“ EFFICIENT METHODS FOR TRAIN TRACKING AND ARRIVAL TIME PREDICTION USING DEEP LEARNING”

Minor project report submitted
in partial fulfillment of the requirement for award of the degree of

Bachelor of Technology
in
Computer Science & Engineering

By

R.THANUJA	(20UECS0792)	**(VTU18153)**
D.DEEKSHITHA	(20UECS0236)	**(VTU18134)**
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Under the guidance of
Mr.R.Ganesan,M.Tech.,
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SCHOOL OF COMPUTING

VEL TECH RANGARAJAN DR. SAGUNTHALA R & D INSTITUTE OF SCIENCE AND TECHNOLOGY

(Deemed to be University Estd u/s 3 of UGC Act, 1956)
Accredited by NAAC with A++ Grade
CHENNAI 600 062, TAMILNADU, INDIA

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CERTIFICATE

It is certified that the work contained in the project report titled "EFFICIENT METHODS FOR TRAIN TRACKING AND ARRIVAL TIME PREDICTION USING DEEP LEARNING" by "R.THANUJA (20UECS0792), D.DEEKSHITHA (20UECS0236),V.THARUN KUMAR (20UECS1030)" has been carried out under my supervision and that this work has not been submitted elsewhere for a degree.

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May, 2023

DECLARATION

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

R.THANUJA

Date: / /

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APPROVAL SHEET

This project report entitled “EFFICIENT METHODS FOR TRAIN TRACKING AND ARRIVAL TIME PREDICTION USING DEEP LEARNING” by R.THANUJA (20UECS0792), D.DEEKSHITHA (20UECS0236), V.THARUN KUMAR(20UECS1030) is approved for the degree of B.Tech in Computer Science & Engineering.

Examiners **Supervisor**

Mr.R.Ganesan, M.Tech.,

Date: / /

Place:

ACKNOWLEDGEMENT

We express our deepest gratitude to our respected **Founder Chancellor and President Col. Prof. Dr. R. RANGARAJAN B.E. (EEE), B.E. (MECH), M.S (AUTO),D.Sc., Foundress President Dr. R. SAGUNTHALA RANGARAJAN M.B.B.S.** Chairperson Managing Trustee and Vice President.

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ABSTRACT

The railway track management system is software that supports the railway track system services as per train schedules. The project is intended to honest GUI that permits monitoring and controlling various trains on the network. It has happened numerous times that you are simply waiting at the train station for somebody.To arrive, and you dont have any exact information about train timing or other stuff.The train schedules and routes are operated by the track management system. The system works on train schedules and lays proper tracks for trains to pass according to their routes. The Train the Executives programe has been intended to help and Keep up with information for different trains on the rail organisation. The train schedules and routes are kept up-to-date in an incredibly large data set. At whatever point the train passes, On a track, the further track crosses or joins are overseen individually according to the train route. Once the train passes, the track is then configured for the following scheduled train to pass

Keywords: Graphical User Interface,Train Schedule,Track Management System ,Train Management,Rail Network.

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

GIS	Geographical Information System
GPS	Global Positioning System
GSM	Global System for Mobile Communications
GUI	Graphical User Interface

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Chapter 1

INTRODUCTION

1.1 Introduction

It has happened such a lot of times that you simply are waiting on railroad station for somebody to arrive and you dont have any exact information about train timing and other stuff. Here, we propose a project for tracking and predicting time points. Using this technique users can get the knowledge about train timing, and is it on time or not, and other information. In this, system will track the train timing at what time train departed from a specific station and pass these timing details to other stations system where it will display the timing in step with train departed from previous station. If system will find any delay in train thanks to signal it will automatically update the train timing in next station and can be flaunted to viewers. In this system theres an admin module, who enters the detail about trains and its timing and these details are going to be suffered internet server and is fetched by the system on other stations, and theres other system that shows train information to the viewers on platform.

The information of all trains however will automatically select the data that refers to specific station and suggests that information on screen. For instance if an admin at Mumbai station enter information about Hyderabad station .Chennai station system wont be effected, but Hyderabad Station system will show the knowledge about train. this method works like when train is departed late from a station, admin will enter details about departure and its time, and this information goes in real time on internet server and retrieved on other system through internet server and shows the main points on screen. Station masters on every station have a login wherein them may update train time of arrival at their station when it arrives. This System is installed on various locations on station for viewers to look at the knowledge. Admin can add information like train departed from station, expected arrival at destination, delay inside the train schedule, etc.

1.2 Aim of the project

Whenever the train passes on a track the further track cross or joins are overseen likewise according to the train course. When the train passes the track is then arranged for the following booked train to pass. Utilizing this technique will follow the train timing at what time train withdrew from a particular station and pass these planning subtleties to other station's framework where it willl show the circumstance in sync with train withdrew from past station. If framework will discover any postponement in train due to flag it will naturally refresh the train timing in next station and can be introduced watchers.

1.3 Project Domain

Prediction of train positions in time and Space is needed for con trol and passenger data. This shows a period of time tool for continuous online prediction of train traffic employing a regular event graph that captures all regular events and precedence relations between them like train runs and stops, connections, and minimum headways. During this system , When people tries to fetch the details of their required train after login , it undergoes into the internet server viewers on platform. Second system can get all the data the knowledge the data of all trains however can mechanically choose the information that refers to explicit station and shows that information on screen. This project publishes period of time train schedule events.

1.4 Scope of the Project

In this busy life we prefer to encourage exact data of train take- off and appearance to prevail in our objective on schedule. Thus, through this Railway Tracking and point in time Prediction utilizing Deep Learning, we will know the exact timings of trains. This strategy dismisses the established truth that a few trains may somewhat live through a defer utilizing period supplements, while others may get more deferred in view of course conflicts. Forecast of train positions in existence is needed for control and traveler data. Not withstanding, practically the last estimated train delays are known and dispatchers should foresee the appearance seasons of trains without PC support.

Chapter 2

LITERATURE REVIEW

Donghyeon Han et al.,2022 [1] Proposed that A DNN Training Processor for Robust Object Detection with RealWorld Environmental Adaptation IEEE 4th International Conference on Artificial Intelligence Circuits and Systems AICAS. It says that a deep neural network DNN training processor that can improve the robustness of object detection in real world environments.The processor is designed to adapt to environmental changes by adjusting the DNNs parameters during training.Overall,the paper presents a promising approach to improving the robustness of object detection in realworld environments by using a specialized DNN training processor.

FlowHu Zhang et al.,2020 [2] Developed a prediction model for bus arrival time at a bus stop that considers signal control and surrounding traffic. The accurate prediction of bus arrival time is crucial for improving the efficiency and quality of public transportation systems. However, predicting bus arrival time can be challenging due to various factors, such as traffic congestion, road conditions, and unpredictable events. The proposed model in the paper uses historical bus trajectory data, real-time traffic information, and signal control information to predict the bus's arrival time at a specific bus stop.

Guangchao Wang et al.,2020 [3] Proposed that A High-precision Method of Flight Arrival Time Estimation based on XGBoost IEEE 2nd International Conference on Civil Aviation Safety and Information Technology (ICCASIT).The new method for estimating the arrival time of flights, which is based on the XGBoost algorithm. This explain that the method uses a combination of historical flight data and real-time weather data to make accurate predictions about the arrival time of flights.Overall,this presents a novel and effective approach for estimating flight arrival times using machine learning techniques, and could have important implications for the aviation industry.

H. Jing et al.,2020 [4] Proposed that Detection method based on network model trained with mixed data sets, Presents a detection method based on a network model that is trained using mixed data sets. This method is specifically designed for radar systems and aims to improve target detection accuracy. They point out that conventional radar detection methods suffer from limitations such as low detection accuracy, high false alarm rates, and difficulty in dealing with complex environments. To overcome these limitations, the proposed method uses a network model trained with both synthetic and real-world radar data.

Ivan Tashev et al.,2021 [5] Developed that on training targets for noise-robust voice activity detection Sebastian Braun.A new approach for training neural networks to improve the accuracy of voice activity detection in noisy environments. This approach uses a two-stage training process that involves pretraining the network on clean speech signals and then fine-tuning it on noisy speech signals with different levels of noise.The results of the experiments conducted in the study demonstrate the effectiveness of the approach in achieving higher accuracy in voice activity detection, particularly in challenging noise conditions. The improving the accuracy and robustness of VAD in noisy environments, which could have important implications for speech processing applications such as speech recognition, speaker identification, and audio surveillance.

Jingtao Wang et al.,2022 [6] implemented that Study on Flight Landing Time Prediction in Complex Terminal Areas 2nd International Conference on Big Data Engineering and Education (BDEE). The problem of predicting the landing time of flights in complex terminal areas. The authors note that accurately predicting the landing time of flights is critical for ensuring the safety and efficiency of airport operations. However, due to the complex and dynamic nature of terminal areas, accurately predicting landing times can be challenging.Overall, the paper presents a novel and effective approach for predicting flight landing times in complex terminal areas using machine learning techniques, and could have important implications for the aviation industry.

