometers away. The speed of the internet has an impact on performance. As the intensity of data processing and transfer, as well as the number of users accessing the data, increases, the risk of data transfer bottlenecks increases, complicating performance and increasing costs.

4. Because everything is connected to the internet, cloud is also dreaded for multitenancy, hypervisor flaws, and leakages.

5. It can take years to migrate vast amounts of government on-premises data, programmes, and supporting infrastructure to the cloud.

4. Adoption in India

India is Asia Pacific's fastest-growing cloud services market, after only China. In this industry, India is primed for rapid growth. Government organizations can leverage cloud infrastructure to quickly spread out new schemes/services and collaborate across geographically dispersed offices. Digital transformation is acknowledged as a critical initiative for the nation's growth. [5] Digital India envisions high-speed digital motorways that would have an influence on business and provide a digital path for every individual. Technologies like the Internet of Things, mobility, analytics, and cloud computing serve as the foundation for a digital India.
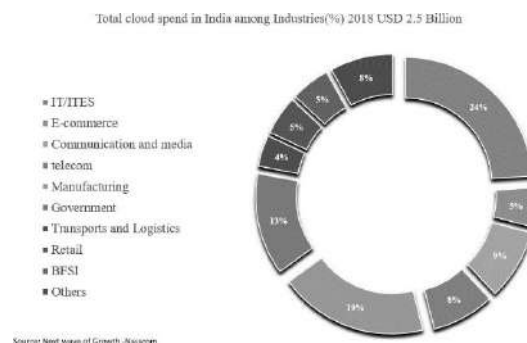

Figure 8 spend in India on cloud

Cloud computing is one of the most significant breakthroughs in the IT industry in recent years, providing a platform for using applications in the form of services that are more scalable, dependable, high-performance, and comparatively low-cost than conventional distributed computing infrastructure. At the same time, we can see that governments are taking proactive measures to plan new ways of interacting, improve services, streamline processes, and revitalize democracy by expanding IT spending.

It intends to use e- to provide people and businesses with more engaging services. Cloud Computing is the most recent information technology revolution, and it is assisting underdeveloped countries in implementing E-governance services at a low cost and providing better services to their residents.

4.1 Indian Government Initiative (GI Cloud – MeghRaj)

MeghRaj [1] The Indian government has launched a large-scale project called "GI Cloud," which has been dubbed "MeghRaj." (https://digitalindia.gov.in) is a website run by the Indian government. India's 'Cloud-King' project, MeghRaj (in Sanskrit, 'Megh' means Cloud and 'Raj' means King), is a Government of India initiative to use Cloud Computing Technology for e-Governance beginning in December 2013. MeghRaj would serve as a link between various Indian government offices, state government departments, citizens, and internet-based and mobile-based businesses.

The goal is to reduce the amount of time, money, and complication in day-to-day government activities. Former Union Minister of Communications and Information Technology, Kapil Sibal, unveiled the National Cloud as part of the "MeghRaj" [6] initiative on February 4, 2014. A self-service portal, numerous Cloud solutions, encrypted Virtual Private Network (VPN) access, and multi-location Cloud-Based on nodes that were put up across India at National Data Centers of the National Informatics Centre were some of the features of the National Cloud (NIC). Departments were given the option of hosting their applications in any of the nodes.

On Rail Cloud, NIVARAN, a Grievance Portal, has been launched. The first IT application to be implemented on the Rail Cloud is NIVARAN-Grievance Portal. It is a place for serving and past railway personnel to resolve service-related issues. The existing application was housed on a traditional server; however, it has been made cloud-ready and is being moved as Indian Railways' first cloud application. It will save a significant amount of money while also improving the user experience (https://news.indianrailways.info).

There has been no legalization of cloud computing in India to yet, but 'Cloud services' have been specifically recognized under the Integrated Goods and Services Tax Act 2017 [7]as 'online information and database access or retrieval services,' and so cloud service providers would be subject to GST. The Information Technology (Reasonable security procedures and practices and sensitive personal data) Rules 2011 (the Privacy Rules) establish guidelines for the collection, use, and protection of any sensitive private data or information of natural persons by any body corporate that possesses, deals with, or handles such data.

The Information Technology Act and the Privacy Rules together establish the legal framework for the creation, collecting, processing, storage, and use of electronic data in India. The Indian government has issued the Personal Data Protection Bill, 2018, which, if enacted, will modernize India's existing privacy and data protection framework[7]. In many areas, the bill resembles the EU's General Data Protection Regulation.

5. Conclusion

The change from a 'cloud-first' to a 'cloud-only' paradigm is forcing Indian businesses to spend more on public cloud services in order to advance their digital business objectives. [8] E Governance via distribution services necessitated a significant amount of infrastructure and safe storage, which may now be accomplished utilizing cloud computing technologies. The Indian government's use of cloud computing in E-Government applications helps to improve security, storage infrastructure, and platform costs.

This study examines the difficulties surrounding cloud computing's adoption and influence in India. Government, health, education, and small and medium-sized businesses are among the key industries that have adopted cloud computing. We talked about the numerous potential and problems in the field of cloud computing, as well as their implications in India.

Many cloud providers and manufacturers, such as Microsoft Azure, Amazon Web Services, and IBM, are already establishing their presence in India [9]. With continuous policy pushes from the government, India's investment climate is poised to improve. Considering the Indian government has introduced projects that promote growth by harnessing technology to generate smart outcomes, Digital India is on track to do its best on the Cloud.

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FULL-STACK E-LEARNING WEBSITE: FSELW

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ABSTRACT

In this digital age and with the current COVID-19 pandemic going on, this has ushered a need for an online e-learning platform that can help students as well as teachers with their online classes in the absence of physical classes. Currently, we are making use of various meeting apps like google meet, zoom, and classroom so that education is not affected. Sometimes it becomes difficult for both students & teachers to manage different platforms and also rely on other platforms. In order to solve this problem, we came up with an online learning environment that will lend its useful features to both students and teachers. This will be achieved with easy access for both teachers and students. This will enable teachers to take online classes easily while also working on student doubts and students will have easy access to course material. The impact of Elpfc is really massive as it is a very efficient way of delivering courses online. Resources are available from anywhere and at any time, this will make students access content at their convenience.

