A REPORT ON

SMART ROAD SAFETY SYSTEM

SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE

OF

BACHELOR OF ENGINEERING (COMPUTER ENGINEERING)

SUBMITTED BY

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ABSTRACT

This paper depicts a proficient strategy for laziness location by three clear cut stages. These three stages are facial highlights and location utilizing Viola Jones, the eye following and yawning discovery. When the face is identified, the framework is made light invariant by portioning the skin part alone and considering just the chromatic parts to reject the vast majority of the non-face picture foundations dependent on skin shading. The following eyes and yawning location are finished by connection coefficient format coordinating. The component vectors from every one of the above stages are linked and a paired straight help vector machine classifier is utilized to characterize the continuous edges into exhaustion and non-fatigue states and sound a caution for the previous, in case it is over the edge time. Broad continuous trials demonstrate that the proposed technique is profoundly effective in finding the languor and cautioning the driver.

With the rapid development of technology, automobiles have become an essential asset in our day-to-day lives. One of the more important research is Traffic Signs Recognition (TSR) systems. This paper describes an approach for efficiently detecting and recognizing traffic signs in real-time, taking into account the various weather, illumination and visibility challenges through the means of transfer learning. We tackle the traffic sign detection problem using state-of-the-art multi-object detection systems such as Faster Recurrent Convolutional Neural Networks (F-RCNN) and Single Shot MultiBox Detector (SSD) combined with various feature extractors.. The aforementioned models were fine-tuned on the German Traffic Signs Detection Benchmark (GTSDB) dataset.

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Thomas Noltey, Hans Hanssony, Lucia Lo Belloz,"Communication Buses for Automotive Applications" In *Proceedings of the* 3rd *Information Survivability Workshop (ISW-2007)*, Boston, Massachusetts, USA, October 2007. IEEE Computer Society.

LIST OF ABBREVIATIONS

Abbreviation	**Illustration**
HCI	Human Computer Interface
PERCLOS	Percent of the time Eyelids are Closed
API	Application Program Interface
HOG	Histogram of Gradient

SVM	Support Vector Machine
WSN	Wireless Sensor Network
YCbCr	A family of color spaces
AAC	Average accuracy
DR	Detection rate
ROI	Region of Interest
FAR	False Alarm Rate
LC	Left Eye Closure
RC	Right Eye Closure
MC	Mouth Closure
TC	Total Closure
TF	Total number of Frames
CNN	Convolutional Neural Network
CM	Classifier Model
TD	Test Data Set
FRNN	Full-Resolution Residual Networks
TR	Train Data Set
CRFs	Conditional Random Fields
CTC	Connectionist Temporal Classification
CTR	Collaborative Topic Regression
DCGAN	Deep Convolutional Generative Adversarial Network
DE	Differential Evolution
Global Vectors	GloVe (Global Vectors) embeddings
HDP	Hierarchical Dirichlet process
HMMs	Hidden Markov Models
KL	Kullback-Leibler (KL) divergence
LDA	Latent Dirichlet allocation
LDA	Linear discriminant analysis

LDADE	Latent Dirichlet Allocation Differential Evolution

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CHAPTER 1
INTRODUCTION

1.1 Overview

The fundamental justification for engine vehicular mishaps is the driver drowsiness.Every year a great many individuals in India lose their lives because of car crashes. The job of human factor assumes a critical part in the mishaps. All in all, the driver exhaustion alone records for around 25% of the street mishaps and up to 60 percent of street mishaps bring about death or genuine injury . A primary driver of weariness is restlessness or a sleeping disorder. So a drivers' languor state is a central point in serious street mishaps that cause a huge number of lives each year.

Nowadays, additional and additional seeing tasks are being solved with Convolutional Neural Networks (CNN). Because of its high recognition rate and quick execution, the convolutional neural networks have increased most laptop vision tasks, each existing and new one. During this article, we have a tendency to propose an associate degree implementation of traffic signs recognition algorithmic rule employing a convolution neural network. The paper conjointly shows many CNN architectures, that are compared to every alternative. Coaching of the neural network is enforced victimization of the TensorFlow library and massively parallel design for multithreaded programming CUDA. The complete procedure for traffic sign detection and recognition is dead in real time on a mobile GPU. The experimental results confirmed high potency of the developed laptop vision system

1.2 Motivation

Humans have always invented machines and developed techniques to make their lives easier and to protect them, for everyday activities like commuting to work or for more interesting purposes like traveling by plane. With the advancement of technology, the means of transportation evolved and our dependence on them began. has increased exponentially. It has had a major impact on our life as we know it. Now we can travel to places at speeds that even our grandparents would not have believed possible. Today almost everyone in the world uses some form of transportation every day. Some people are wealthy enough to own their own vehicles while others use public transport; However, there are some rules and codes of conduct for those who drive a car regardless of their social status. One of them is to stay alert and active while driving.

Our duties towards safer travel have enabled hundreds of thousands of tragedies to be linked to this

wonderful invention each year. g for most of the people, but observing the rules and regulations of the road is of the utmost importance.On the road, a car has the greatest power and can be destructive in irresponsible hands, and sometimes this neglect can even harm the lives of people on the road. One type of carelessness is not to admit when we are too tired to drive. In order to monitor and prevent a destructive result of such negligence, many researchers have authored research articles on systems for detecting drowsiness of drivers, but sometimes some of the points and observations made by the system are not accurate enough. This project was carried out from a different perspective on the problem at hand in order to improve its implementations and further optimize the solution[1].

Also, total of 151,113 people were killed in 480,652 road accidents across India in 2019, an average of **414 a day or 17 an hour**, according to a report by the transport research wing of the **ministry of road transport and highways**.India continued to have the most road fatalities in the world, followed by China, a distant second at **63,093 deaths in 2,12,846 road accidents in 2019,** the report revealed.The United States of America (USA) reported the most road accidents at 2,211,439, and witnessed 37,461 deaths in 2019.Interestingly, it wasn't curved roads that took the most lives — 96,624 people lost their lives on straight roads, while curved roads saw 20,141 deaths.Advanced technologies and artificial intelligence can control some human errors or driver factors (for example, camera-based speed-detection system)[22].

1.2 Problem Statement: To create a smart road safety system that will alert the driver when the signs of drowsiness are detected and also it will assist the driver in identifying various traffic signs accurately.

1.3 Project Definition and Objectives

Project Title : Smart Road Safety System.

For Drowsiness Detection:

1. In this system, various features of the human face like eyes, mouth and face orientation will be used to detect the drowsiness of the user who is driving the vehicle and instantly alert the user by raising an alarm.
2. Also this system will be deployed on a web app which will store data like the data and time when the user went drowsy,and this data will be analyzed.
3. This analysis will be shown to the administrator who can then take appropriate action.

For Traffic Sign Detection:

1. In this system, various features of Traffic Sign like color, size, dimension will be used to

detect the traffic sign and will be notified to the driver.

2. Using this system we will predict the traffic sign even in unconditional weather like rainfall, snowfall or in foggy weather.

3. We will deploy this using a web app for later driver analysis and feedback.

Objectives:

1. To alert the driver by raising the alarm instantly when the driver shows symptoms of drowsiness for some fixed period of time.
2. To attain good output even if the driver is wearing spectacles, cap,etc.
3. To attain good accuracy even in case reflection, bright sunlight,and also in case of poor illumination.
4. Identifying Sign with high accuracy even is unconditional weather and notifying the driver.
5. Integration emergency(i.e, Ambulance , Police) help in case the accident occurs.
6. Develop web applications for convenience.

CHAPTER 2

LITERATURE SURVEY

2.1 Predicting the drowsiness of the driver(Paper 1):

The fundamental justification for engine vehicular mishaps is the driver's laziness. This work shows a reconnaissance framework created to recognize and alarm the vehicle driver about the presence of sleepiness. It is a cell phone-like little PC with a portable application utilizing the Android working framework to carry out the Human Computer Interaction System. For the discovery of sleepiness, the most pertinent visual markers that mirror the driver's condition are the conduct of the eyes, the parallel and front-facing consent of the head and the yawn. The framework works satisfactorily under characteristic lighting conditions and no matter the utilization of driver extras like glasses, listening devices or a cap. Due to an enormous number of auto collisions when drivers have nodded off, this proposition was created to forestall them by giving a non-obtrusive framework, simple to use and without the need of buying particular gadgets. The strategy gets 93.37% of sluggishness[1].

2.2 Predicting the drowsiness of the driver(Paper 2):

This paper portrays a proficient strategy for sluggishness recognition by three distinct stages. These three stages are facial highlight identification using Viola Jones, the eye following and yawning location. When the face is identified, the framework is made brightening invariant by portioning the skin part alone and considering just the chromatic segments to reject a large portion of the non-face picture foundations dependent on skin color. Eye tracking and yawning discovery are finished by relationship coefficient layout coordination. The element vectors from every one of the above stages are connected and a paired straight help vector machine classifier is utilized to characterize the sequential frames into exhaustion and non-fatigue states and sound a caution for the previous, on the off chance that it is over the threshold time. Broad continuous analyses demonstrate that the proposed technique is profoundly productive in discovering the languor and alarming the driver[2].

2.3 Prediction of the drowsiness of the driver(Paper 3):

Street crashes and related types of mishaps are a typical reason for injury and demise among the human populace. As per 2015 information from the World Wellbeing Association, street traffic wounds brought about 1.25 million passes around the world, for example roughly like clockwork an individual will encounter a fatal accident. While the expense of auto collisions in Europe is assessed

at around 160 billion Euros, driver laziness represents roughly 100,000 mishaps each year in the US alone as revealed by The American Public Roadway Traffic Wellbeing Organization (NHTSA). In this paper, a novel methodology towards constant languor recognition is proposed. This methodology depends on a profound learning strategy that can be carried out on Android applications with high precision. The fundamental commitment of this work is the pressure of a heavy baseline model to a lightweight model. In addition, insignificant organization structure is planned dependent on facial landmark key point detection toward perceiving whether the driver is lazy. The proposed model can accomplish an exactness of over 80%[3].

2.4 Toward Real-Time Traffic Sign Detection and Classification (2018) (Paper 4)

Traffic sign recognition plays a vital role in driver assistance systems and intelligent autonomous vehicles. Its period of time performance is extremely fascinating additionally to its recognition performance. This paper aims to modify the period of time traffic sign recognition, i.e., localizing what sort of traffic sign seems during which space of the Associate in Nursing input image at a quick time interval. To attain this goal, we tend to initially propose an especially quick detection module, that is twenty times quicker than the prevailing best detection module. Our detection module relies on traffic sign proposal extraction and classification engineered upon a color likelihood model and a color HOG. Then, we tend to harvest from a convolutional neural network to classify the detected signs into their subclasses inside every taxonomic group. Experimental results on each German and Chinese road show that each of our detection and classification ways succeed in comparable performance with the progressive methods, with considerably improved machine potency[29].

2.5 CNN-Design for Real-Time Traffic Sign Recognition (2017) (Paper 5)

This paper considers the implementation of the classification rule for the traffic signs recognition task. Combined with preprocessing and localization steps from previous works, the planned technique for traffic signs classification shows superb results: 99.94% you look after properly classified pictures.

The planned classification answer is enforced victimization of the TensorFlow framework.