Peng Hu et al.,2022 [7] Proposed that Research on flight arrival delay prediction based on support vector machine, a research study on the use of support vector machine SVMfor predicting flight arrival delays. The study aimed to improve the accuracy of flight delay prediction and enhance the efficiency of airport operations. . This model was evaluated using real flight data and compared with other commonly used prediction models. The results showed that the SVM-based model outperformed the other models in terms of accuracy and robustness, indicating its potential for practical applications in the aviation industry. The study provides important insights into the use of machine learning techniques for flight delay prediction and could contribute to the development of more efficient and reliable air transportation systems.

Qingwen Han et al.,2022 [8] Proposed that A Bus Arrival Time Prediction Method Based on Position Calibration and LSTM, IEEE Access,proposes a new method for bus arrival time prediction. The method involves position calibration using road network information to improve the accuracy of GPS data and utilizes Long Short-Term Memory (LSTM) network to make predictions. The paper presents experimental results demonstrating that the proposed method outperforms traditional methods such as k-Nearest Neighbor (k-NN) and Support Vector Regression (SVR) in terms of prediction accuracy. The proposed method has important implications for improving the efficiency and reliability of public transportation systems.

Vignesh et al.,2020 [9] Proposed that a Dynamic bus arrival time prediction method using temporal difference learning approach. Accurate bus arrival time prediction is important for improving the efficiency of public transportation systems, reducing passenger wait times, and enhancing overall user experience. However, predicting bus arrival time can be challenging due to various factors such as traffic congestion, weather conditions, and unexpected events. The proposed method in the paper uses a temporal difference learning approach, a type of reinforcement learning, to predict bus arrival time. The model uses historical bus trajectory data, real-time traffic information, and weather data to learn the relationship between different variables and generate predictions.

Xin Xu et al.,2020 [10] Proposed that LSTM-GAN-XGBOOST Based Anomaly Detection Algorithm for Time Series Data 11th International Conference on Prognostics and System Health Management PHM-2020 Jinan.Proposed that the LSTM model is used to capture the temporal dependencies in the time series data, while the GAN model is used to generate synthetic data that can be used to augment the training dataset. The XGBoost model is then used to classify the data as normal or anomalous based on the features extracted from the LSTM and GAN models.Overall, the paper presents a promising approach to anomaly detection in time series data by combining LSTM, GAN, and XGBoost models.

Chapter 3

PROJECT DESCRIPTION

3.1 Existing System

The existing railway reservation system has many shortcoming related to it. within the existing system railway wont to set train reservation levels above seating capacity to catch up on passenger cancellation and no-shows accounting to overbooking within the agent frequently to try and do so thus delay and money for all. within the existing system integration of various railways on single platforms wasn't met

Disadvantages of Existing System

• High expensive
• Time taken procedures and methods
• No portability.
• No user friendly

3.2 Proposed System

This project is about the train schedules and routes are operated by the track management system Using Random Forest algorithm.This algorithm can be used for both classification and regression tasks, and is often used for predicting arrival times based on historical data.This system works on train schedules and lays proper tracks for trains to pass according to their routes. The Train the Executives programming has been intended to help and keep up information for different trains on the rail organization. The train schedules and routes are kept up in an incredible data set. At whatever point the train passes on a track the further track cross or joins are overseen appropriately according to the train route

Advantages

• Significantly lower expenses.
• Time savings by not having to ship paper or to re enter data into a computer.
• Richer, more complete and more accurate data.

3.3 Feasibility Study

The feasibility of the project is analyzed during this phase and business proposal is put forth with a really general plan for the project and a few cost estimates. During system analysis the feasibility study of the proposed system is to be administered . This is often to make sure that the proposed system isn't a burden to the corporate . For feasibility analysis, some understanding of the main requirements for thesystem is important .

1. Economic Feasibility
2. Technical Feasibility
3. Social Feasibility

3.3.1 Economic Feasibility

While deep learning models can offer significant benefits in terms of accuracy and efficiency, they also require significant resources for development, training, and deployment. However, the economic feasibility of this approach can be improved by leveraging existing infrastructure and data sources, as well as by carefully managing project costs and prioritizing high-impact features. Additionally, the use of deep learning can result in cost savings by reducing delays and improving overall system efficiency.

3.3.2 Technical Feasibility

This study is administered to see the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. this may cause high demands on the available technical resources. this may cause high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this technique.

3.3.3 Social Feasibility

The aspect of study is to see the extent of acceptance of the system by the user. This includes the method of coaching the user to use the system efficiently. The user must not feel threatened by the system,instead must accept it as a necessity. the extent of acceptance by the users solely depends on the methods that are employed to teach the user about the system and to form him conversant in it.

3.4 System Specification

3.4.1 Hardware Specification

• Processor :i5
• Hard Disk :5 GB
• ROM:1TB
• Key Board : Standard Windows Keyboard
• Memory – 1GB RAM
• Mouse: A Standard Mouse

3.4.2 Software Specification

• Windows 10
• Python 3.10.11

3.4.3 Standards and Policies

Standards and policies are in place for train tracking and arrival time prediction using deep learning. The General Transit Feed Specification , Railway Industry Standard, and European Rail Traffic Management System are examples of such standards that provide a common format for transit data, which can be used to train machine learning models for predicting train arrival times. Open Machine Learning Framework is an open-source platform for machine learning that provides a standard interface for data, models, and experiments. Privacy policies also play a crucial role in ensuring that personal information is handled in a secure and ethical manner. Together, these standards and policies ensure that train tracking and arrival time prediction using deep learning is done in a standardized and ethical manner.

Chapter 4

METHODOLOGY

4.1 Architecture Diagram of Train Tracking

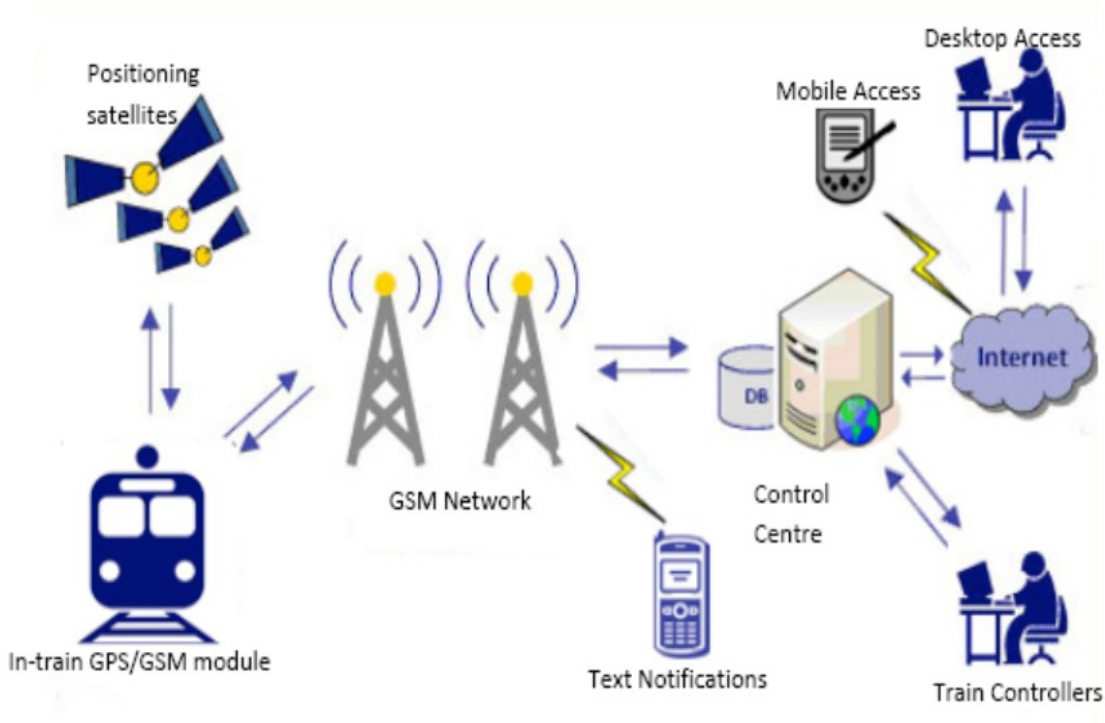


Figure 4.1: **Architecture Diagram of Train Tracking**

In the figure 4.1, shows that the proper combination of latest data and communication technologies will give a good and possible answer for the need of a reliable and correct train pursuit system productivity of India Railways. The solution we tend to propose encompasses a strong combination of mobile computing, international System for Mobile Communication (WIRELESS), International Positioning System (GPS), Geographical system (GIS) technologies associated software package to produce an intelligent train pursuit and management system to enhance the present railway transport service.

4.2 Design Phase

The aim of the design phase is to determine how the system will be working.In design phase we use architecture diagram,dataflow diagram ,UML diagram,Sequence diagram and use case diagram to know the process of the system easily.