Keywords: Web Development, E-Learning, Fselw, Django, Python

1. INTRODUCTION

In this pandemic, the various platforms really helped a lot in the smooth functioning of online classes but a reliable and convenient E-Learning platform is required that can be used for constant learning. There are a lot of platforms that are being used by teachers for teachings like Zoom Meetings, Google Meet, and Google Classroom but there is a need for a common platform that will cater to both functionalities.

There is a need for such a platform that can do all these things so that both teacher and student can get a hassle-free experience. Currently, teachers are managing lots of stuff from giving live sessions to providing notes and assigning assignments to students using different platforms. Also, students have to attend classes online and submit their assignments on different platforms. But there is no common platform that caters to all the above needs. In order to fulfill all the above problems, the idea of developing an online learning platform for all the above purposes will be a great move toward E-Learning. Python Django is used in the development of the project and a live session is developed using Node.js. At last, testing was done in order to check the functionalities which we have added in the project. Iterative software development life cycle model has been used throughout the development. The reason behind using this approach is to add new functionality, design, test and at last implement it. An approach that we followed takes less time to be developed after each passing iterations.

The viability study helped us to list the main objectives which are-

- Different login and sign-up pages for students and teachers.
- Teachers can upload lecture videos as well as they can have a live session on the platform.
- Teacher can upload class notes and can also create assignments.
- Students can access pre-recorded lecture videos as well as a live session.

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● Students can access the class notes, assignments and can upload assignments for evaluation.

2. PROJECT DEVELOPMENT APPROACH
A. SDLC Model:

SDLC process defines the various phases involved in software development. Software development life cycle covers the complete software life cycle i.e., from start to completion of the project. The main purpose of SDLC is to develop a good quality product. The phases involved in SDLC are Requirement gathering, Designing,

It's necessary to follow the phases to provide the software systematically.

The Software Development life cycle model is basically used by the developer to build the strategies which are required for developing projects. In this project, we used the iterative model approach as in this model with each iteration we get the working functionality. In an iterative model with each iteration, the next iteration becomes easier to develop, and we can add the functionality which we have skipped or forgotten to add. It is also easier to check the functionalities whether they are working or not.

B. Software Requirements:

The following requirements which have been enlisted below were added to this project-

✔ Student-Teacher Registration
✔ Student-Teacher Login
✔ Teacher can create new subjects and add different lectures.
✔ Teacher can also add video, notes in each lecture.
✔ Teacher can create assignments.
✔ Teacher can also give a live session.
✔ Students can access subject lecture videos and notes.
✔ Students can submit assignments assigned by the teacher.
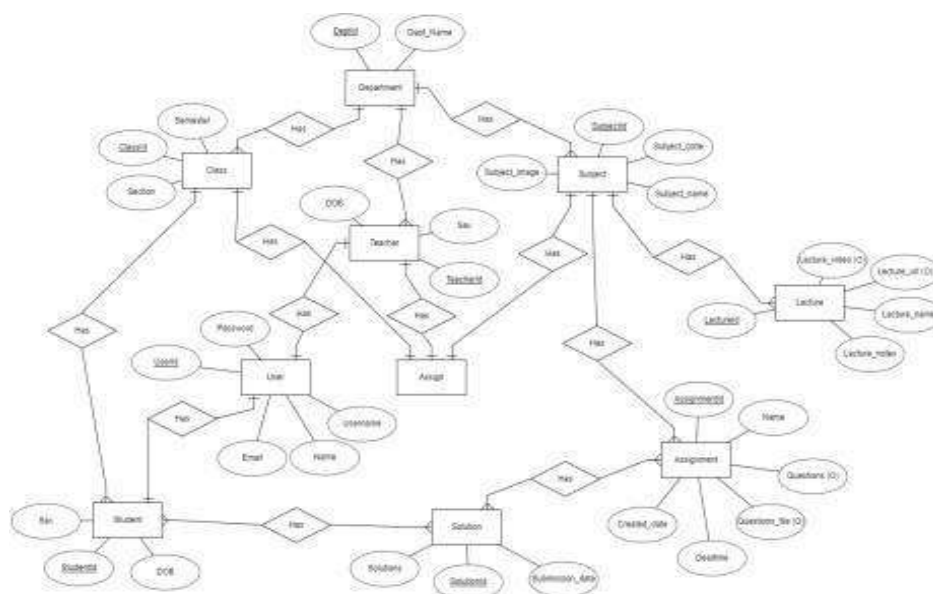✔ Students can also access live sessions.

C. ER Diagram:

Fig.-1: ER Diagram

3. METHODOLOGY

Multiple steps are used while developing the project. Major steps are:

· Install Python version 3.8.3 and add it to the windows path variable.

· **Create Virtual Environment as follows:**

        pip install virtualenv venv

        env\Scripts\activate

· Install Django 2.2.0:

        pip install django=2.2

· Go to the destination folder where you kept your project, using the cd command. · Create Project using commands:

    django-admin startproject fselw cd

        fselw

· Create different project apps:

        django-admin startapp home

        django-admin startapp student

        django-admin startapp teacher

· Migrate Django Models to Database using:

        python manage.py migrate

· Run Django server using:

        python manage.py runserver
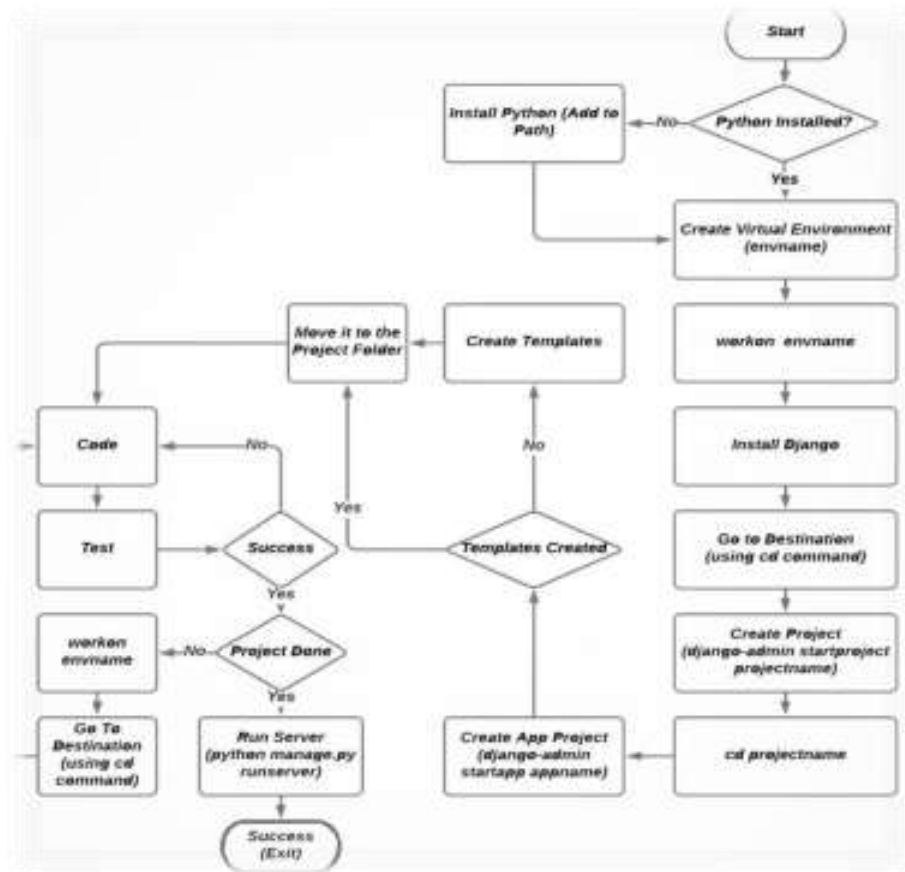
Fig.-2: Methodology Flowchart

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4.   HARDWARE & SOFTWARE REQUIREMENTS

The following specifications that are required for the project to run on any device are mentioned be-low: **Hardware Requirements –**

> Processor: Intel Core i5 5th Gen System
>
> Type: 32-bit or 64-bit OS RAM: 4 GB
>
> OS: Windows 7, Windows 10.

Software Requirements –

> Front-End Technologies: HTML5, CSS3, Bootstrap (4.5), JavaScript
>
> Backend Technologies: Django, Node.js, SQLite
>
> Local Access Link: 127.0.0.1:8000
>
> Global-Access-Link: https://fselw.herokuapp.com/

5.   RESULTS AND DISCUSSION

The home page consists of a navbar that contains the website logo, name, signup, and login page for both student and teacher. Below the navbar, there is a welcoming banner on the website below that there are some functionalities that we can use on the website. The login page consists of a username and password. Sign-up consists of details which both teacher and student have to follow and then there is an option to select whether the user is a student or teacher, after that, they will be redirected to the profile page where they will extra detail.

Student homepage consists of a navbar that has options like subjects and assignments and below that there is a dashboard that contains student information, and he can also edit it. Subjects will contain various subjects related to their department and section. Similarly, there will be an assignment section where students will be able to check the assignments and can also submit the assignments.

The teacher homepage consists of a navbar that has options like create subject, add lectures, create assignments and check the assignments submitted by the student, and below that there is a dashboard that contains teacher information, and he can also edit it.
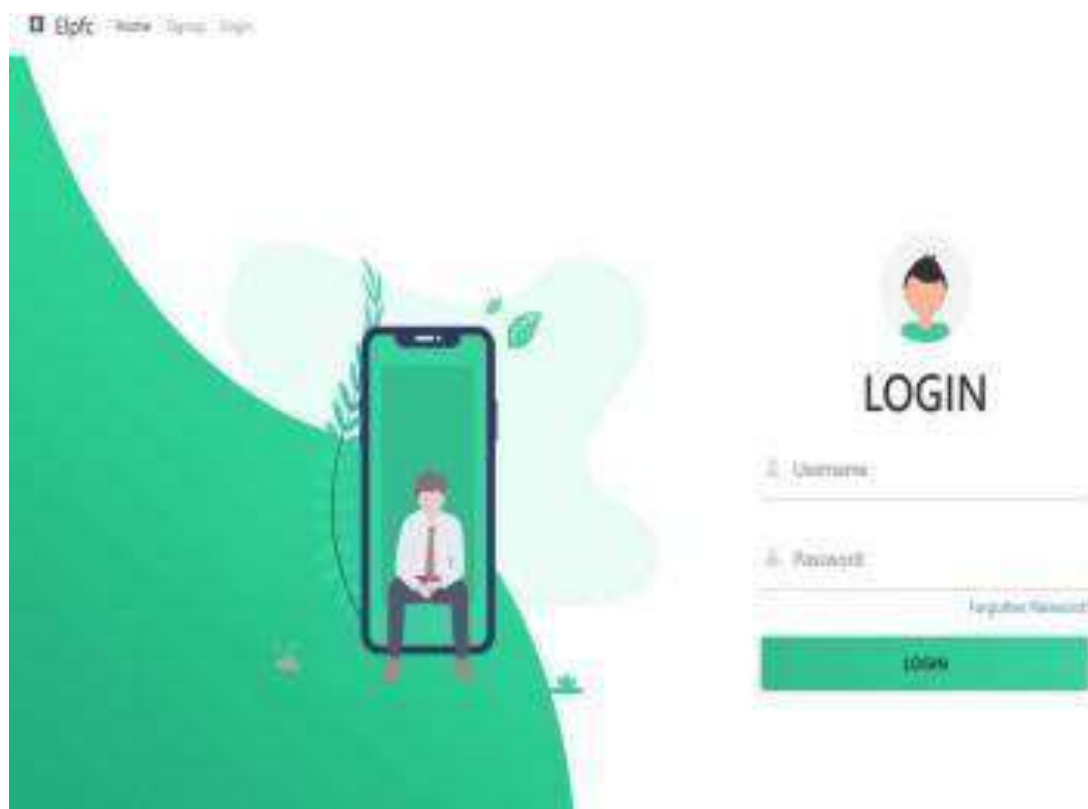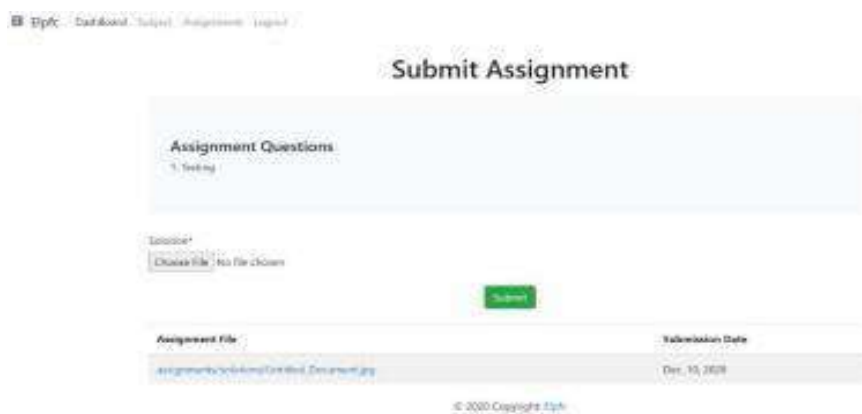