The use of our TSR algorithms permits processing of video streams in periods with high resolution, and thus at bigger distances and with higher quality than similar TSR systems have. FullHD resolution makes it attainable to notice and acknowledge a traffic sign at a distance up to fifty m.
The developed technique was enforced on a tool with the Nvidia Keras K1 processor. CUDA was used to accelerate the performance of the delineated paths.
In future analysis, we have a tendency to train CNN to think about additional traffic sign categories and attainable increments. Also, we have a tendency to arrange to use a CNN not just for classification except for object detection too[30].

2.6 Real Time Traffic Sign Detection and Recognition System for Assistive Driving (2020) (Paper 6)

From this paper I have concluded that among the four evaluated pre-processing and detection strategies, Shadow and Highlight Invariant technique provided the most effective trade-off between segmentation success rate and interval because of the less advanced image filtering approach and use of HSV color house. Convolutional Neural Network classifier has the most effective performance in each accuracy and process speed among the 10 evaluated algorithms for traffic sign recognition because of the optimization technique of the loss-operated mistreatment back propagation and also the in-system feature extraction technique of the algorithmic rule. In classification, a further category to contain the not-targeted traffic signs provides improvement of false detection performance[32].

S.N	Title of Paper	Journal/conferences/ Year of Publication	Author Name	Summary of Paper
1	Real Time Driver Drowsiness Detection Based on Driver's Face Image	Advances in Intelligent System and Computer January 2018.	Franklin Silva,Edder Gularza.	Surveillance System to detect and

	Behavior Using a System Human Computer Interaction Implemented in a Smartphone.			alert the driver about the presence of drowsiness.
2	Facial Feature Monitoring for Real Time Drowsiness Detection.	2016 12th International Conference on Innovation in Information Technology(IIT)	Manu B.N	This paper describes an efficient method for drowsiness detection by these well defined phases.
3	Towards Feature Monitoring for Real Time Drowsiness Detection.	IEEE 2018	Yi Yang Hengling Luo, Huaroug Xu an Fuchao Wa	Our detection module is based on traffic sign proposal extraction and classification built upon a colour probability model and a colour HOG
4	CNN Design for Real-Time Traffic sign Recognition	ScienceDirect 2017	Alexander Shustanova, Pavel Yakmov	implementation of traffic sign recognition algorithm using a convolution neural network.

5	Driver drowsiness detection system based on binary eyes image date	International Conference on Electro/Information technology.2018	M Kahlon and S. Ganesan	In this paper we detect Drowsiness based on Binary eye image Data
6	Real Time Drowsiness Detection For Android Application Using Deep Neural Network.	Procedia Computer Science 2018	R jabbar, K Al Kharbeche,W Alhajyaseen,M. Jafari.	Android Application is used to detect Drowsiness.
7	Real time Driver Drowsiness Detection System Using Facial Feature.	IEEE Access vol 7. 2019.	W Deng and R Wu.	Real-Time Driver Drowsiness Detection using facial features.
8	Drowsiness detection Using Eye Aspect Ratio and Eye Closure Ratio.	SSRN Electronic Journal,2019.	S Mehta and Dadhich, S Gumber and Jadhav Bhatt.	Using Eye Aspect Ratio and Eye Closure Ratio used for Drowsiness detection at real time.
9	Eye Tracking Based on Driver Fatigue monitoring and warning.	Indian International Conference on Power Electronics, 2010.	Singh H, Bhatia, J.S Kaur.	Drowsiness is detected by eye tracking and monitoring and warning.
10	Real-time eye,gaza and face pose tracking for monitoring driver vigilance.	IEEE Access, 2009.	Ji,Q, Yang X.	Driver Vigilance and Drowsiness is Detected at real time

				using gaza and face tracking.

Table No 2.0 Literature Table.

CHAPTER 3

SOFTWARE REQUIREMENT SPECIFICATION

3.1 Introduction:

3.1.1 Project Scope:

Our project falls under the scope of Road Safety. We are going to accomplish our goal using technologies like deep learning , AI, etc. The aim of our project is to detect the traffic signs and drowsiness of driving , so that we can avoid road accidents to some extent.

3.1.2 User Classes and Characteristics

In this study, we investigated several feature selection methods to extract relevant features that characterize driving fatigue. These features are derived from facial expressions which measure eyes and head behaviors as well as from vehicle speed and steering wheel movements which reflect driving behavior. Features based on driving behavior illustrate for the first time their efficiency in a real driving environment. The relevance of retained features was evaluated using classification methods, they well discriminate fatigued drivers and no fatigued drivers. As future works, we plan to develop an on-line fatigue detection prototype based on data stream analysis methods and the obtained conclusions about the effectiveness of the retained features in driving fatigue detection on a real setting. Such prototypes would activate systems of autonomous helper cars when the drivers' states are unsafe.

This paper considers Associate in Nursing implementation of the classification algorithmic rule for the traffic signs recognition task. Combined with preprocessing and localization steps from previous works, the planned methodology for traffic signs classification shows excellent results: 99.94 you look after properly classified pictures.

The planned classification answer is enforced victimization of the TensorFlow framework.

3.1.3 Assumptions and Dependencies

Assumptions and Dependencies For drowsiness:-

- Face of driver should be visible
- Driver should sit at proper driving situation
- Driver must not cover his face with any cloth

Assumptions and Dependencies For Traffic Sign Detection:-

- Not Very bad weather
- Traffic Sign should be proper colored
- Traffic sign should have Geometry Shape

3.2 Functional Requirements:

3.2.1 Detect Drowsiness

It will detect the drowsiness of the system by taking real time input in the form of images from the camera feed and apply the trained neural network to detect whether the symptoms of drowsiness are seen.

Fig 3.2.1 User Drowsiness

3.2.2 Alert the Driver

The system will alert the driver when the symptoms of drowsiness are detected by playing an alerting tune on the speakers.

3.2.3 Store data in database

The system will store the time and date along with frequency for which the driver went drowsy in the database.This data can be used by the administrator of the system for analysis purposes and also to keep an eye on the performance of the driver.

3.2.4 Detect traffic signs:

The system will also detect the traffic signs on the road and notify it to the user in order to assist him to accurately detect the traffic signs on the go.This will be also done using a deep learning model which will take camera feed as input and give the detected traffic sign as output to the user.

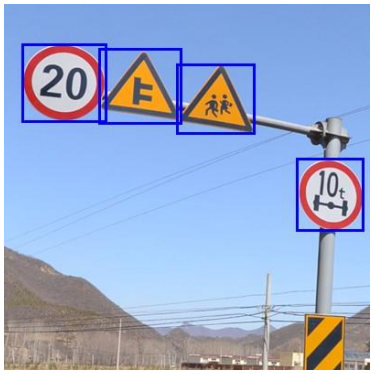


Fig 3.2.4 Traffic signs

3.3 Non Functional Requirements

3.3.1 Performance requirements

Computational non-intensive since real time performance is required.So that it can work on various systems without any need of powerful computing resources.Also as it will be majorly used on mobile devices it needs to be computationally non-intensive and hence the algorithms should be optimized according to it.

3.3.2 Safety Requirements:

Accuracy should be good because it is critical use case.Robustness the system must be tolerant modest amount of lighting variation,relative camera motion (eg:- due to poor road condition) changes to drivers visual appearance.So the accuracy of the system should be very good to give accurate results as it is an application created for critical use case.

3.3.3 Security Requirement:

It should have separate login id and password for each user and the administrator so that no one can access the system system without authorization from the administrator.Also the data of the users should be stored in the database securely.So the security of the database should be maintained and the database should be designed according to it.

3.3.4 Software quality attributes:

Availability:

The system should have almost 99.99% uptime as it is a critical use case.

Interoperability:

The system should be able to communicate with the server in case of emergency.

Performance:

Computational non-intensive since real time performance is required.So that it can work on various systems without any need of powerful computing resources.

Testability

It should be a software-driven system which allows Software Testing professionals to conduct tests in line with predefined criteria. This attribute also assesses the ease with which Software Quality Assurance engineers can develop test criteria for a said system and its various components. Engineers can assess the testability of a system by using various techniques such as encapsulation, interfaces, patterns, low coupling, and more.

Security

It should avoid any unauthorized access to the system as it can cause a data breach and lead to unauthorized access of the proprietary software.

Usability

The system should have a user friendly interface so that a wide variety of audiences can use the system without any sweat.

Functionality

The system should conform with actual requirements and specifications as per the functional requirements given the software requirement specification document.

3.4 System Requirements

3.4.1 Database Requirements

In the Smart Road Safety System we require a database to store data in the backend,DBMS used for data storage is MYSQL. The database contains various attributes which perform functionality as per requirement, the database has attributes like Name, Mobile Number,Drowsiness Count,Login password credential, Detecting Traffic Sign, this was for uses side attribute requirement. For Admin Purpose the attributes like Admin Name,Admin Id, Admin Number, Generate Report and Analyzed Report. By using these attributes the database functionality is achieved in the Smart Road Safety System.

3.4.2 Software Requirements

For Smart Road Safety system we required Various software like Chrome or Mozilla Firefox Browser,Operating System Windows, Tensorflow 2 Python Library for doing Functioning,Jupyter Notebook for writing code,Anaconda Navigator Software,Python installed in PC, and for Database MongoDB .

3.4.3 Hardware Requirements

Hardware Requirements in our Smart Road Safety System Project are Minimum Core Duo Processor,Minimum 4 gb Ram for processing,Minimum 50 GB free space for Storage Space, Server to Deploy Web Application, Camera for Monitoring the face of Driver, Speakers for raising alarm for giving alert signal, Continuous power supply for system.

3.5 Analysis Models: Agile Methodology

Deep Learning applications often leverage modern software engineering practices, tools, and techniques for developing and deploying new applications. The current state of the art of ML

Component development is still working through gaps in tooling and techniques that will need to be addressed as we look at building and scaling new applications. Finding the right tools to help data science and engineering teams collaborate better will decrease the time to deploy new applications while increasing the quality of new applications. Some of these tools will be extensions of existing tools and workflows, but new tools will also emerge as new patterns of development are implemented.

Agile was intended to help product teams deal with changing circumstances and build tools in a robust, repeatable, and predictable process. Agile-like techniques can work for Machine Learning by supporting better communication, understanding of objectives and communication of concerns.

3.6 System implementation plan:

Pre-Project: Here first various requirements will be gathered for which various surveys and research will be done.Then the justification for those requirements will be done.

Planning: First survey of various research papers along with other online resources will be done accordingly.Then by the learnings that we got from our literature survey we will decide the technology,algorithms,frameworks and database to be used in our project.

Design: For the design of our project we will use the web technologies that will help us to develop the attractive User Interface so that even a layman can use the application effectively. For developing UI we will use HTML, CSS, Javascript, Bootstrap-5. Other tools web designers might use include markup validator and other testing tools for usability and accessibility to ensure their websites meet web accessibility guidelines.

Implement – This covers everything from system install to add-ons like custom reports and test type packages.

Validate – Risk assessment is performed along with scripts, IQ, OQ, PQ, DM and execution.Also in this step we will find all the bugs and whether the system fulfills all the requirements according to software requirement specification document.

Deployment – Users receive training on the new system and the system is made live.Also a demo will be created which will help the new users to learn how to use it.