4.2.1 Data Flow Diagram of Train Tracking

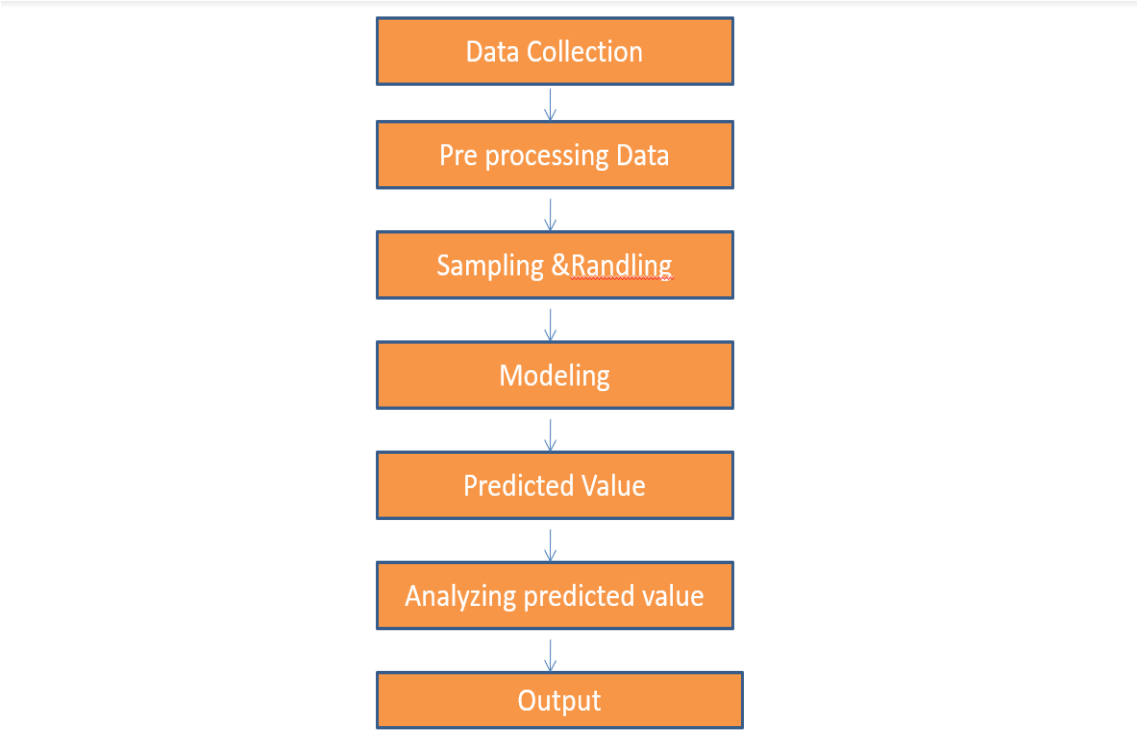


Figure 4.2: **Data Flow Diagram of Train Tracking**

In the figure 4.2, the aim of the design phase is to determine how the system will be working.In design phase we use architecture diagram,dataflow diagram ,UML diagram,Sequence diagram and use case diagram to know the process of the system easily.Dataflow Diagram shows the movement of information from the user to the System.Passenger gets information from the system. The system is managed by the admin .

4.2.2 Use Case Diagram of User And Admin

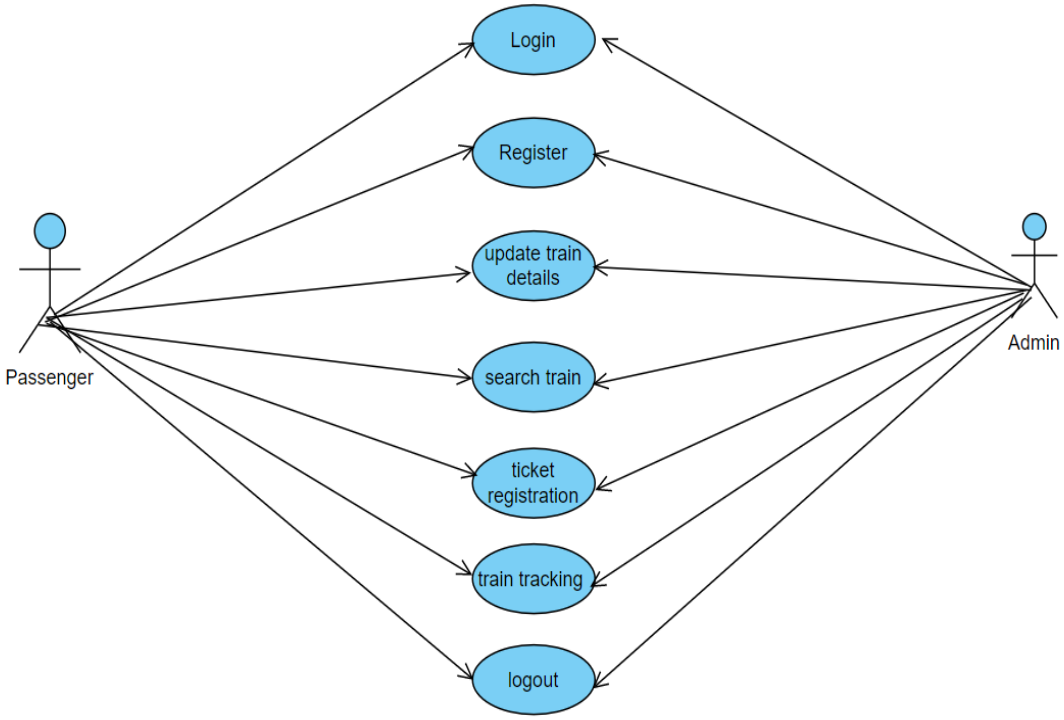


Figure 4.3: **Use Case Diagram of Train Tracking**

In the figure 4.3, We use case diagram that is a type of behavioral diagram defined by and created from use case analysis. The main purpose of the use case diagram is to show that what system functions are performed for which actor. Roles of the actors in the system can be depic track Train .The Station Master can track a train and monitor its location in real-time. Configure Track The Administrator can configure tracks for the train to pass through. Update Train Schedule. The Administrator can update the train schedules and routes. Report Train Status. The Train Driver can report the status of the train for example if there is any delay or breakdown, to the Station Master. The use case diagram illustrates the different actors involved in the system and the various functionalities or use cases that they can perform.

4.2.3 Class Diagram of Train Tracking

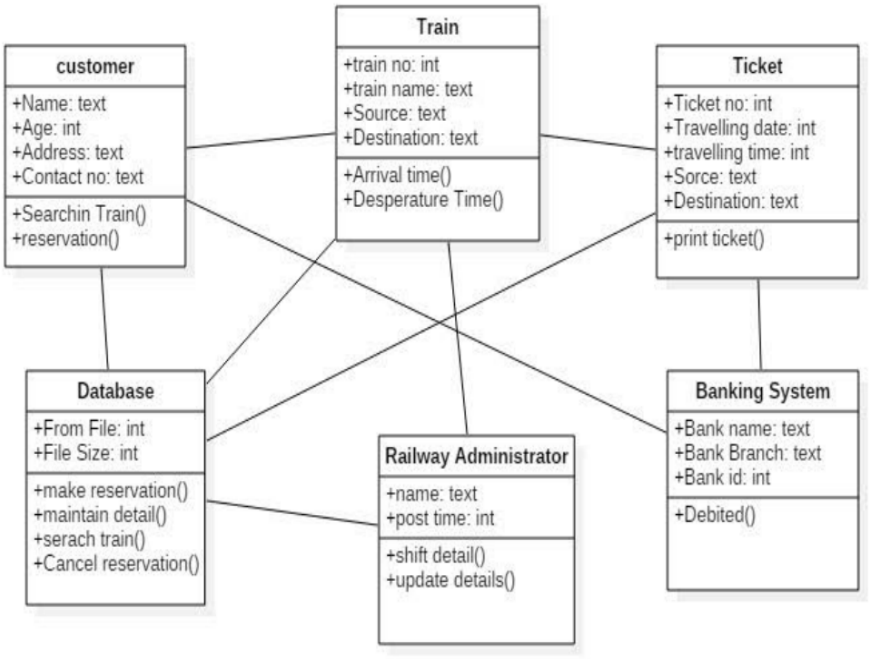


Figure 4.4: **Class Diagram of Train Tracking**

In the figure 4.4, the Class diagram based on the the purpose of visually representing a system along with its main actors, roles, actions, artifacts or classes, in order to better understand, alter, maintain, or document information about the system. The class diagram for train tracking system typically includes classes such as Train, GPS Module, GSM Module, Microcontroller, Server, User Interface, Database, and Data Processor. The Train class represents the train and its attributes such as train number, speed, and direction. The GPS Module class represents the GPS module used to obtain the real-time location of the train, while the GSM Module class represents the GSM module used to send the location data to a remote server. The Microcontroller class is responsible for processing the GPS data and communicating with the GSM module. The Server class represents the remote server that receives the location data from the GSM module. The User Interface class represents the user interface used to display the current location of the train. The Database class represents the database used to store train location data for future reference, while the Data Processor class is responsible for processing the train location data, generating alerts, and generating reports.