Fig.-3: Home Page

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Fig.-4: Signup Page

Figure 5: Login Page

Subject: ADBMS

Subject Code: ETCS-400

Faculty: test

Fig.-6: Subject Page

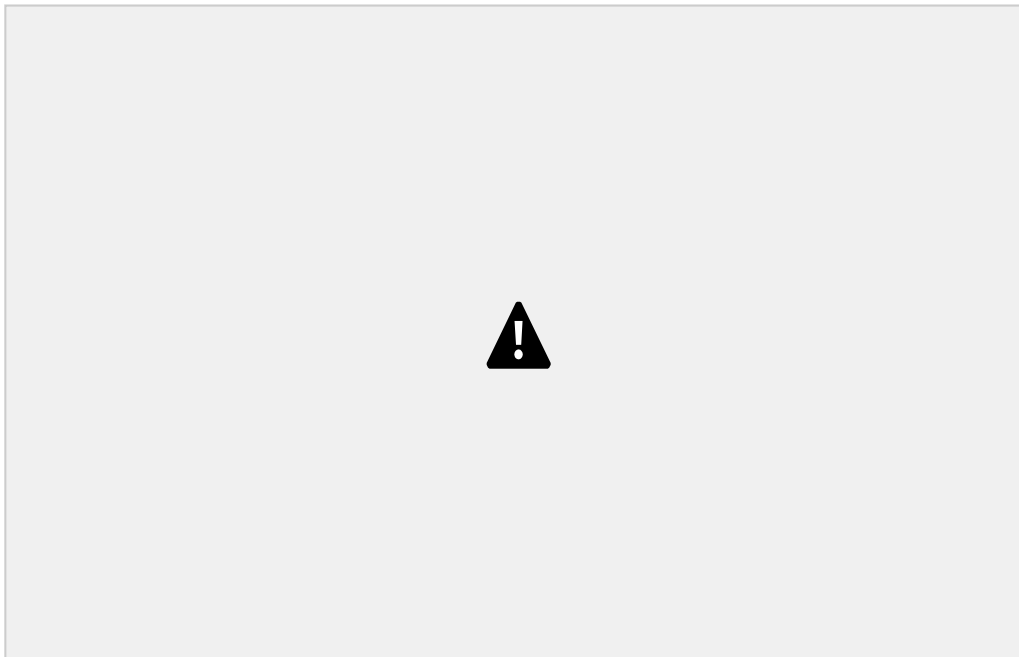**Fig.-7:** Subject Lecture Page

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Fig.- 8: Submit Assignment Page
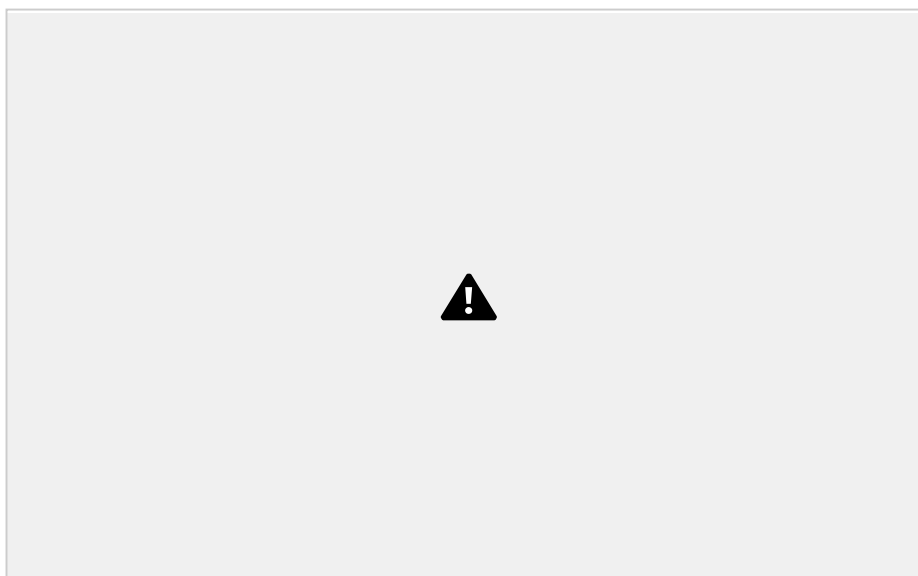**Fig.-9:** Assignment Submissions Page

Fig.-10: Live Session Page

6. CONCLUSION

The project developed is appeasable after analyzing the results. Website created will be very useful for students as well as teachers in their educational life as it will contain all the notes and assignments in one place and student can refer the videos as well as notes for revision which will help the students a lot.

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A comparative study between the classroom study and the online study was carried out. The study reveals that online learning has numerous benefits as compared to classroom learning. Online learning has also lots of challenges like lack of feedback from students and lack of the proper technology to effectively conduct online learning, these limitations can be overcome by upgrading the E-Leaning systems and providing a common platform. In the project development, we started by creating the database according to the requirements and also created the ER Diagram. An iterative model life cycle has been used in order to develop the project. Online learning is beneficial to the students, teachers, and the institution offering these courses. Therefore, I would suggest that online learning using the project be implemented in all learning institutions, and research on how to improve this learning process should be carried out. This Project also gives relaxation of not using any other application for teaching lectures, sharing class notes and assignment so all the necessary feature that should be in an online learning platform have been provided in this particular project.