CHAPTER 4

SYSTEM DESIGN

4.1 System Architecture

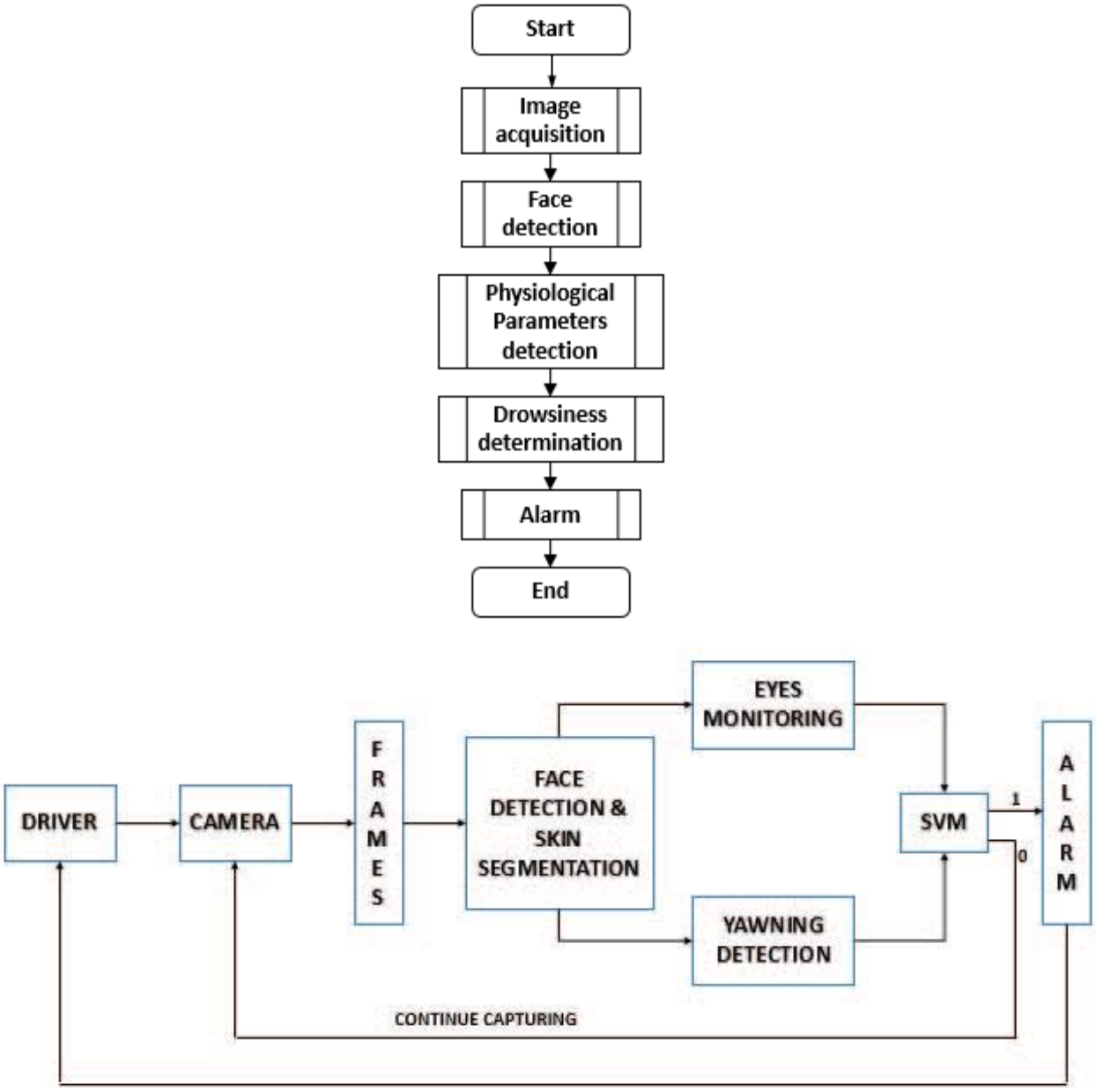


Fig 4.1 System Architecture.