4.2.4 Sequence Diagram of Train Tracking

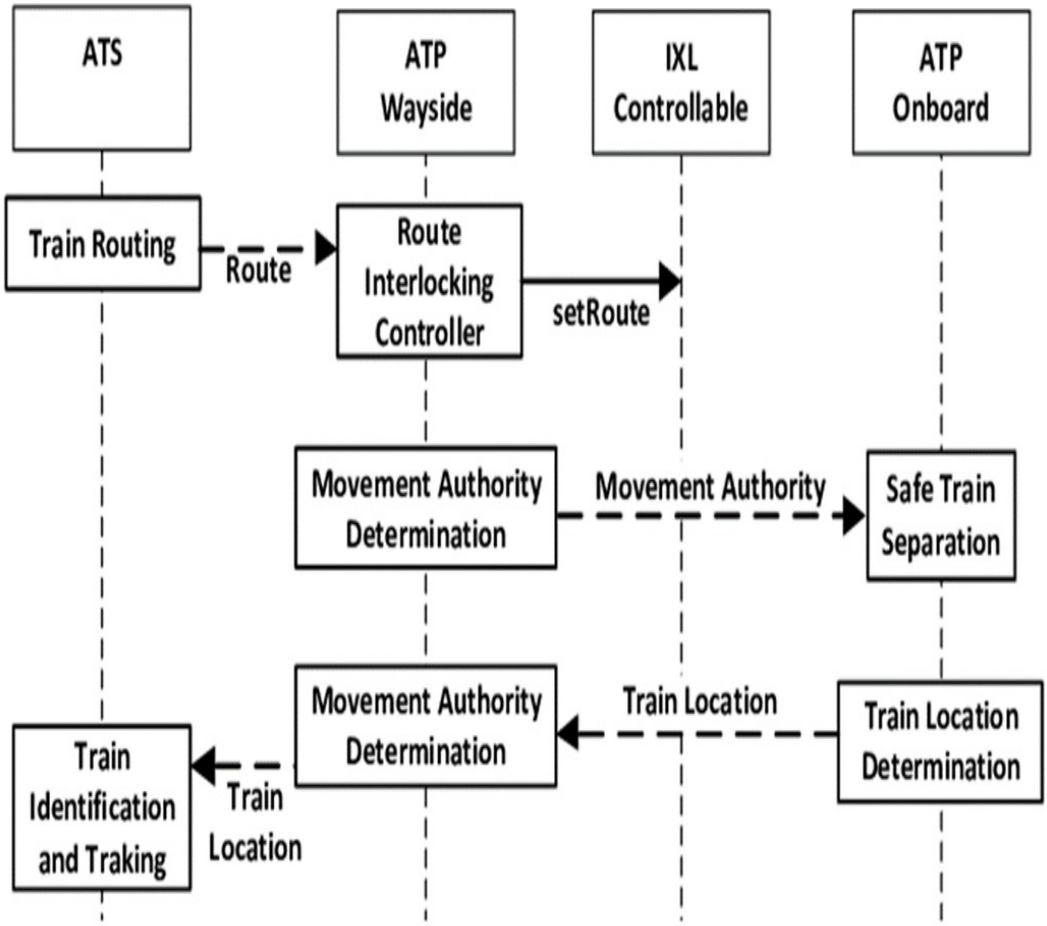


Figure 4.5: **Sequence Diagram of Train Tracking**

In the figure4.5, the Sequence diagram shows how the data transmission occurs between user and data base and it shows that how the data is accessing the user in the database system.The user opens the GUI and enters the train schedule and route information. The system retrieves the information from the database and displays it on the GUI. The user selects a train and clicks on the ”Track” button. The system sends a request to the train tracking component to start tracking the train. The train tracking component retrieves the real-time location information of the train from the GPS tracking system. The train tracking component updates the train's location on the GUI in real-time. The system checks the train schedule and route information to determine the next track to be used by the train. The system sends a request to the track management component to configure the next track for the train. The track management component updates the track configuration to allow the train to pass through. The train passes through the track, and the track management component

reconfigures the track for the next scheduled train to pass through. This sequence diagram illustrates the flow of events involved in the train tracking and scheduling process and how various system components interact with each other to ensure efficient and safe train operations.

4.3 Module Description

4.3.1 Admin and Describer Module

During this method there's an admin module, where user enters the most points about train i.e train PNR number or train name . So, these details are visiting be tried and true internet server and is fetched by the system. Train describer systems keep track of train positions in discrete steps over its route, supported train numbers and messages received from the signalling and interlocking systems (sections, switches and signals). After login ,users will receive the messages resulting in chronologically ordered lists of infrastructure and generated train number messages. Hence, train number step messages are coupled to trace section messages.

4.3.2 Time Module

We track information to examine the dependency of running and dwell times on departure and arrival delays, respectively. These dependencies, along with the particular route plan, timetable and current positions of all trains, are wont to predict the long run running times of all trains. Microscopic operational constraints are incorporated in predictions, therefore capturing all train interactions because of capacity or connection constraints. When an update of the train positions becomes visible, the predictions are recomputed. The train steps are recorded on the amount of track sections (a block consists of 1 or more track sections), with a message when a brand new track section is occupied by a train and when a track section is released by a train.

4.3.3 Arrival and Delay Module

The point in time predictions might be wont to check connections within the case of arrival delays. The impact of any control decision may be checked by an update of the predictive model resulting in arrival and delay time predictions. When a connec-

tion conflict is detected, the signaller may attempt to secure or cancel a connection before. The dependencies of dwell times further as running times on the extent of open track sections (line segment between two stations) were captured and wont to compute robust estimates of arrival and departure times. Hence, it will be analysed with reference to the last measured departure (arrival) delay, which can be exploited for computing period and time predictions.

4.3.4 Whether Data Module

Bad weather may be prominent cause of train delays and also the operational speeds of trains are reduced for safety reasons. According to Railway Safety Management Regulations, when rainfall or wind speed exceed the predetermined level for one hour, trains are required to operate at a lower speed. We used a web crawler to collect the weather data of the cities from the Meteorological Data Network, a body offering a weather data-sharing service. The standard format of the weather records are stored. The items recorded include type of weather, temperature, and wind direction and scale. At present, accurate weather forecasts can be made over ten days in advance. Weather conditions can serve as a key feature of a train delay prediction model.

4.3.5 Online Traffic Prediction Module

The online prediction tool is predicated on a timed event graph with dynamic arc weights. The graph topology is constructed and updated supported the particular timetable, route and connection plan, and current positions of trains on the network. Route plan for a train is given as a planned sequence of block sections within the train route. Arcs are described by starting event, end event, type and weight. Styles of the starting and end events determine the sort of an arc. Arc weights represent the minimum process times and that they are computed supported the present train positions and delays, and processed historical data. A route plan will be translated to the amount of track sections and accustomed determine the required headway arcs for routes with common track sections.

Chapter 5

IMPLEMENTATION AND TESTING

Implementation is a stage of the project when the theoretical design will be turned out into a working system. From this we can be consider that the most critical stage in achieving a successful new system and in giving the user, confidence that the new system will work and be effective. There will be designing of new methods to achieve the new change over.