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A proposed method for recognition the iris imprint

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Abstract. Because the human eye, particularly the iris, has unique and distinguishing characteristics that set each person apart from others, eye print has emerged as one of the most critical physiological characteristics of the human being, with increasing importance in biometrics to identify people. In this paper, an effective method was proposed for recognizing irises using both the LBP operator and the histogram intersection distance classifier, where an effective method was used to improve the image and remove noise in addition to subtracting the area of interest. LBP, DWT provides frequency features around the iris image and extracts the largest number of characteristics that help increase recognition accuracy. In addition, the use of DWT leads to a shorter period and reduced complexity in the classification stage. In the classification stage, three classifiers were used, the best of which were chosen in terms of accuracy of discrimination. It was relied upon through the results of many experiments conducted. The method was applied on two standard bases to evaluate the accuracy of the proposed method. The results indicated that the proposed method achieved high discrimination accuracy by using different data sets with less complexity.

Keywords: Iris recognition, bio-metric, LBP plainer interpolation, Discrete wavelet transform, Histogram instruction distance.

1   Introduction

The modern identification scheme includes biometric systems. In biometrics, iris recognition systems have a high level of accuracy as the iris is a distinctive pattern of people since it is a unique feature. Biometric systems have become common in recent years as information technology has spread. Researchers sought new approaches that could easily be measured that don't change over the years. These distinguishing characteristics include physical and behavioral characteristics. Physical characteristics include iris patterns, fingerprints, and the geometry of the face and hands, among others. Although behavioral characteristics such as voice and signature are beneficial, physical characteristics have proven to be more beneficial because they accurately recognize and differentiate individuals. Iris recognition is a critical biometric recognition technique for human identification.[3]. Iris recognition has risen to prominence as a preferred method for large-scale user authentication, with considerably higher user acceptance than the more accurate retinal identification. The iris patterns are extremely stable and special, with the likelihood of two identical irises being potentially 2 estimated to be extremely low, i.e. one in 1072 [1]. Even though iris patterns' performances were systematically evaluated in the literature, they are often insufficient to meet the stringent requirements for very large-scale applications. Personal identification methods based on multi-biometrics (multi-algorithms, multi-features, multi-classifiers, etc.) are much more promising for such applications and have yet to be investigated for improving performance

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utilizing iris images [2]. Iris recognition is a biometric authentication technique that uses the iris of an individual's eyes to retrieve features. Each person has a unique iris; differences can be seen even between identical twins and between the right and left eyes of the same person [4].

2   Proposed Technique

In this paper, an effective method for distinguishing the eye print is proposed through the use of the LBP and DWT feature vector and the use of Histogram intersection distance. The different stages of the proposed method can be summarized as follows:

1. Preprocessing stage: the purpose of this stage is to enhance the iris image and remove the noise as well as extract the region of interest and finally Normalize the resulting image.
2. The feature extraction stage: In this stage, the useless information is reduced, and the important features are extracted through the use of the LBP characteristic vector, thus facilitating the matching process with different patterns. This process aims to extract features specific to each individual by drawing their irises, in addition to the use of WT to reduce the complexity of the classification process and increase the speed.
3. Classification stage: In this stage, the test iris image is classified into recognized or unrecognized. In this work, we used the histogram intersection distance classifier in the classification stage. Figure 1 illustrates the proposed technique.
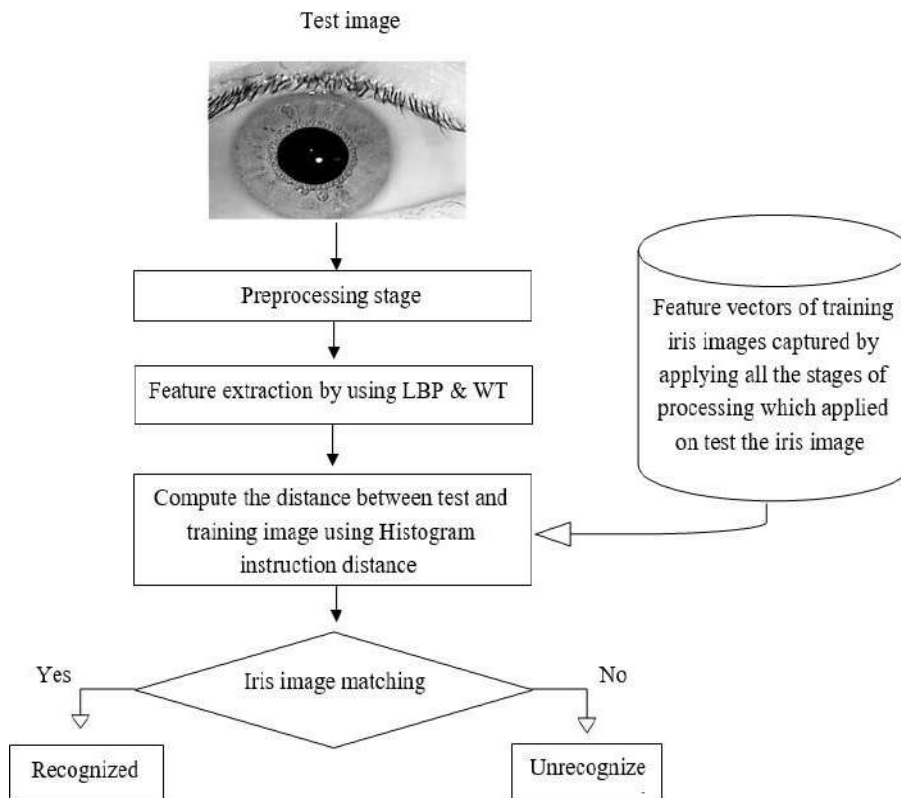

Fig. 9. The proposed technique's block diagram.

3 Preprocessing

The preprocessing stage plays a more important role in the iris recognition system because it contains basic operations such as converting the image to grayscale, image enhancement and noise removal, and iris image segmentation and normalization.