4.2 Data Flow Diagram

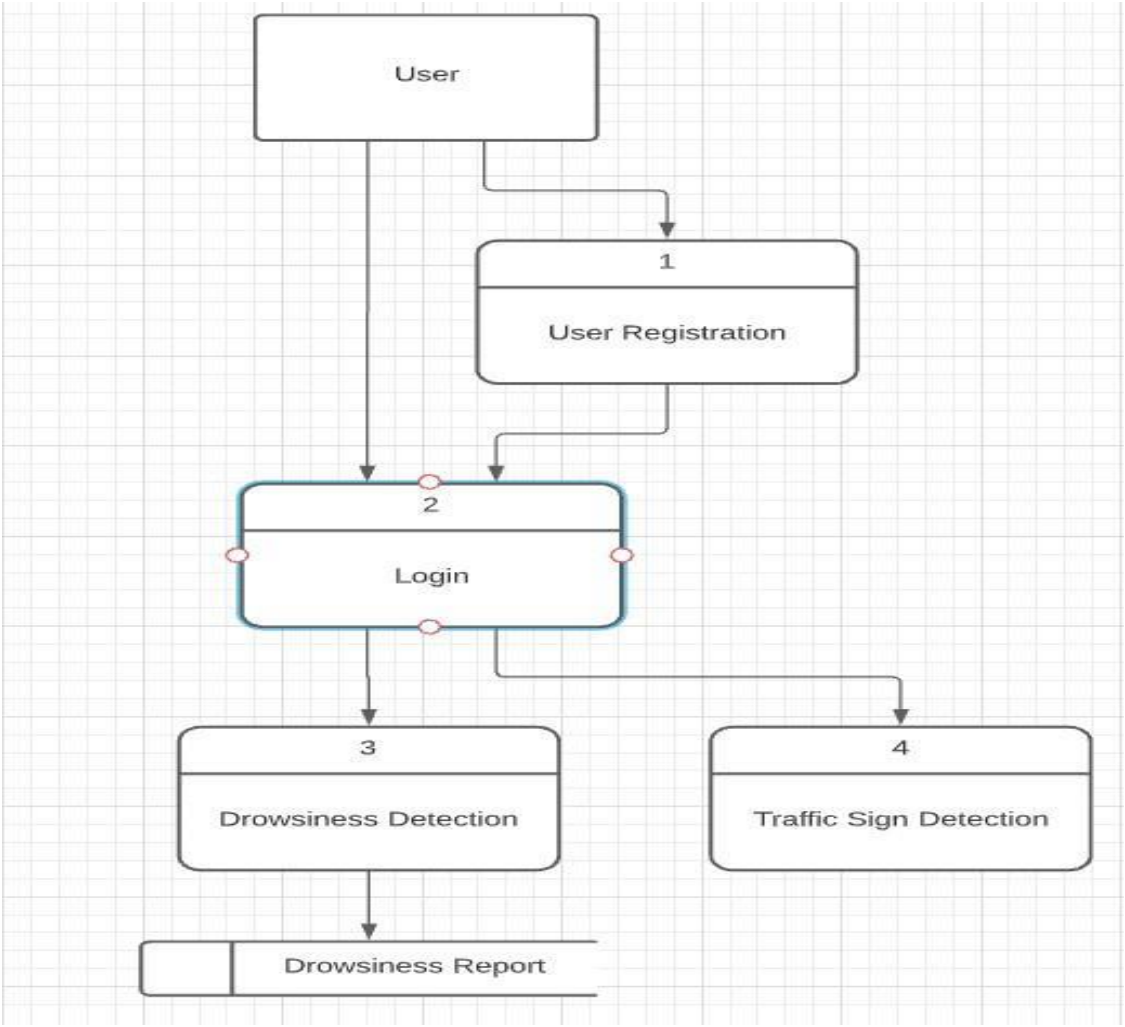


Fig 4.2 Data Flow Diagram

4.3 Entity Relationship Diagram

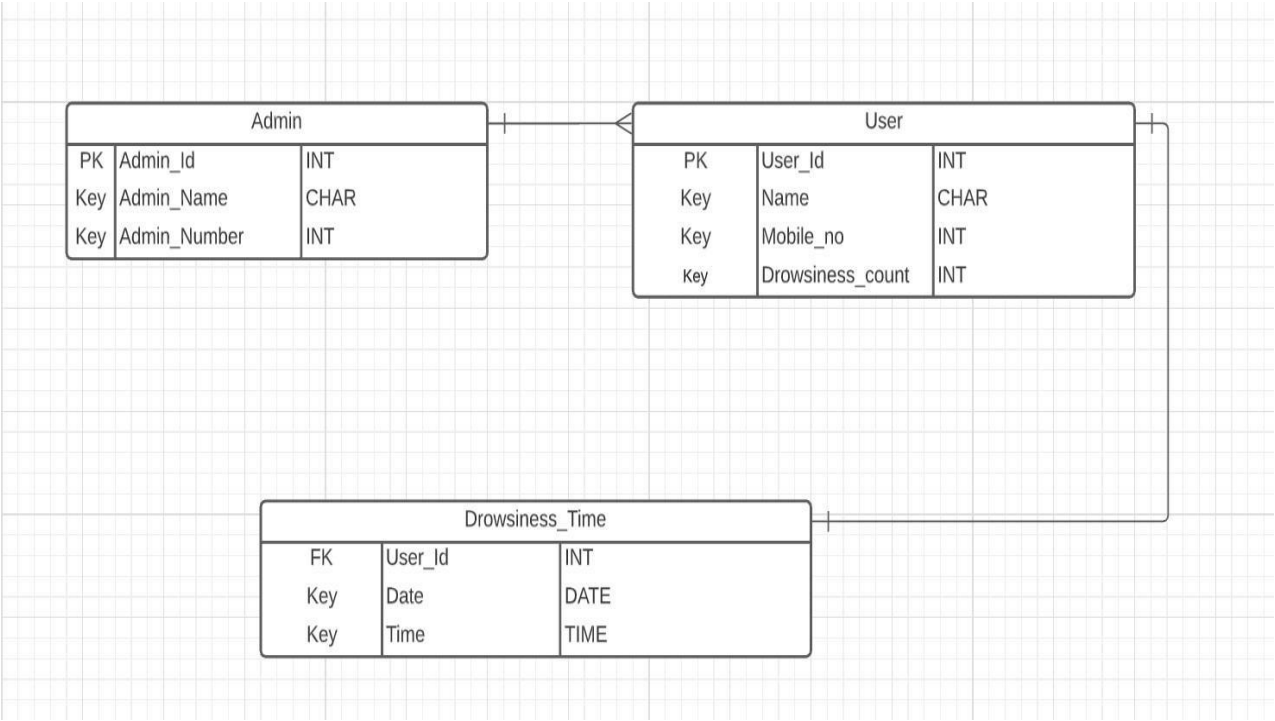


Fig 4.3 Entity Relationship Diagram

4.4 UML Diagram

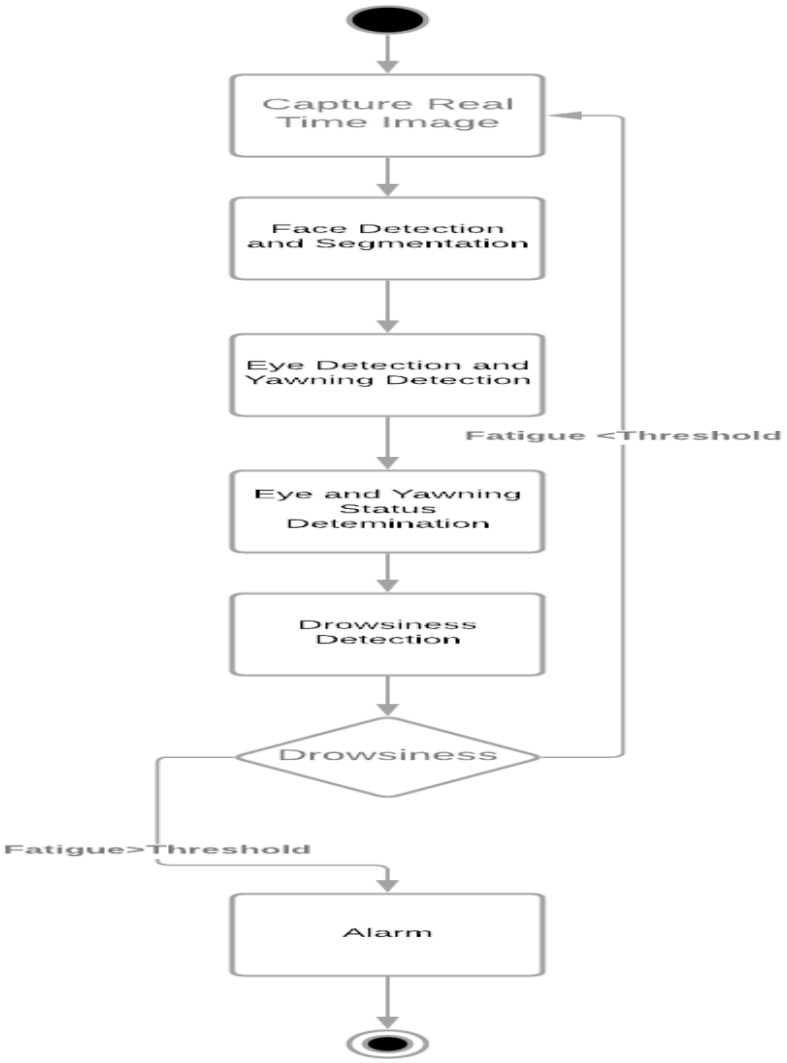


Fig 4.4 UML Diagram

4.5 Sequence Diagram

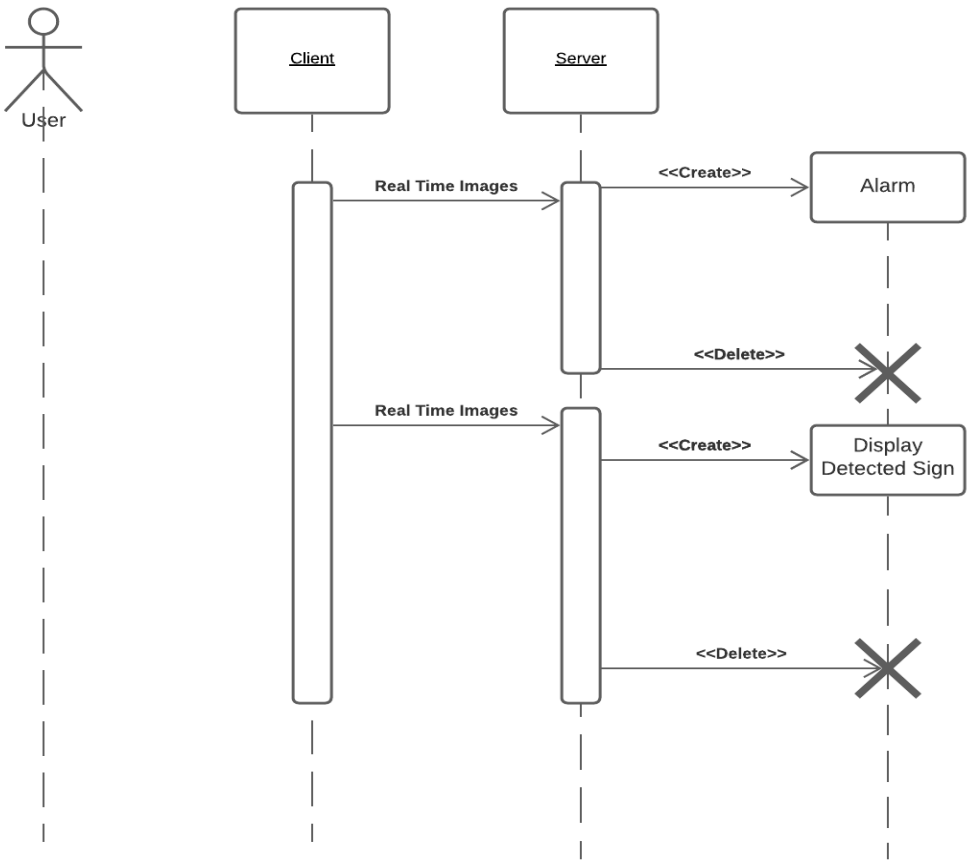


Fig 4.5 Sequence Diagram

Fig 4.1 shows the distribution of the functional correspondences.

Fig 4.2 maps out the flow of information for any process or system

Fig 4.3 shows the relationships of entity sets stored in a database.

Fig 4.4 visually represents the system along with its main actors, roles, actions, artifacts or classes, in order to better understand, alter, maintain, or document information about the system.

Fig 4.5 shows object interactions arranged in time sequence in the field of software engineering.

CHAPTER 5

PROJECT PLAN

5.1 Project Estimates:-

In this context we have provided the estimation cost of the project in the context of Software development cost, hardware development cost, bug fixing, support, maintenance , employee, etc. The provided cost is estimated by considering all the economic factors and industrial standard.

Task Required	**Total**
Software Development Cost	₹ 25,000.00
Hardware Development Cost	₹ 50,000.00
Bug Fixing	₹ 5,000.00
Support	₹ 5,000.00
Maintenance	₹ 4,000.00
Employee	₹ 90,000.00
Testing	₹ 3,000.00
Grand Total	**₹ 1,82,000.00**

5.1.1 Reconciled Estimates:

In this section we have provided the reconciled estimate of the project. We have a meeting with the project sponsor and revised the estimation cost so that it will flex the sponsored need and also we can do the project completed by considering the industry's standard of cost.

Task Required	**Total (Reconciled Estimates)**

Software Development Cost	₹ 22,000.00
Hardware Development Cost	₹ 40,000.00
Bug Fixing	₹ 4,000.00
Support	₹ 5,000.00
Maintenance	₹ 4,000.00
Employee	₹ 70,000.00
Testing	₹ 1,000.00
Grand Total	**₹ 1,46,000.00**

5.1.2 Project Resources:

In our project development we will require software and hardware resources.

Software Resources:-

- Chrome Browser
- Operating System
- Tensorflow 2
- Jupyter Notebook
- Anaconda Navigator
- Python
- MongoDB

Hardware Resources:-

- Minimum Core Duo Processor
- Minimum 4gb ram
- Minimum 50 gb free Storage Space
- Server to Deploy Web Application
- Camera
- Speaker
- Continuous power supply

5.2 Risk Management

Risk management is the process of identifying, assessing and controlling threats to an organization's capital and earnings.

5.2.1 Risk Analysis:

Technical Risk(Moderate):- While creating innovative projects often there is a need to use cutting edge technologies, which themselves can add a number of different disadvantages.

Unpredictable External Risk(Serious) :- While working on a project it may happen that due to limitations of certain technology we have to change our software design. Which can further take time for new design.

Time Estimation(Minor) :- Due to later error detection in code it may take time to revise it and need to change which can cause delay in the project.

5.2.2 Risk Overview:

As the workplace is always changing, so the risks to our project change as well. As new equipment, processes, and people are introduced, each brings the risk of a new hazard. Continually review and update your risk assessment process to stay on top of these new hazards.

5.2.3 Overview of Risk Mitigation, Monitoring, Management

So to overcome the risk associated with our project we have taken the following precautions,

1. We have prioritized the investment in design , we start with identifying the user requirements and finding ways to address them, which means understanding the problems and the goals.
2. We opt for Agile Methodology in our project so that we can find the risk associated with our project in each iterative cycle.
3. Throughout our project we have to continuously review our objective to be achieved in the project and take the necessary action so that we would not misalign with our goal.
4. As data is the secret sauce when it comes to keeping track. Choosing the right metrics to monitor project progress enables you to identify reiska before they can escalate and become serious issues.

5.3 Project Schedule

5.3.1 Project Task Set:

To achieve the objective of our project we perform a different set of tasks that can lead to a fully functional project. The set of tasks that we perform are as follows:

1. Identification of the problem statement
2. Analysis of problem statement
3. Literature survey
4. Designing and Modeling
5. Planning and Distribution of work
6. Implementation
7. User Interface
8. Integration
9. Testing