5.1 Input and Output

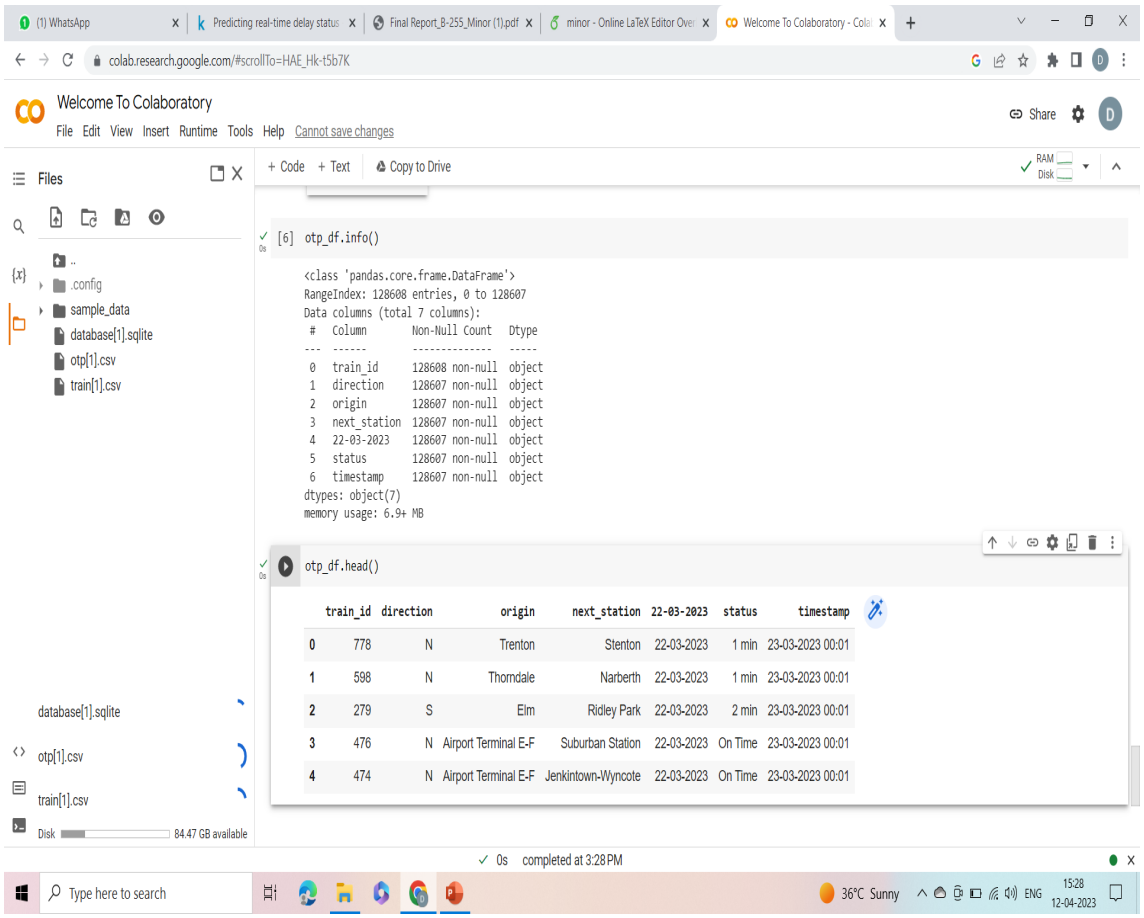


Figure 5.1: **Frequency of Train**

5.1.1 Input Design Visualize of Train Ids Showed up

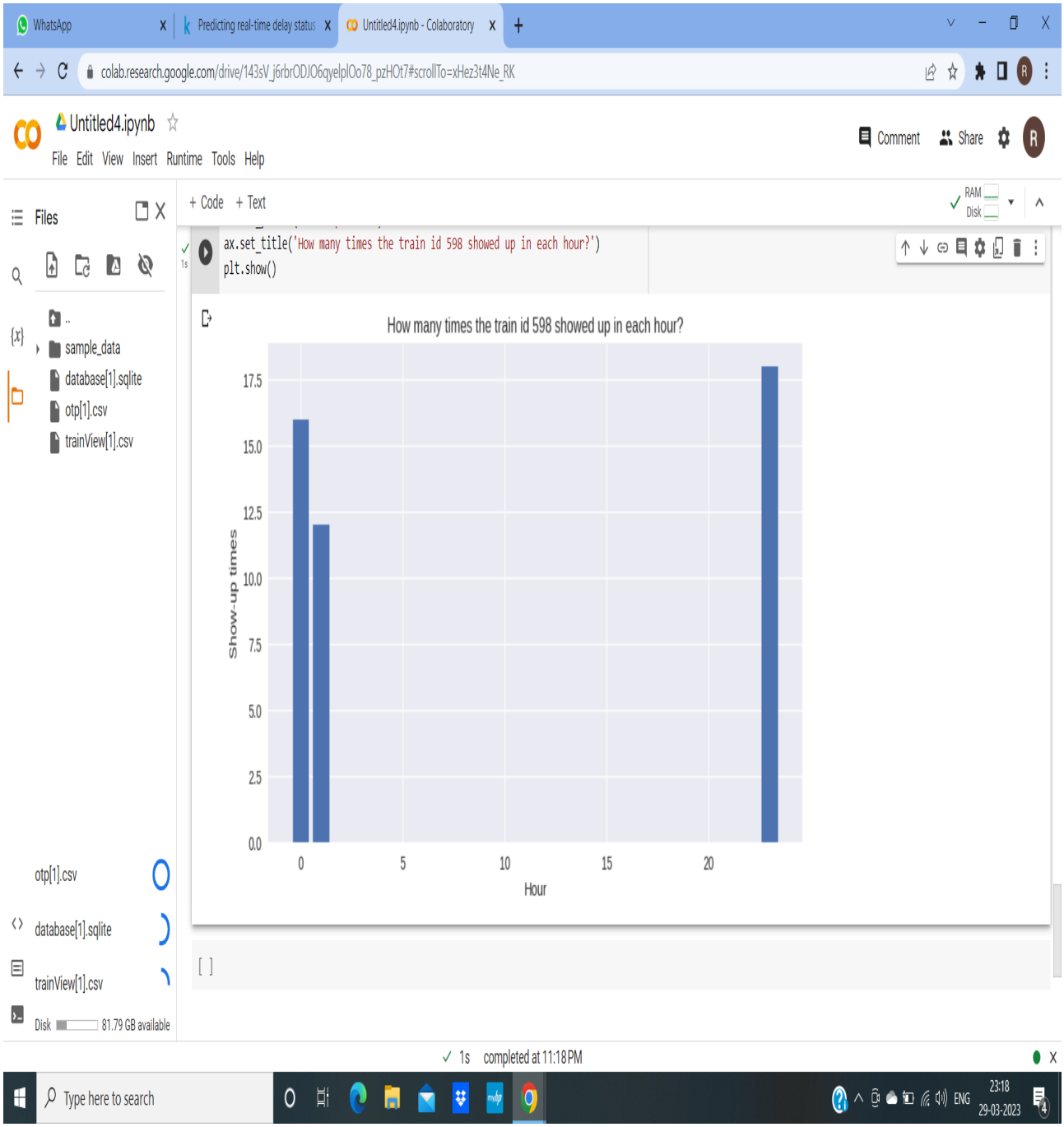


Figure 5.2: **Train Ids Showed up in Each Hour**

Since the longest run for a train is less than 2 hours, the plot above shows that there are unless two trains using the same train id running in a single day. Therefore, the train id cannot be used as the unique key to identify each train in the system.

5.1.2 Output Design Visualize of Delay Time

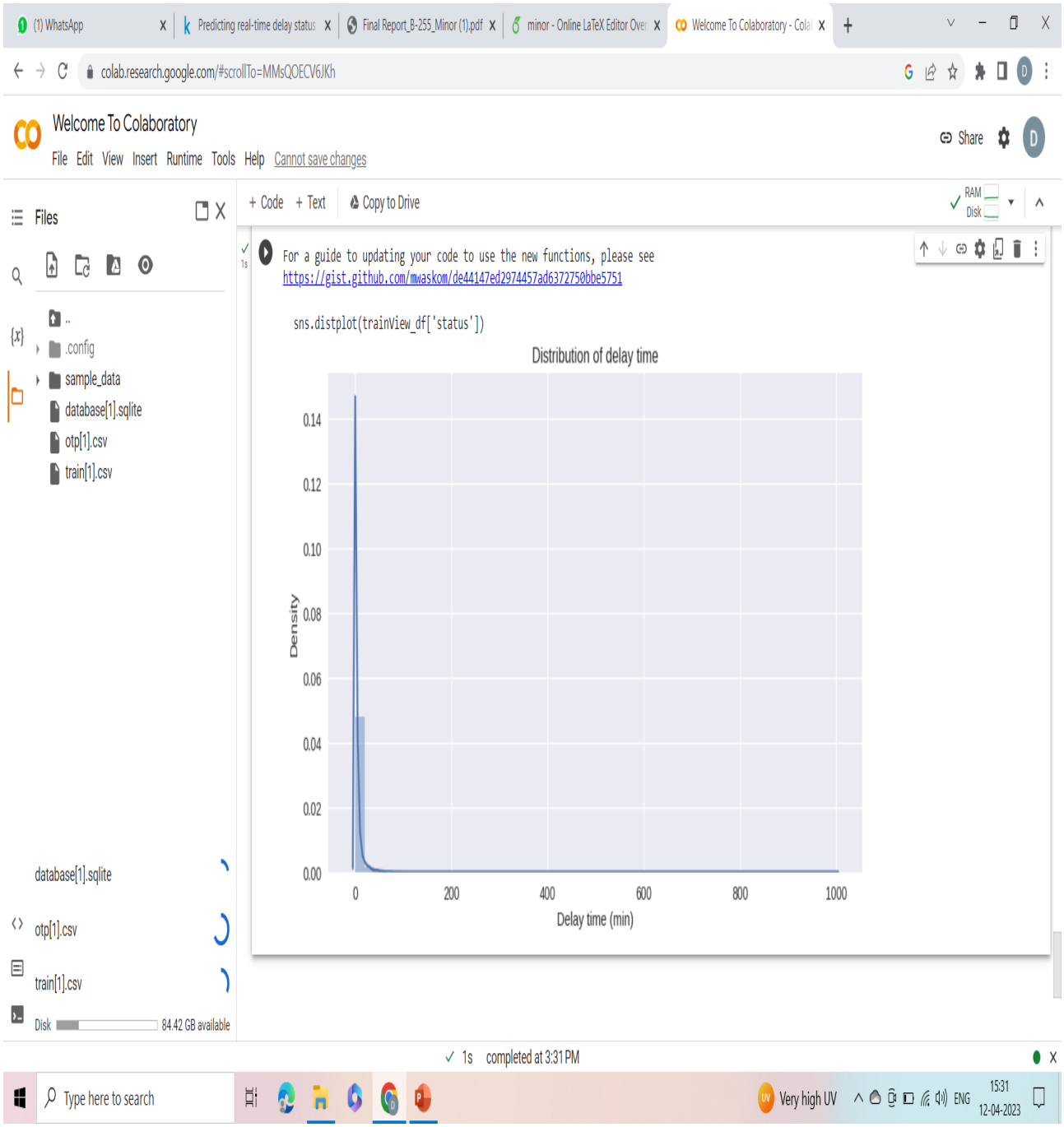


Figure 5.3: **Distribution of Delay Time**

The above figure 5.3 showed that the information contained by two dataframes are identical. Therefore, using either one for analysis should work. I will use otp.df for all following analysis.

5.2 Testing

Testing process is a process of verifying system to identify any errors in the code .And checking accurate results.

5.3 Types of Testing

5.3.1 Unit Testing

It prevent errors and bugs in code. The program is dampened into blocks, and every element (unit) is tested separately. It involves testing individual units of the ASCII text file, like functions, methods, and sophistication to establish that they meet the wants and have expected behaviour. Unit tests are usually very small and it takes less time to execute.