Iris image Enhancement

we improve the image quality of the iris by removing noise as well as improving the contrast of the iris images. For this purpose, we used the histogram equation to increase the contrast of the iris image. The important edges in the image were also determined using Unsharp Mask Filter. Fieger 2. Presented the eye image before and after the enhancement
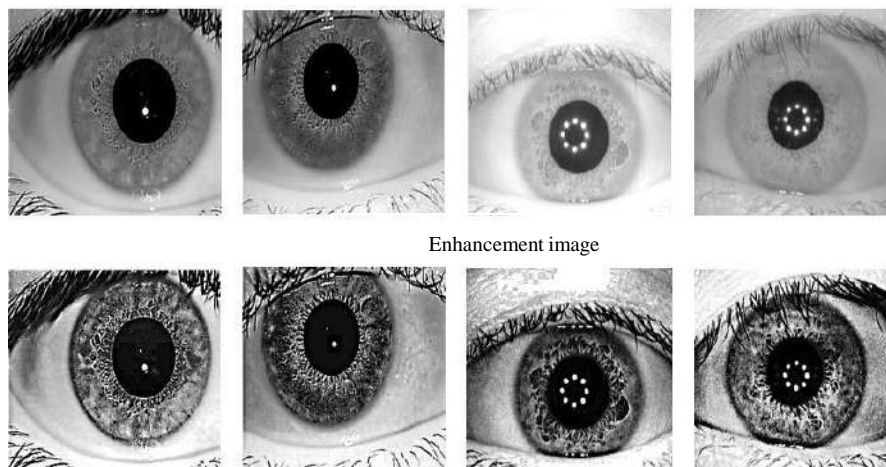
.

Enhancement image

Fig. 10. Iris image enhancement using filters

Iris image segmentation

Iris image segmentation is the process of separate region of interest (ROI) from unwanted areas such as eyelashes, eyelids, and other details. In this work, an effective method was used to segment and subtract the iris image through several steps that can be illustrated as follows [5]:

1. Determining the pupil area by converting the image into a binary gradient and applying morphological processes to determine the center and radius of the pupil.
2. The segmentation process, which is done by applying a mask to each of the pupil and iris area while taking the inverse of the iris mask and removing the unimportant parts that represent the eyelashes and the upper and lower eyelids in order to extract the region of interest.
3. Normalization of the iris, which is a complementary stage to the process of segmentation of the region of interest, where the shape of the iris is restructured and converted from Cartesian coordinates to polar coordinates and the iris vector is prepared for the process of extracting the characteristics. The figure 3. Show some image of iris before and after segmentation operation.
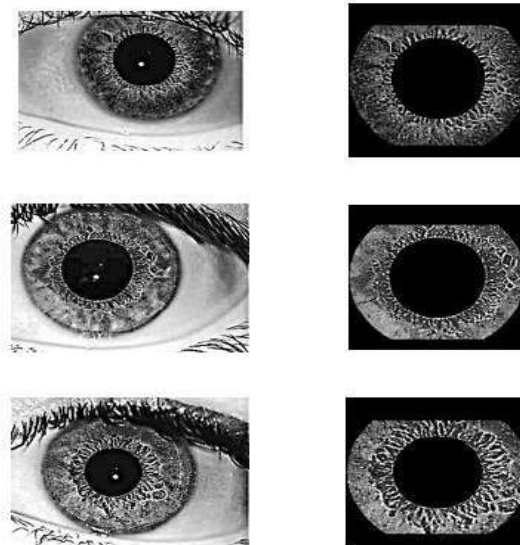
Fig. 11. Some Iris images before and after segmentation process (a) iris image before segmentation (b) iris image after segmentation the ROI

4   Feature extraction

In this stage, the most important features of the enhanced segmented test, segmentation, and training of iris images are extracted in order to generate feature vectors. For this, we used two of the most important feature extraction techniques, namely (LBP Bilinear interpolation), which is one of the most important techniques for extracting traits and distinguishing the iris tissue with high accuracy. DWT was also used as it provides a hierarchical analysis of images resulting from frequency features at different levels. Applying DWT to a 2D image provides four subdomains which are 2D approximate subdomains (LL) and three detailed 2D subdomains (LH, HL, HH). In order to reduce the dimensions, we used the LL subdomain coefficients and ignored the other subdomain coefficients. Daubches8 (DB8) DWT was used because it provides more accurate according to other experiments that have been conducted [6, 7].

4.1   The LBP

The coefficients of LBP operator are computed as follows:

$$LBP_{P,R}(x_C) = \sum_{i=0}^{P-1} 2^i Q(x_i - x_c) \qquad (1)$$

Type equation here.

Where$x_c$and$x_i$are the central pixel gray-level value and its neighboring i^{th}gray-level value, respectively. P Is the total number of pixels on a circle with radius $R$and center at the locationx_c. The function $Q(x_i - x_c)$is defined as [8]:

$$Q(x_i - x_c) = \begin{cases} 1, \\ 0, \end{cases} if x_i \geq x_c \, otherwise \tag{2}$$

Most of the research works employing LBP operator use a 3×3 window and 8 neighborhood pixels as shown in Fig.4. This operator is referred to as $LBP_{8,1}(x_c)$, which means 8 neighborhood pixels on a circle with radius $1(P = 8, R = 1)$. This operator is very simple to use and computationally efficient. Although other LBP operators such as $LBP_{8,2}(x_c)$ and $LBP_{16,2}(x_c)$ are also proposed in the literature [9], no extensive experimentations are performed for their effectiveness on face recognition. In this paper, we develop a computational framework for $LBP_{8,2}(x_c)$ and compare its performance with $LBP_{8,1}(x_c)$. We shall show that $LBP_{8,2}(x_c)$ provides much better results as compared to $LBP_{8,1}(x_c)$,and its performance is much better under noisy condition