5.3.2 Task Network :

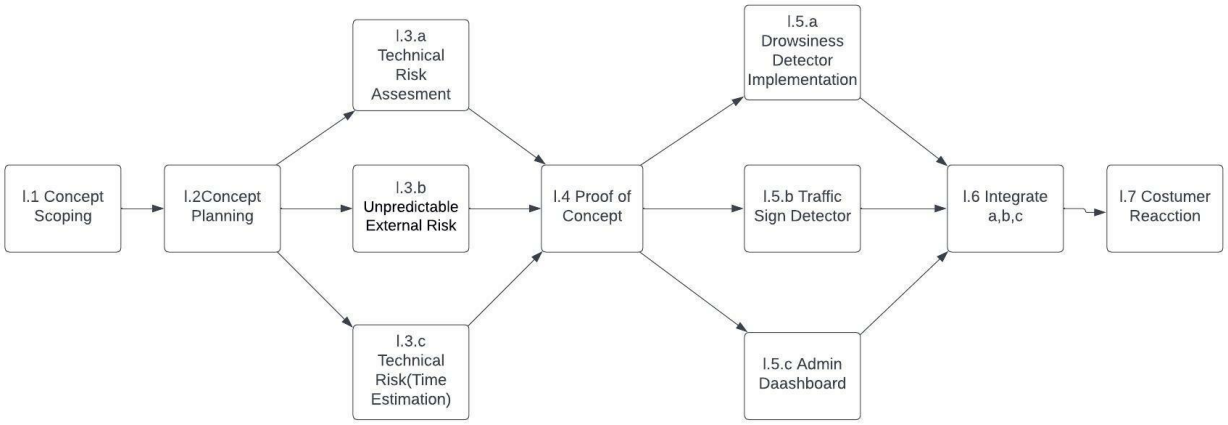


Fig 5.3.2.1 Task Network

5.3.3 Timeline Chart:

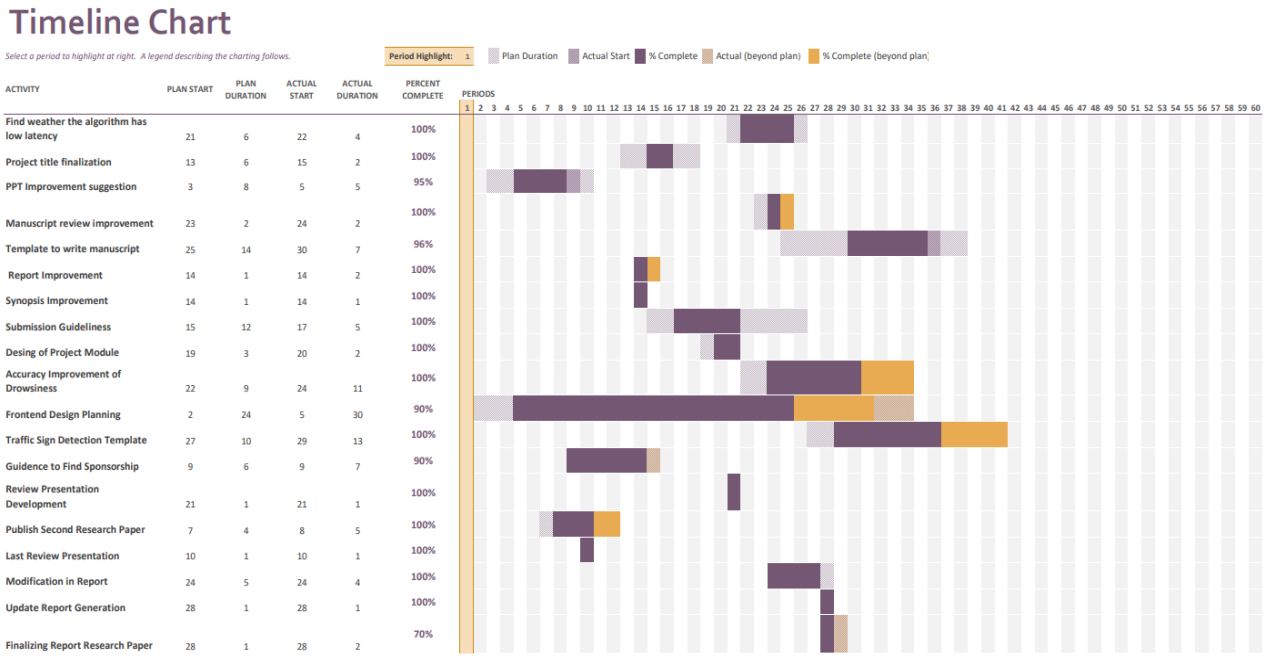


Fig 5.3.3.1 Timeline Chart

5.4 Team Organization

5.4.1 Team structure:

Our team consists of Nachiket S Patil,Mahesh Patil,Shreeram Bhaskar and our mentor Prof. Nitin Alzende.In our team the idea generation and its extension to a real life product is done by all of us. The backend work is done by Nachiket.The frontend work is done by Mahesh and the sponsorship,research paper publication,project coordination and work related to it is done by Shreeram.Our mentor guided us very well in all the obstacles we met in our journey and also corrected us at times with their valuable suggestions.

5.4.2 Management reporting and communication:

We had regular meetings and shared our thoughts about the progress of our project.Also whenever we met any bug in our project we solved it by sharing our solutions and doing research and debugging together.We also regularly shared the progress of our project work with our mentor.Whenever we met a milestone in our project work we communicated about it with our mentor and kept our team up to date about the progress.

CHAPTER 6
PROJECT IMPLEMENTATION

6.1 Overview of Project Modules:

For the backend of the system we have used python using the django framework.We have created a separate apps for performing different tasks.The apps are as follows:

1. drowsiness_detection:It performs all the operations related to drowsiness detection.
2. accounts:It does all the account management and stores all the data related to authentication and authorization of the user.
3. traffic_sign_detector:It performs the tasks related to the traffic sign detection.
4. admin_analysis:All the implementation related to admin dashboard and the analytics is dome in this app.

6.2 Tools and Technologies Used:

The Smart Road Safety System is implemented using following tools and technologies:

1. django
2. python
3. HTML

4. CSS
5. Bootstrap
6. various libraries which assist in predicting the output.

6.3 Algorithm Details :

For development of the front end of Smart road safety systems we have to use web Technology i.e., HTML5 , CSS, Javascript, Bootstrap5, Jquery, etc. In our website we have a home page which has a navigation bar which provides the login and signup option. If a user has an already existing account he can directly login. But if the user is new to the site he has to create his account by clicking on the Signup button provided on the Navigation bar.

Once a user has login access to the website he can use all the features of the website. We have provided two main features: one is Traffic Sign Detection and another feature is Drowsiness Detection.

If a user wants to use the traffic sign detection feature he can click on the button provided on the website. Then the site will redirect users to a new page where more detail about the feature is given and how one can use it. On the same page a user is available with the option start traffic sign detection. Once a user clicks on the button then the camera will start and the traffic sign detection will start. Then our algorithm will detect the available traffic sign and notify it to the user. And if the user wants to stop the detection he can click on the stop button and the detection will stop.

Now, again our second feature is Drowsiness detection. The similar UI Interface is available for drowsiness detection as that of traffic sign detection. If you click on the drowsiness detection button it will redirect you to the Drowsiness detection page where you will provide depth knowledge about the drowsiness detection. User is also available with the start drowsiness detection button on clicking on it drowsiness detection will start. Now our model will detect the face and predict whether the drive is drowsiness or not. If the drive is detected under drowsiness then our system will quickly generate the alarm until the drive is out of the drowsiness condition. And to stop the detection drive is available with the stop drowsiness detection button on clicking on it the drowsiness detection will stop.

For the backend as we have used separate modules.The algorithm used and their implementation is as follows:

Drowsiness Detection:First 68 landmarks on the face are detected by using a pre-trained model import dlib module.Dlib is a toolkit for making real world machine learning and data analysis applications.The real time images are captured using the openCV library.This images are given as input to the object which detects 68 landmarks on the face.In the blinked function using this landmarks whether the user blinked is detected.For calculating whether the user has blinked the ratio of distance

of how the eyelids are open as compared to the ideal state is calculated. It is found through several research that if this ratio is greater than 0.25 then the user is considered as active.If this ratio is between 0.25 and 0.21 the user is considered as drowsy and if this ratio is less than 0.21 then the user is considered as sleepy.Now, if for more than six consecutive frames the left eye points or the right eye points return 0 from the blinked function then it is considered as drowsy.If for more than six consecutive frames the left eye points or the right eye points return 1 from the blinked function then it is considered as sleepy.if for more than six consecutive frames the left eye points or the right eye points return 2 from the blinked function then it is considered as active.This output is shown in real time to the user in the output frame.For the drowsy and sleepy state an alarm is raised until the state again changes to active.The alarm is raised using playsound function imported from playsound library.

Traffic Sign Detection:- For traffic sign detection we have to use the German Traffic Sign Dataset which we get from Kaggel. We have Train and classify Traffic Signs using Convolutional neural networks. This will be done using OpenCV in real time using a simple webcam . CNNs have been gaining popularity in the past couple of years due to their ability to generalize and classify the data with high accuracy. In this project we will train traffic signs with over 35000 images of 43 different classes with the help of tensorflow and keras.

Now as we are available with a data set then we need to do the preprocessing on the image for we have converted the image to grayscale once we done on it we then standardize the lighting on an image. Later we perform the normalization on the image to bring its value between 0 to 1 instead of 0 to 255.

Then once we are done with preprocessing we check if all image training is done properly or not. Then we perform augmentation of the image to make it more generic. If more than 1 E.G 10 then it refers to no. of pixel EG 10 pixels.

Now using our Convolution Neural Network algorithm we train our model on the available dataset. And lastly we check the accuracy of the model.

Admin Dashboard: In the admin dashboard various graphical representations of the data are used for analytics purposes.The graphs in the admin dashboard are as follows:

1. Bar graph(users vs no. of time drowsiness detected)
2. Line chart(date vs no. of times drowsiness detected)

3. Pie chart(It shows drowsiness detected at which time of day)

For generating this graphical representations javascript pychart library is used.And the data required to generate this graphical representations is taken from the mongoDB database.

Accounts:The account management in the Smart Road Safety System is done by the inbuilt functions provided by the Django framework.

CHAPTER 7

SOFTWARE TESTING

7.1 Type of Testing:

Different types of software testing methods used in the software development process are as follows:

- Regression testing
- Unit testing
- Functional testing

7.2 Test cases & Test Results:

Test Case Type:Usability

Description: It will check whether the login and logout process is working correctly and smoothly.

Test Description: The logout and login process takes place smoothly without any lag and bugs and generates html reports.

Status: Pass.

Test Case Type:Performance

Description: It will check whether the drowsiness detector is giving output within one second.

Test Description: The drowsiness detector should instantly predict if it detects the symptoms of drowsiness.

Status: Pass.

Test Case Type: Reliability

Description: It will check whether the traffic sign detector is giving output correctly.

Test Description: The traffic sign detector should instantly predict correct output.

Status: Pass.

Test Case Type: Regression

Description: It will check whether the sub modules drowsiness detector and traffic sign detector is giving output correctly after integration.

Test Description: The drowsiness detector and traffic sign detector should instantly predict correct output.

Status: Pass.

Test Case Type:Unit

Description: It will check whether the drowsiness detector and traffic sign detector are working correctly.

Test Description: The drowsiness detector and traffic sign detector give the correct output individually.

Status: Pass.

CHAPTER 8

RESULTS

8.1 Outcomes:

The Smart Road Safety System successfully assists in detecting the symptoms of drowsiness and assisting the driver in identifying the traffic signs.Also it successfully helps the admin in the analysis work by providing the admin dashboard so that he can improve the efficiency and safety of the drivers of the organization/company.