5.3.2 Integration Testing

It observes how multiple components of the program work together. If we make any changes in one component it will reflect errors in other components. Checking the components that employment together by doing an integration testing runs the complete pipeline end-to-end. The slowness of running the whole pipeline makes continuous integration testing harder.

5.3.3 White Box Testing

It is a software testing method used for testing within the interior structure/ design/ implementation of the item being that it will be understand to the tester. Data domains together with inner or internal boundaries will be better tested. It's also known as clear box testing. This sort of testing of software is started after detail design document.

5.3.4 Black Box Testing

No knowledge of implementation is required. It are often referred as outer or external software testing. It's functional test of the software and this testing are often initiated on the premise of requirement specifications document. It's the behavior testing of the software and is applicable to the upper levels of testing of software.

5.3.5 Test Result For Frequency Of Train

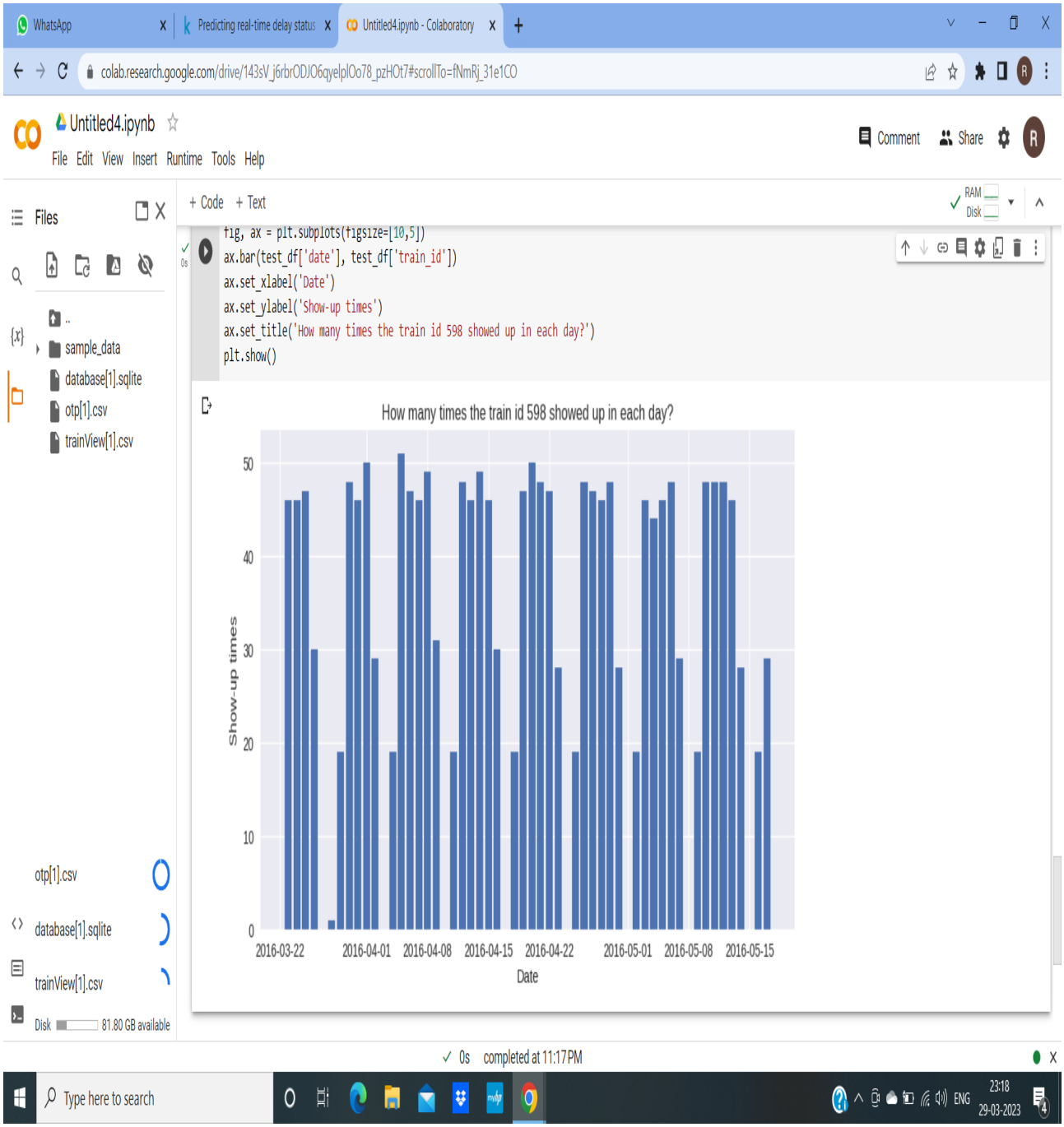


Figure 5.4: **Number of Train Ids Showed up in Each Day**

The plot above shows that the train id is not unique. It clearly shows that the same train id can show up in multiple days.

Chapter 6

RESULTS AND DISCUSSIONS

6.1 Efficiency of the Proposed System

Using these deep learning techniques gives accurate results and its user friendly model and portable.we can accessed the particular train schedule whether the train will arrive or delay by using prediction technique.Its gives accurate results these methods are very useful for time management for every single people who are will to plan their journey and selected the transport as railway.Its gives updates within seconds.it is amazing ,strategical and versatile technique

6.2 Comparison of Existing and Proposed System

While comparing Proposed system and Existing system ,proposed system more accurate than the existing system and it is less expensive and its more ease to accesses the data about a particular train and its location.It is more efficient than the existing system because the location tracking technology, Indian Railways now has the ability to pin point the location and other attributes of an operational train in an economical accurate manner than existing system.

6.3 Advantages of the Proposed System

•Time savings by not having to ship paper or to re enter data into a computer.
•Richer, more complete and more accurate data.
•Remote deployment to travelers; and in many cases.
•The ability to use devices that you already own(user-friendly).

6.4 Sample Code

```
file_path = '/content/train.csv'
trainview_df = pd.reaf_csv(file_path)
trainview_df.head()
file_path = '/content/test.csv'
otp_df = pd.read_csv(file_path)
otp_df.head()
con = sqlite3.connect('/content/database.sqlite')
tables_df = pd.read_sql_query( 'SELECT name FROM sqlite_master WHERE type ="table" ',con)
tables_df
test_df = otp_df[otp_df['train_id]== '778'].copy()
test_df = test_df.groupby('date')['train_id'].count().reset_index()
fig,ax = pit.subplots(figsize=[10,5])
ax.bar(test_df['date'],test_df['train_id])
ax.set_xlable('date')
ax.set_ylabel('show-up times')
ax.set_title('How many times the train id 778 showed up in each day?')
plt . show()
fig, ax = plt . subplots(figsize = [10,51])
sns.distplot(trainView_df['status'])
ax.set_xlabel('Delay time (min)')
ax. set_label('Density')
ax.set_ytitle('Distribution of delay time')
plt.show()
```