We define $LBP_{8,2}(x_c)$ within a 5×5 window using the bilinear interpolation as shown in Fig.5. The locations of 8 symmetrically located points are given by $(\pm 2, 0), (0, \pm 2), (\pm\sqrt{2}, \pm\sqrt{2})$. the pixel values at locations $(\pm 2, 0)$ and $(0, \pm 2)$, marked as 1, 3, 5, 7, are directly available. The pixel values at other 4 locations are computed using the bilinear interpolation given as:

$$f(x,y)=a0+ a1x+a2y+a3xy \tag{3}$$

Where the unknown coefficients a_0, a_1, a_2, and a_4 are derived by the 4 neighboring pixels. As an illustration, the pixel at location 2 is derived by the use of 4 neighboring pixels marked as *a, b, c, and d* in the first quadrant of the circle. The central pixel x_c is averaged using its 8 neighborhood for comparing its value with the 8 symmetrically located pixels on the circle. This procedure uses all 25 pixels of the window for its computation and hence it is resilient to noise to some extent.
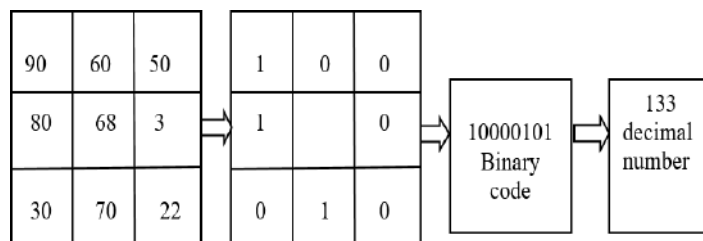

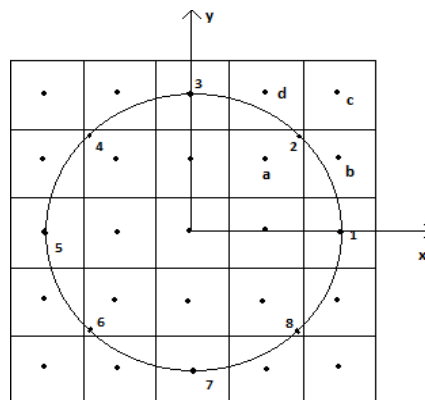**Fig. 12.** Illustration of a conventional LBP code generation in a 3×3 window.

Fig. 13. the proposed $LBP_{8,2}(x_c)$ defined in a 5×5 window using bilinear interpolation

5   Classification

In this stage, Histogram Intersection Distance classifier was used in the graphic-based image matching process due to the high resolution of discrimination and matching which has proven effective in the experiments conducted, which measures the similarities in the contents through graphs between the test model image and the training images in the database. In order to complete the marking process with accept or rejection [10]

Let $I_G I_R$, I_B represent natural color graphs from an image in a database and let $Q_G Q_R$ and Q_B represent normal color graphs of the query image. Also, R, G, B refer to the three-color channels in RGB which represent the color space of the pixel. The degree of similarity between the query image and the images stored in the database $S_c^{HI}(I, Q)$ is given as follows [11]:

$$S_c^{HI}(I, Q) = \frac{\sum_r \min(I_R(r), Q_R(r)) + \sum_g \min(I_G(g), Q_G(g) + \sum_b \min(I_B(b), Q_B(b))}{\min(|I|, |Q|) * 3} \quad (4)$$

It can be seen that the value of $S_c^{HI}(I, Q)$ belongs to the interval [0, 1] where if the graphs I and are identical, then the value of $S_c^{HI}(I, Q) = 1$.

If either of the two images (query or database) is fully contained in the other, then the value of $S_c^{HI}(I, Q) = 1$.

6   The analysis of the experimental part

The accuracy of the iris recognition technology was evaluated through many experiments where the system was applied to two standard iris databases, (CASIA-Iris-Interval) database and (IIT Delhi Iris) database. We applied the suggested method to a computer running in a Windows environment with i5 CPU and 8 GB of RAM.

Description of the utilized databases.

The utilized Iris databases can be described as follows:

(1)   IIT Delhi Iris database [12]:

The IIT Delhi Iris database primarily contains photographs of iris obtained from students and faculty at IIT Delhi in New Delhi, India. From January to July 2007, this database was collected in the Biometrics Research Laboratory using JIRIS, JPC1000, and a CMOS digital camera [13]. The image acquisition program is written and stored in bitmap format, and it is also freely available on request. There are actually 224 users who have access to the database, and all images are in raster format (*.bmp). Both subjects in the database are between the ages of 14 and 55, and there are 176 males and 48 females. The 1120 image database is divided into 224 volumes, each with its own integer number / identification. These images have a resolution of 320 x 240 pixels and were all captured in an indoor environment. Furthermore, researchers have had access to this database since 2007. fig.6. Some sample of this database
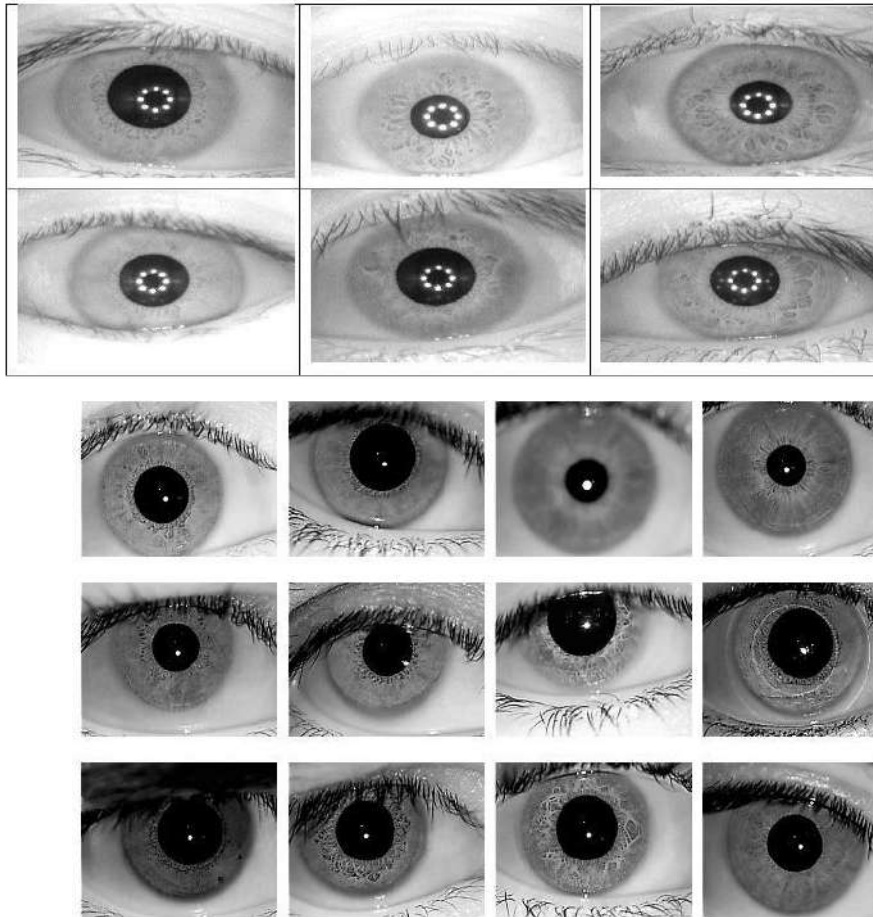
Fig. 14. Some samples of (IIT Delhi Iris) database