8.2 Screenshots:

Fig 8.2.1 Output Screenshot

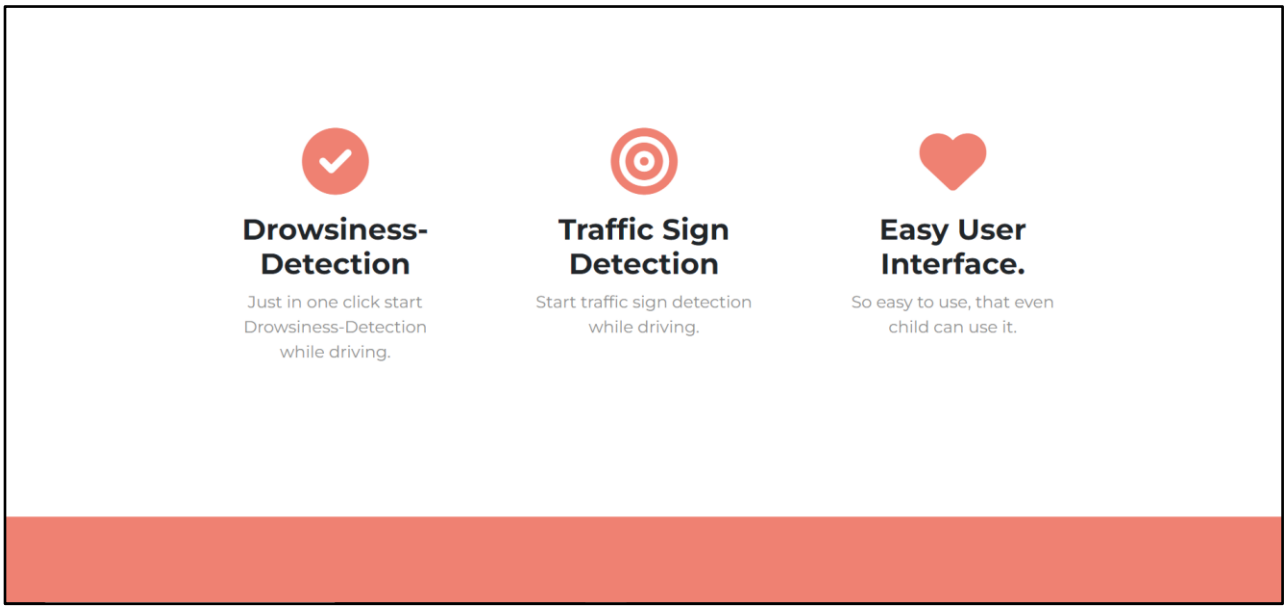


Fig 8.2.2 Output Screenshot

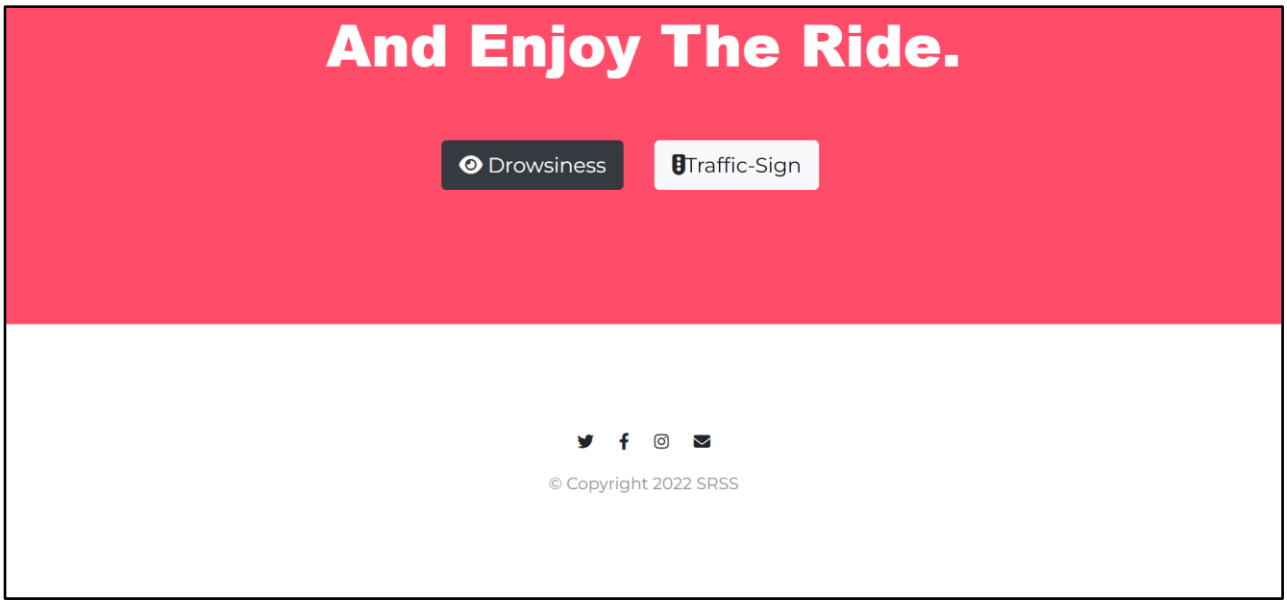


Fig 8.2.3 Output Screenshot

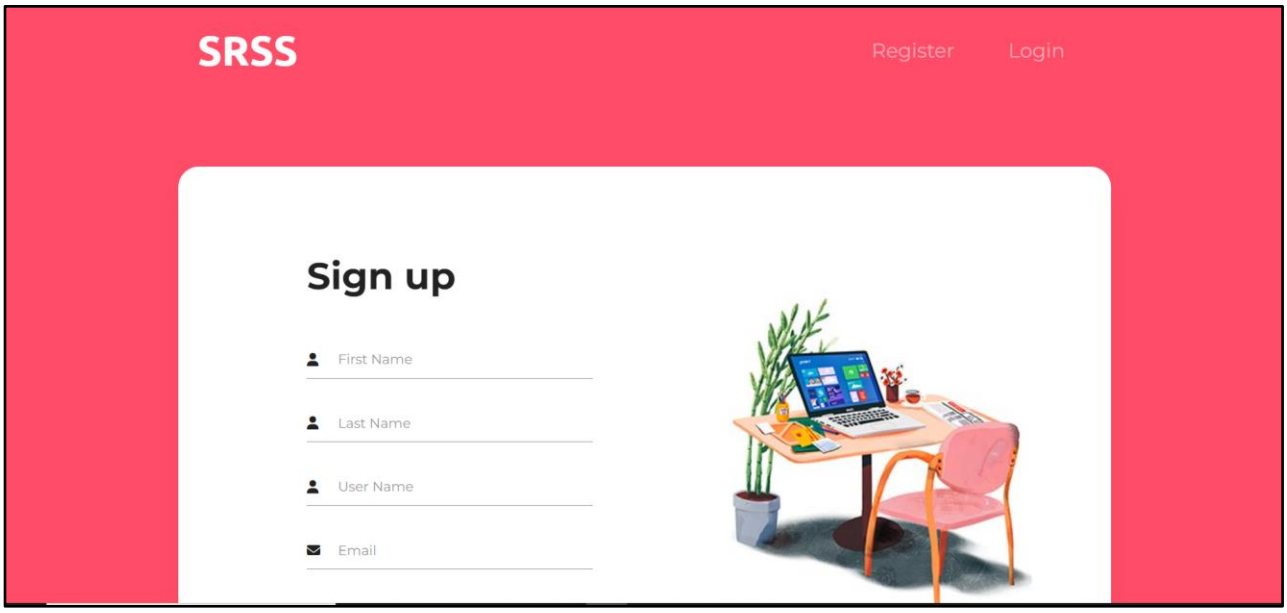


Fig 8.2.4 Output Screenshot

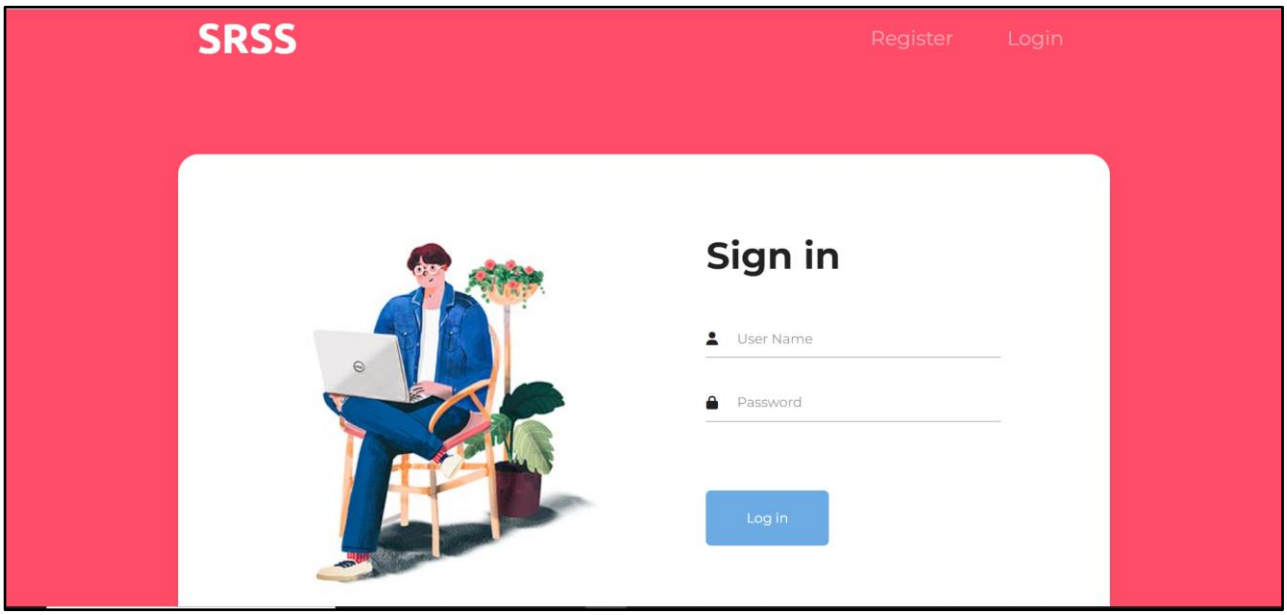


Fig 8.2.5 Output Screenshot