Output of Trainview dataset

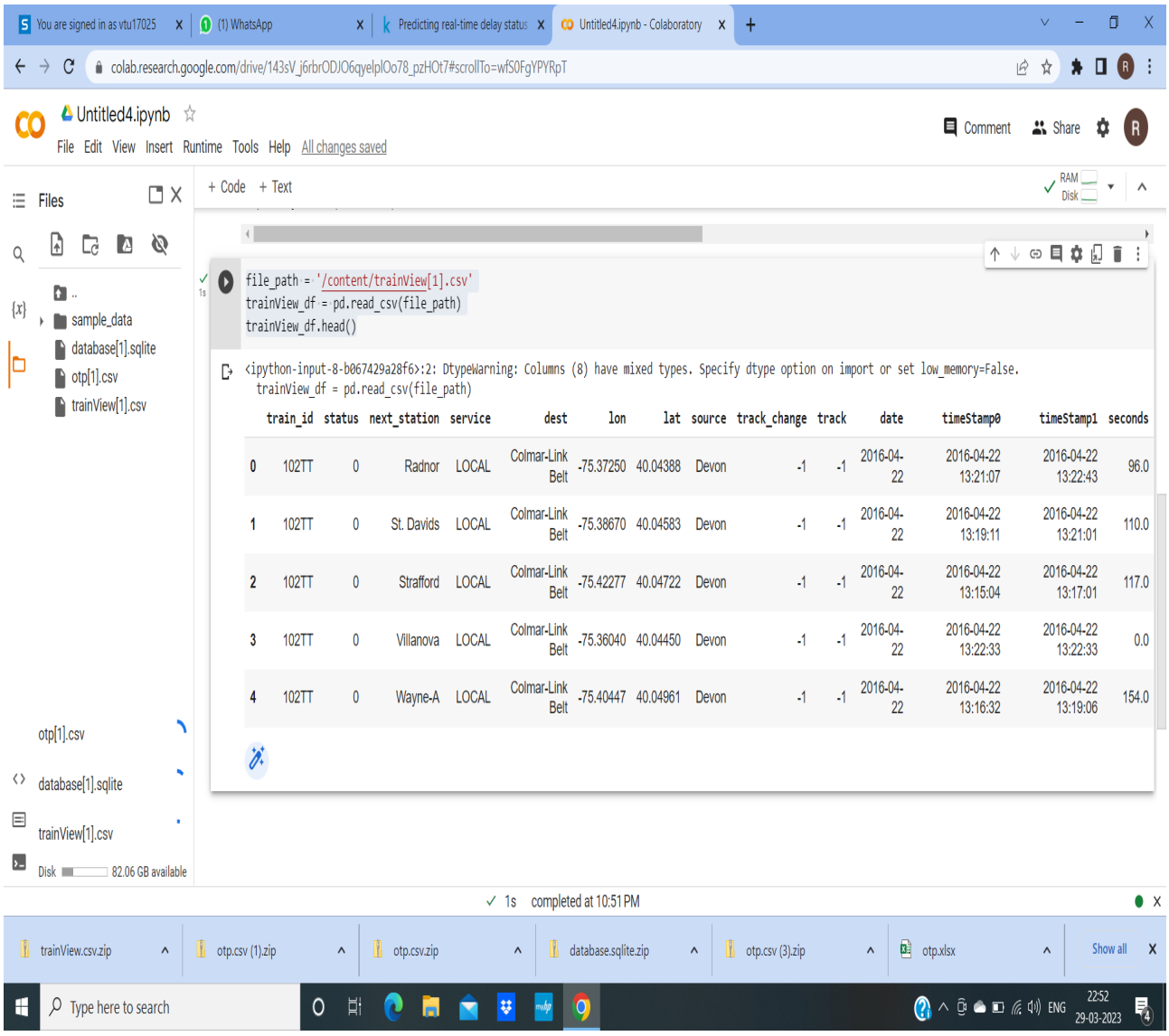


Figure 6.1: **Trainview Dataset**

First load the trainView.csv into pandas as a dataframe called train View df. Display first 5 rows and check if the loading is Okay.Then load the otp.csv into pandas as a data frame called otp df. Display first 5 rows and check if the loading is Okay.

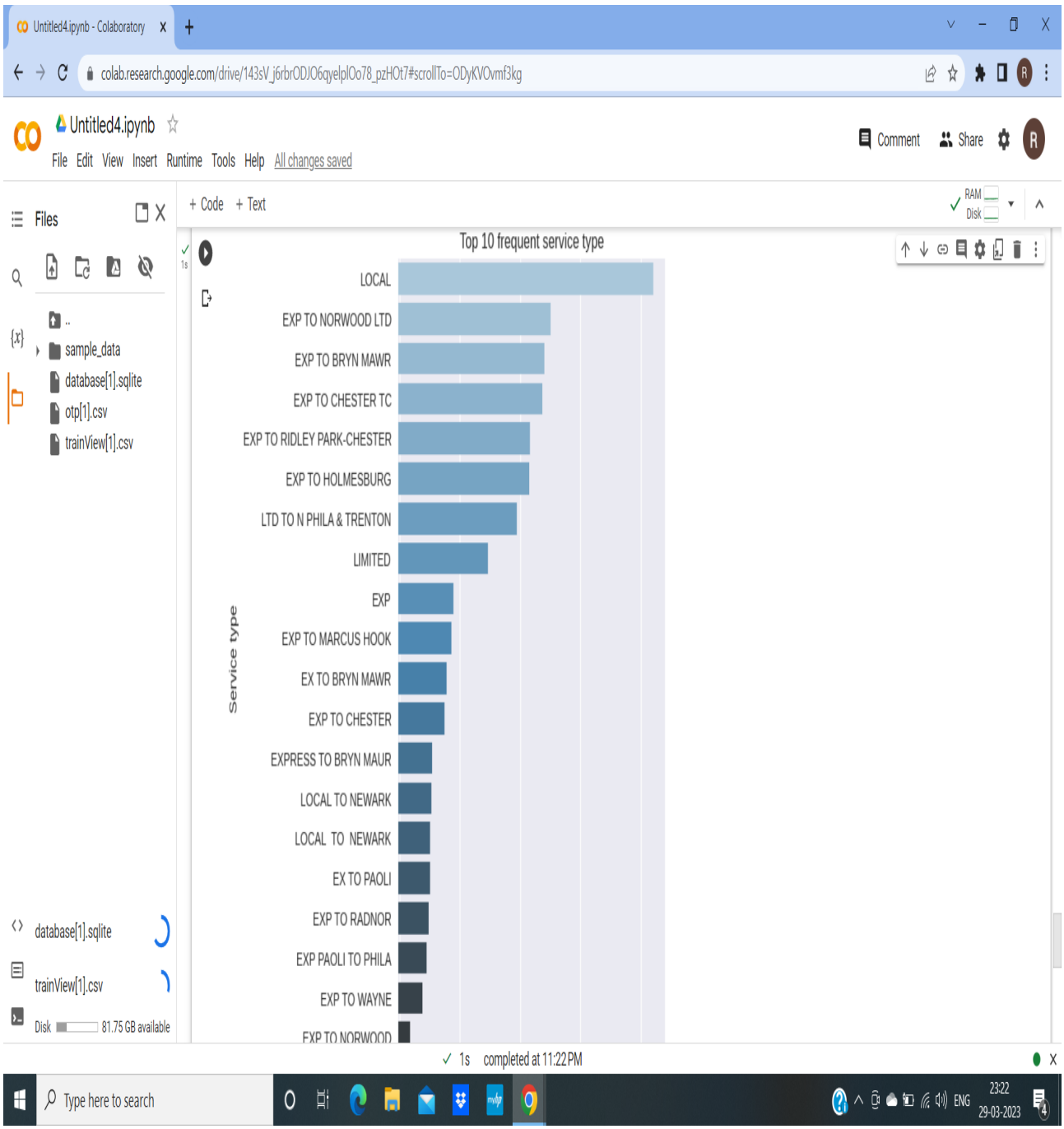


Figure 6.2: **Frequent Service Type**

The ”service” column labels trains with service type. Based on the list of service column printed out above, generally there are two types of service: Local and Express.For each servie line, both Local and Express trains are running on the same route. However, Local trains stop at each train station while Express trains skip the stops where fewer amount of people are using.I decide to drop this column since the service type also reflects in ”next station” column.

Chapter 7

CONCLUSION AND FUTURE ENHANCEMENTS

7.1 Conclusion

In this project we proposed an efficient method for train tracking that uses a combination of computer vision and deep learning techniques. The proposed method can accurately track the train's position and estimate its arrival time in real-time, even in challenging weather conditions. This approach has significant benefits for transportation systems, as it can help operators better manage train schedules and provide more accurate arrival time estimates to passengers. Overall, our project demonstrates the effectiveness of deep learning in predicting the arrival time of trains and tracking their position in real-time. Our proposed approach can be applied in various transportation systems, providing significant benefits to both passengers and operators by improving system efficiency and reliability.

7.2 Future Enhancements

In this project we modified the machine learning techniques into deep learning techinques For future research will progress in two directions improving training time and improving prediction accuracy. The model accuracy may be improved through metaheuristic methods such as genetic algorithms or simulated annealing or hybrid algorithms to find a better network architecture.