(2)   CASIA-Iris-Interval database [14]:

It is one of the free iris databases available for researchers on the Internet to conduct tests on. The iris image data set has been released and developed by the China Academy of Sciences of the International Society of Biometrics and has been updated from CASIA-IrisV1.0 to CASIA-IrisV4.0 where the iris images were taken for CASIA-Iris-Interval using a self-developed close-up iris camera. The most compelling feature of an iris camera is its circular NIR LED matrix design with light flux suitable for iris photography. Due to this new design, the special iris camera can capture very clear photos. The CASIA-Iris-Interval database is also well suited for studying detailed texture features of iris images. This database consists of a dataset of 249 files and each file has two samples (left and right) of one individual, each eye having 6 or 7 iris images. This database consists of a dataset of 249 files and each file has two samples (left and right) of one individual, each eye having 6 or 7 iris images. The iris images are 8 bit grayscale jpeg format with a resolution of 320 * 280 captured in two sessions for most iris images in indoor environment. Fig. 7. Some samples of (CASIA-Iris-Interval)

Fig. 15. Some samples of (CASIA-Iris-Interval)   database.

Evaluation of the proposed technique using theIIT Delhi Iris database:

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The proposed method was evaluated by applying it to this rule. A sample of 300 pictures of 100 people was taken, at the rate of 3 pictures of the left eye for each person. Three experiments were conducted on the IIT Delhi Iris rule. In the first experiment, 200 pictures were chosen for training and 100 pictures. To test the proposed algorithm, either in the second experiment 100 pictures were chosen for training and 100 pictures for the test, while the third experiment 100 pictures were adopted for the training and 200 pictures for the testing process and it was applied using three types of the LBP feature vector in addition to the classifier HID, and the results were recorded in the following tables:

Table 1. Results of the first experiment on IIT Delhi

Sample test1	LBP (PEP)*HID		LBP 8_2*HID		LBP 8_1&HID	
	Accuracy	Time(s)	Accuracy	Time(s)	Accuracy	Time(s)
3	98%	10.7	98%	10.7	96%	11.0

Table 2. Results of the second experiment on IIT Delhi

Sample test2	LBP (PEP)*HID		LBP 8_2*HID		LBP 8_1&HID	
	Accuracy	Time(s)	Accuracy	Time(s)	Accuracy	Time(s)
2	98%	6.9	98%	7.0	96%	6.32

Table 3. Results of the third experiment on IIT Delhi

Sample test3	LBP (PEP)*HID		LBP 8_2*HID		LBP 8_1&HID	
	Accuracy	Time(s)	Accuracy	Time(s)	Accuracy	Time(s)
3	96%	9.86	93.5%	10.2	93%	10.8

The results presented in Tables 1, 2 and 3 indicate that the iris recognition technology achieved high recognition accuracy by using the LBP feature vector that combines a large number of characteristics by extracting all parts of the image in addition to using the HID classifier that uses graphs to match the training and testing images where high accuracy was obtained in a short time

Evaluate the proposed technique using CASIA-Iris-Interval Database:

The proposed method was evaluated by applying it to this rule. A sample of 300 pictures of 100 people was taken, at the rate of 3 pictures of the left eye for each person. Three experiments were conducted on the CASIA-Iris-Interval rule. In the first experiment, 200 pictures were chosen for training and 100 pictures. To test the proposed algorithm, either in the second experiment 100 pictures were chosen for training and 100 pictures for the test, while the third experiment 100 pictures were adopted for the training and 200 pictures for the testing process and it was applied using three types of the LBP feature vector in addition to the classifier HID, and the results were recorded in the following tables:

Table 4. Results of the first experiment on CASIA-Iris-Interval

LBP (PEP)*HID	LBP 8_2*HID	LBP 8_1&HID

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Sample test1	Accu-racy	Time(s)	Accu-racy	Time(s)	Accu-racy	Time(s)
3	99%	7.7	98%	8.0	92%	7.9

Table 5. Results of the second experiment on CASIA-Iris-Interval

Sample test2	LBP (PEP)*HID		LBP 8_2*HID		LBP 8_1&HID	
	Accu-racy	Time(s)	Accu-racy	Time(s)	Accu-racy	Time(s)
2	96%	6.0	93%	6.5	85%	7.0

Table 6. Results of the third experiment on CASIA-Iris-Interval

Sample test3	LBP (PEP)*HID		LBP 8_2*HID		LBP 8_1&HID	
	Accu-racy	Time(s)	Accu-racy	Time(s)	Accu-racy	Time(s)
3	94.5%	10.0	91%	10.8	82%	10.6

From the results presented in Tables 4, 5, 6 it is clear that the proposed system gives a high discrimination rate of up to 99% through the CASIA-Iris-Interval database with less complexity, and from here we conclude that the system works very effectively with different data.

Evaluation of the proposed technique using the IIT Delhi Iris and CASIA-Iris-Interval databases with DWT:

By using the discrete wavelet transformation that has proven effective in reducing time while maintaining a high resolution of discrimination due to the techniques it applies by reducing image size and thus reducing complexity, the following tables illustrate the results obtained from the application of DWT on the two standard bases:

Table 7. The result of applying DWT on databases

Result with DWT		Result without DWT	
Accuracy	Time(s)	Accuracy	Time(s)
98%	5.4	98%	10.5

7. Conclusions

Empirical analysis showed the following conclusions:

4. The proposed iris recognition technology achieves high discrimination rates by using different iris data sets.
5. The complexity of the proposed method has been reduced through the use of effective LBP in order to identify the most important features in addition to the DWT and to consider the scope of the LL only in order to reduce the time taken for the classification process.

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6. Using HID in the classification stage leads to achieving high classification accuracy compared to traditional distance scale such as Euclidean distance and Chi square distance.

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