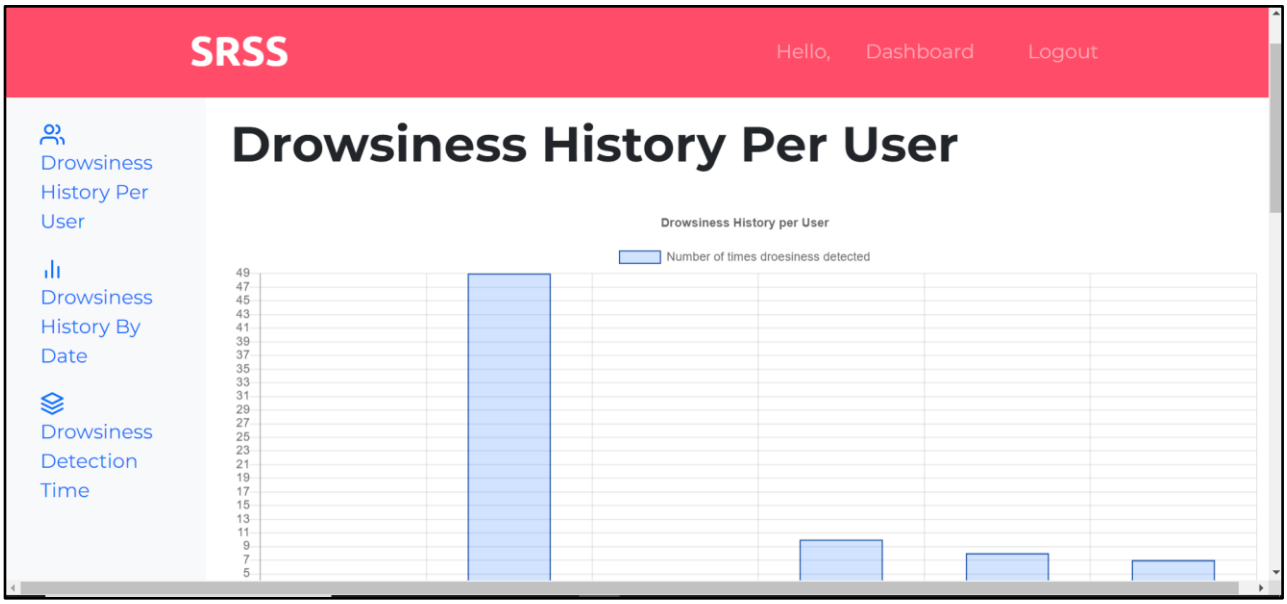


Fig 8.2.6 Output Screenshot

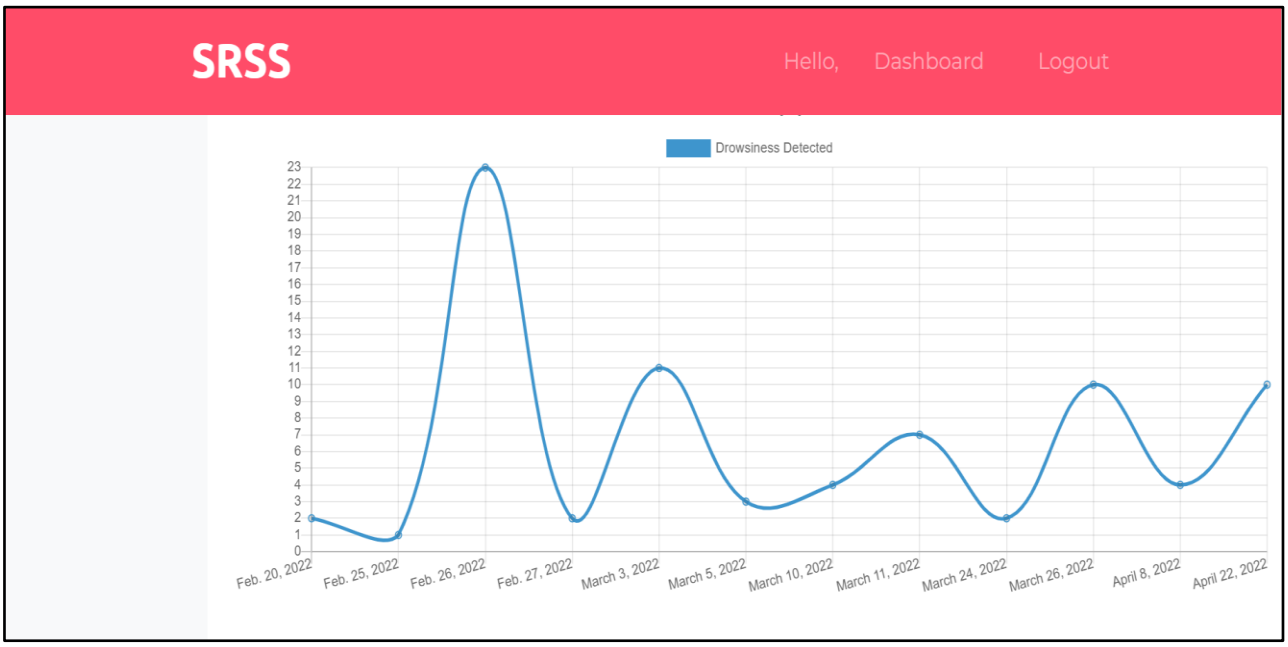


Fig 8.2.7 Output Screenshot

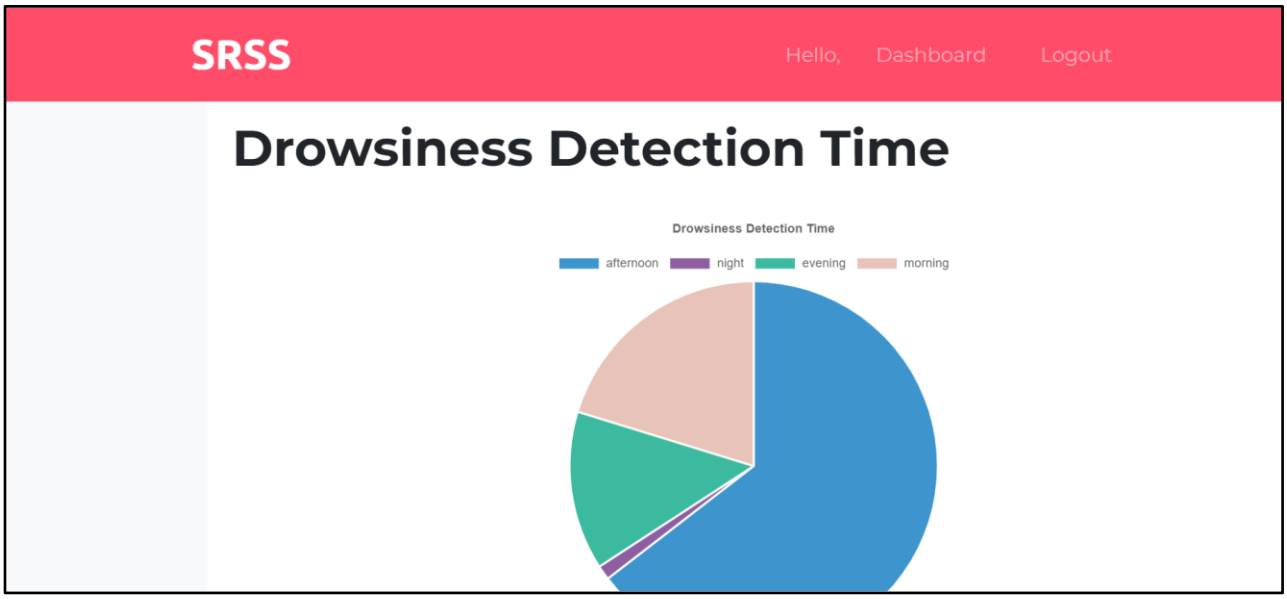


Fig 8.2.8 Output Screenshot

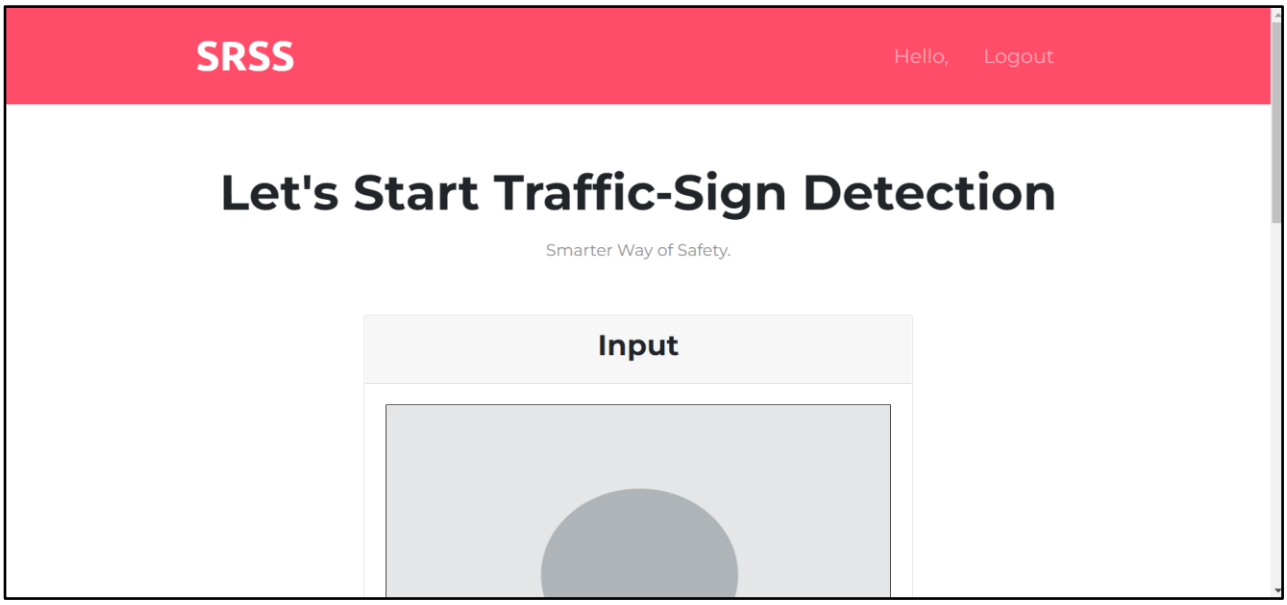


Fig 8.2.9 Output Screenshot

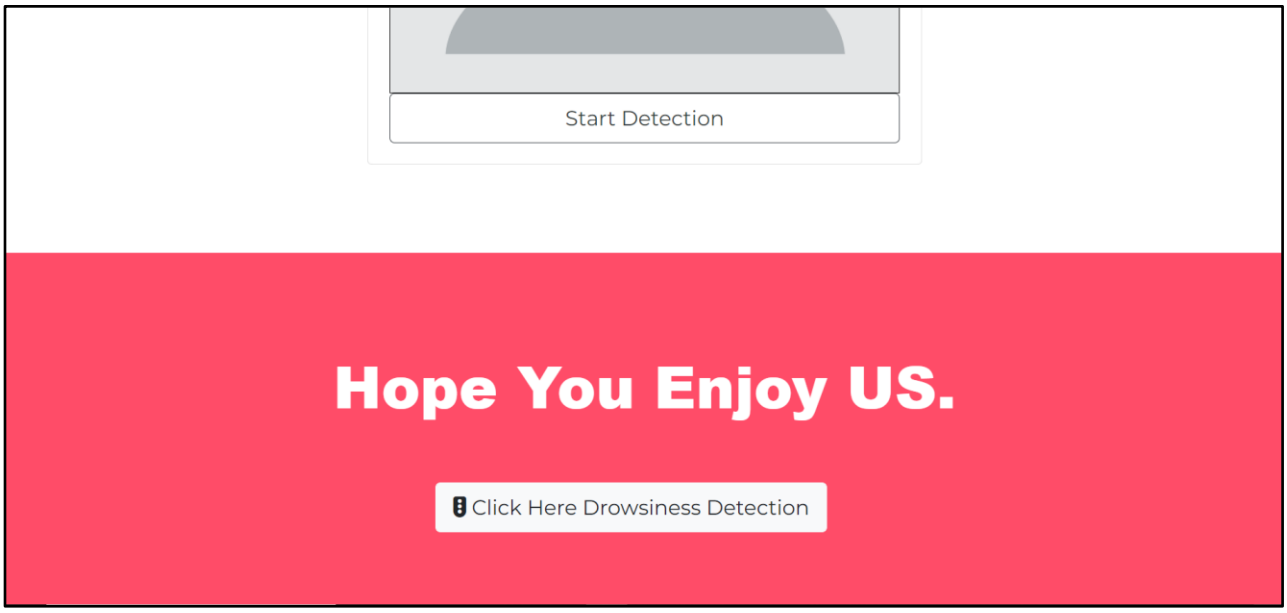


Fig 8.2.10 Output Screenshot