Chapter 8

PLAGIARISM REPORT

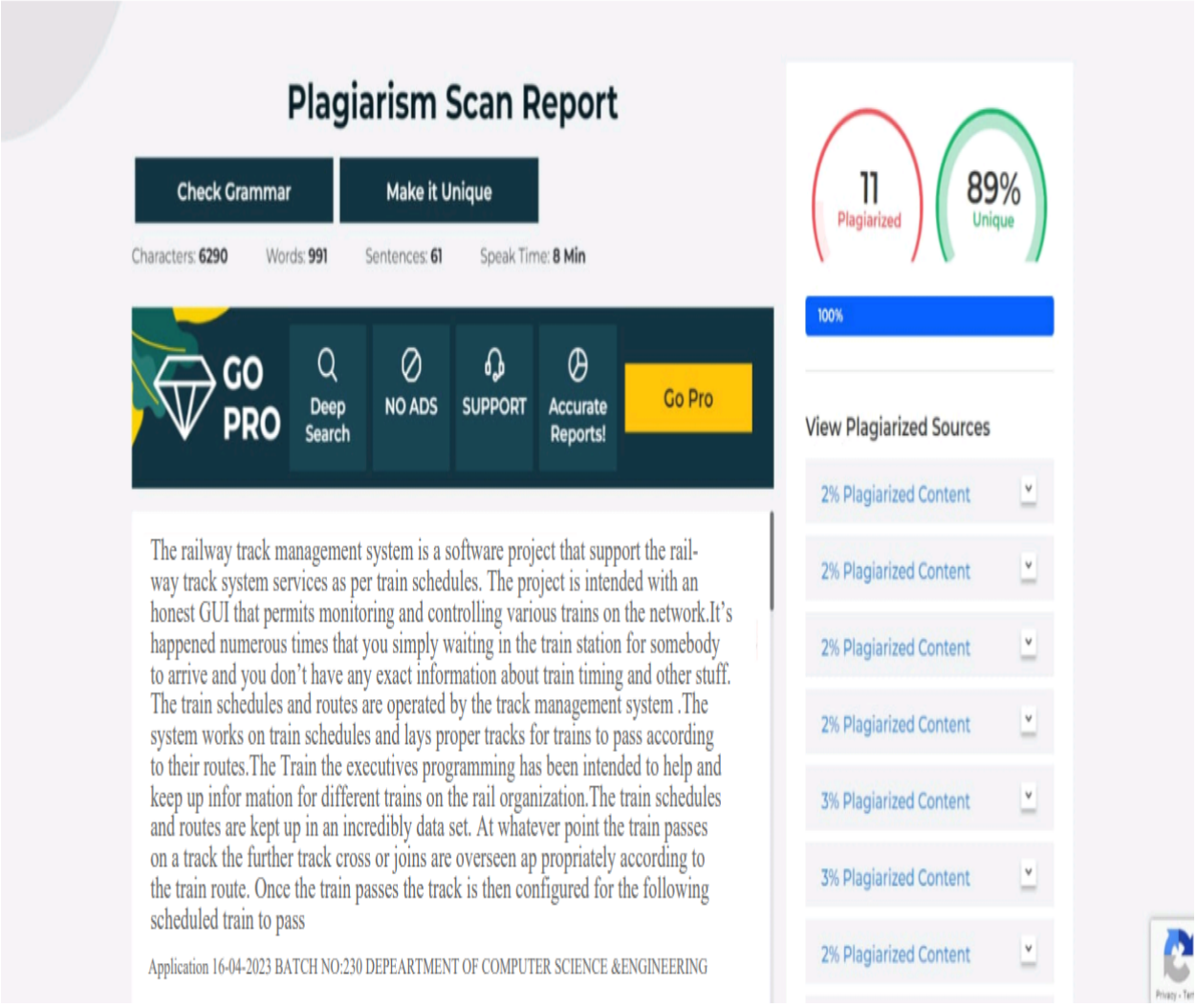
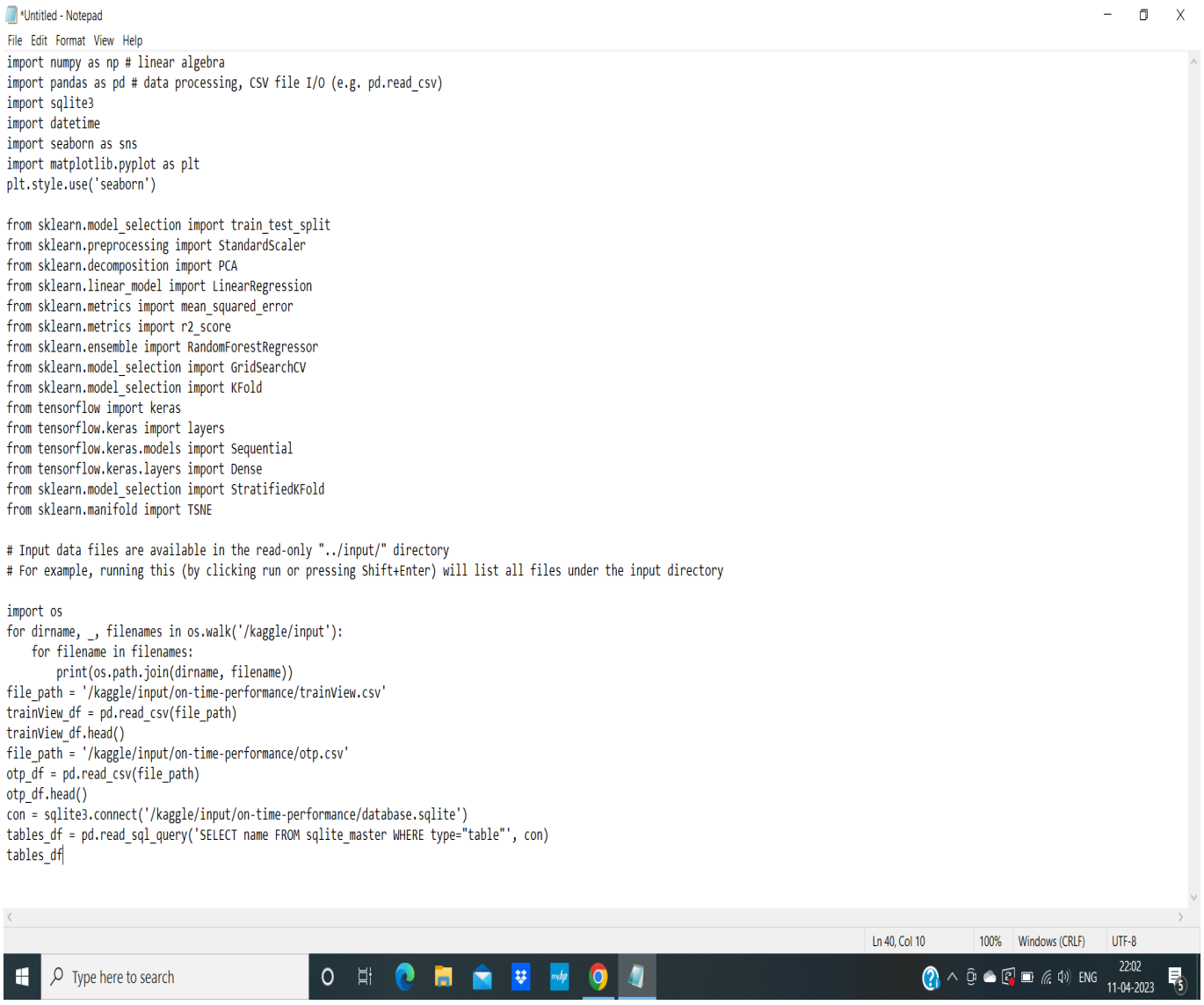


Figure 8.1: **Plagriasm Report**

Chapter 9

SOURCE CODE & POSTER PRESENTATION

9.1 Source Code



9.2 Poster Presentation

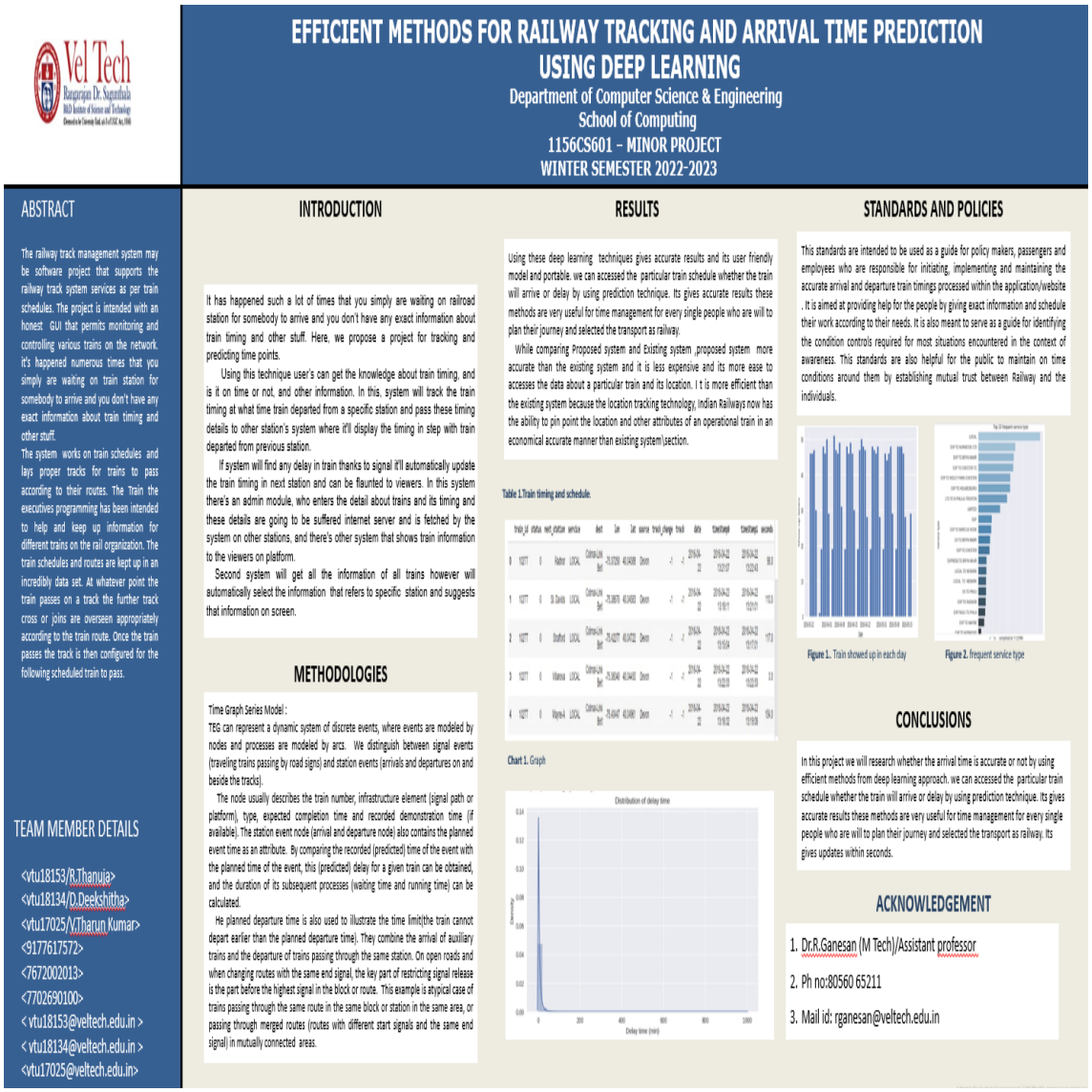


Figure 9.1: **Poster Presentation**

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