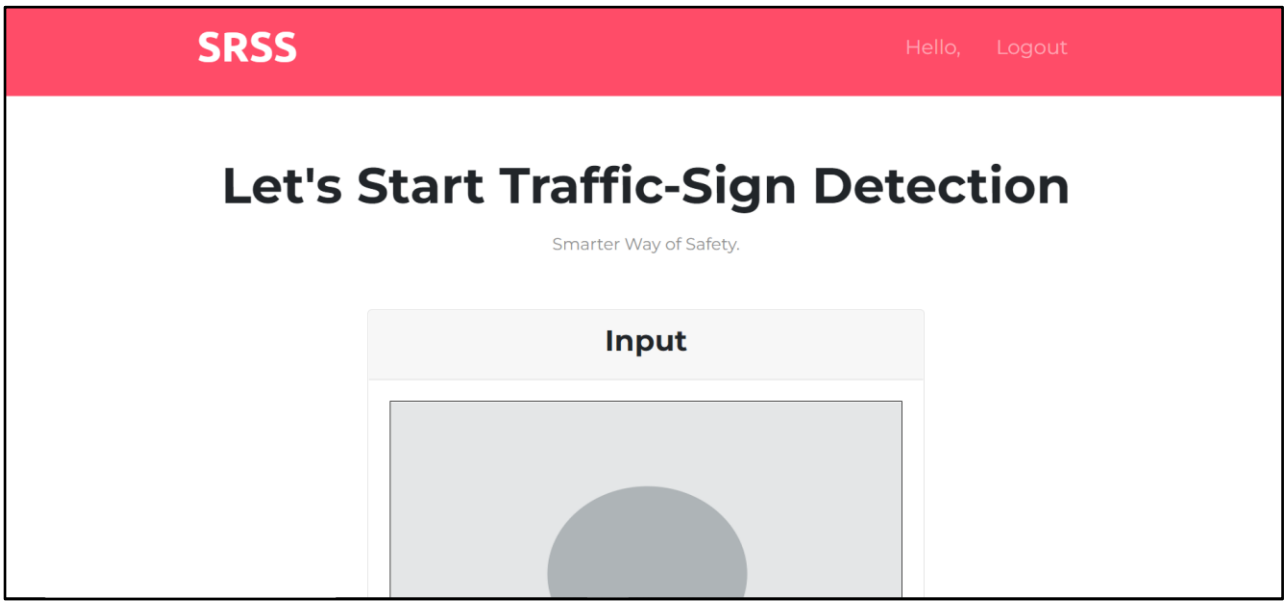


Fig 8.2.11 Output Screenshot

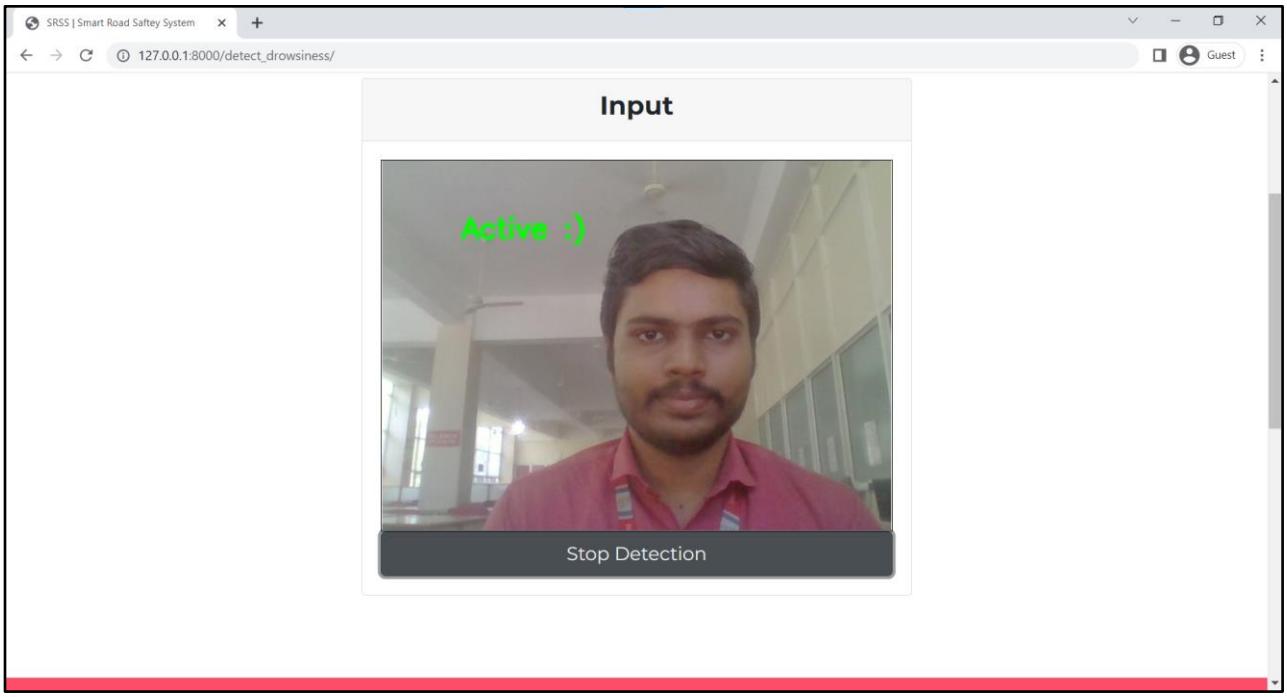


Fig 8.2.12 Output Screenshot

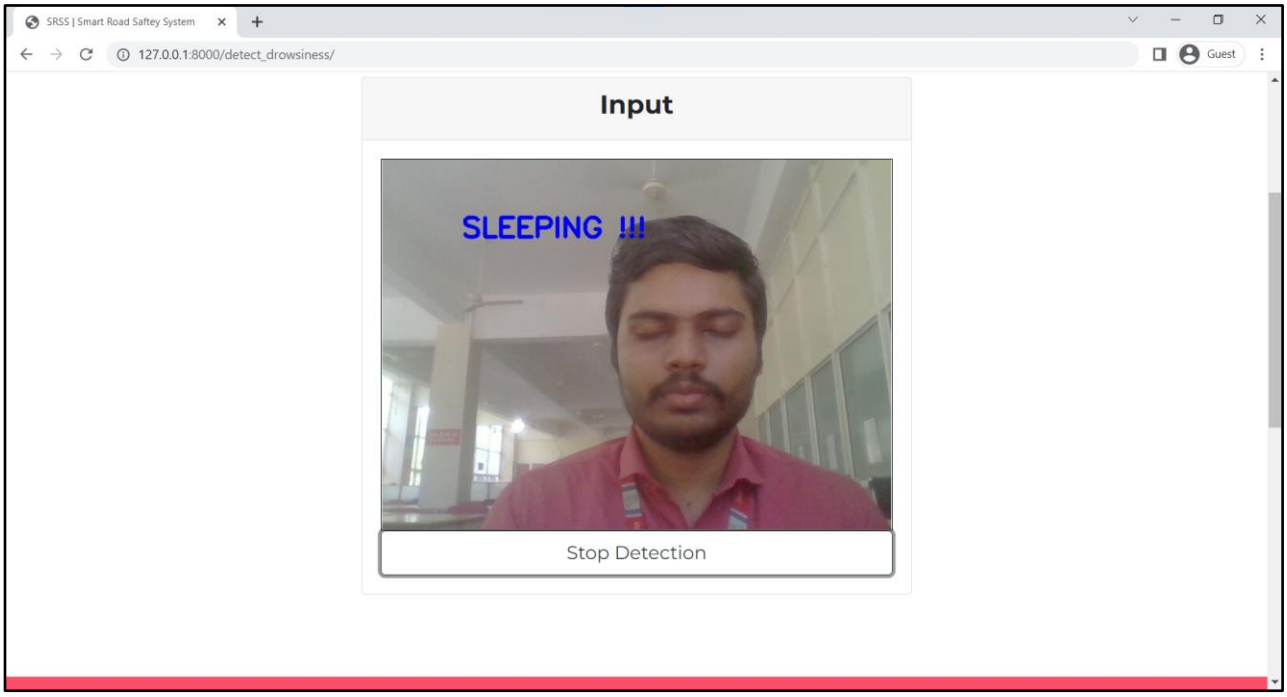


Fig 8.2.13 Output Screenshot

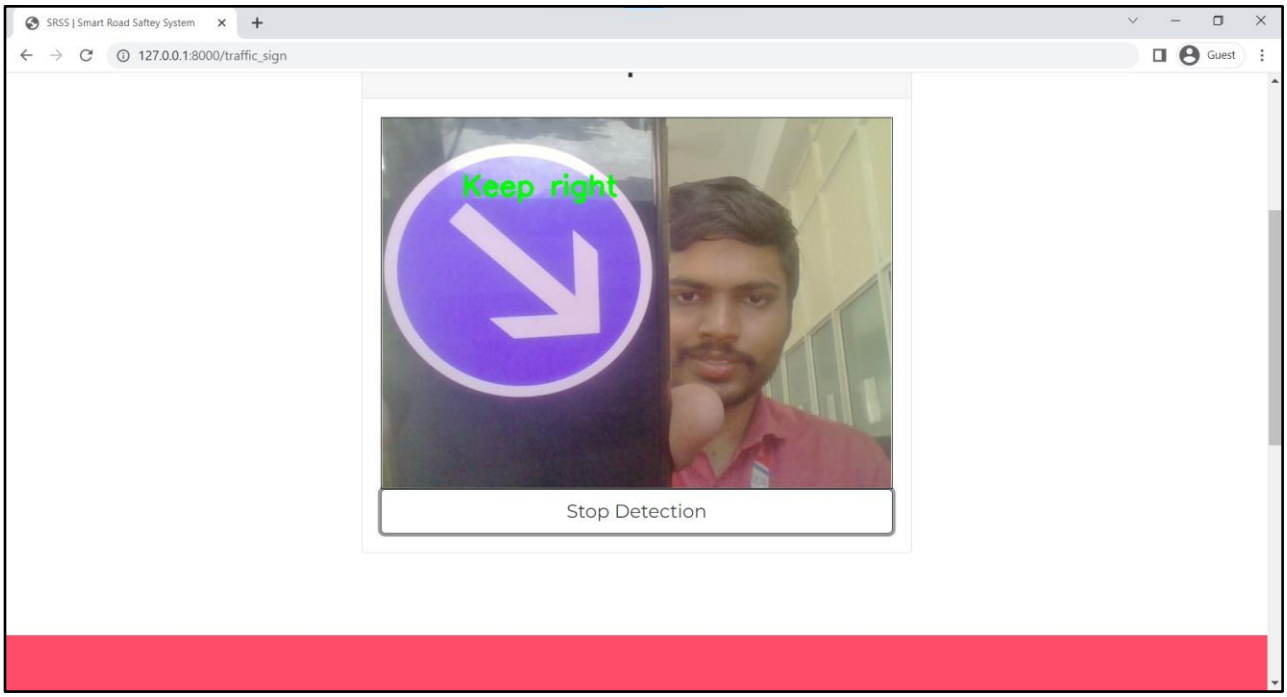


Fig 8.2.14 Output Screenshot

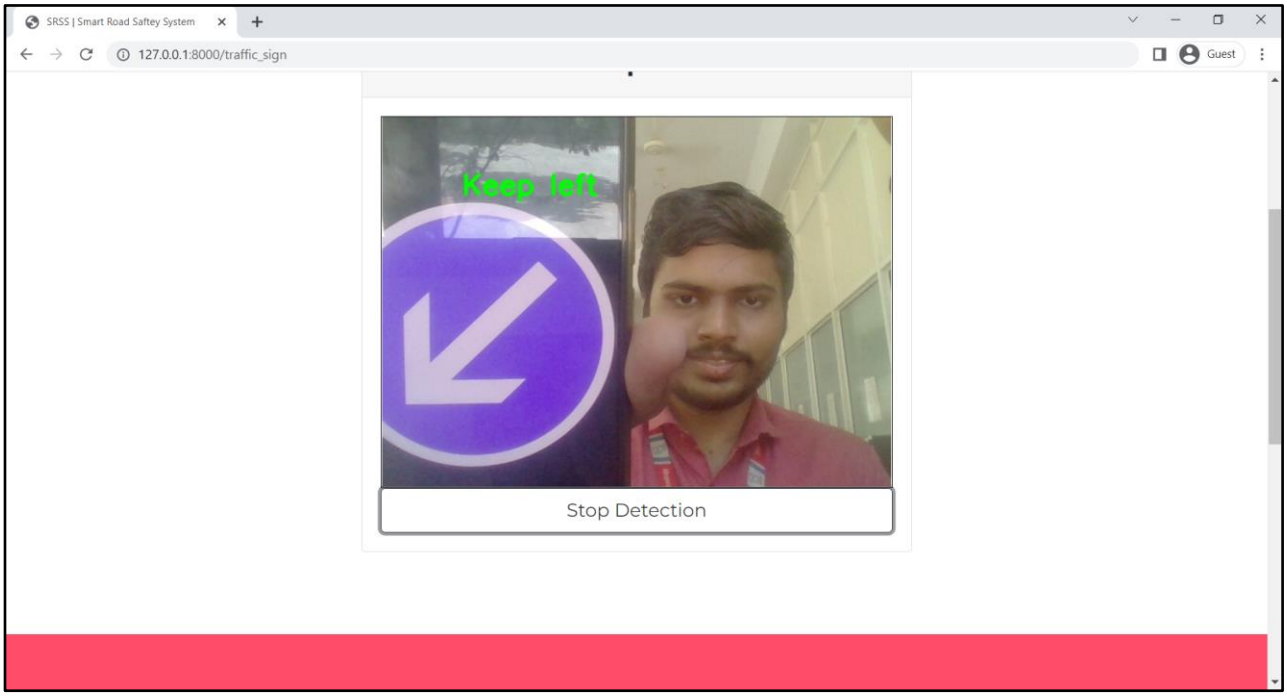


Fig 8.2.15 Output Screenshot

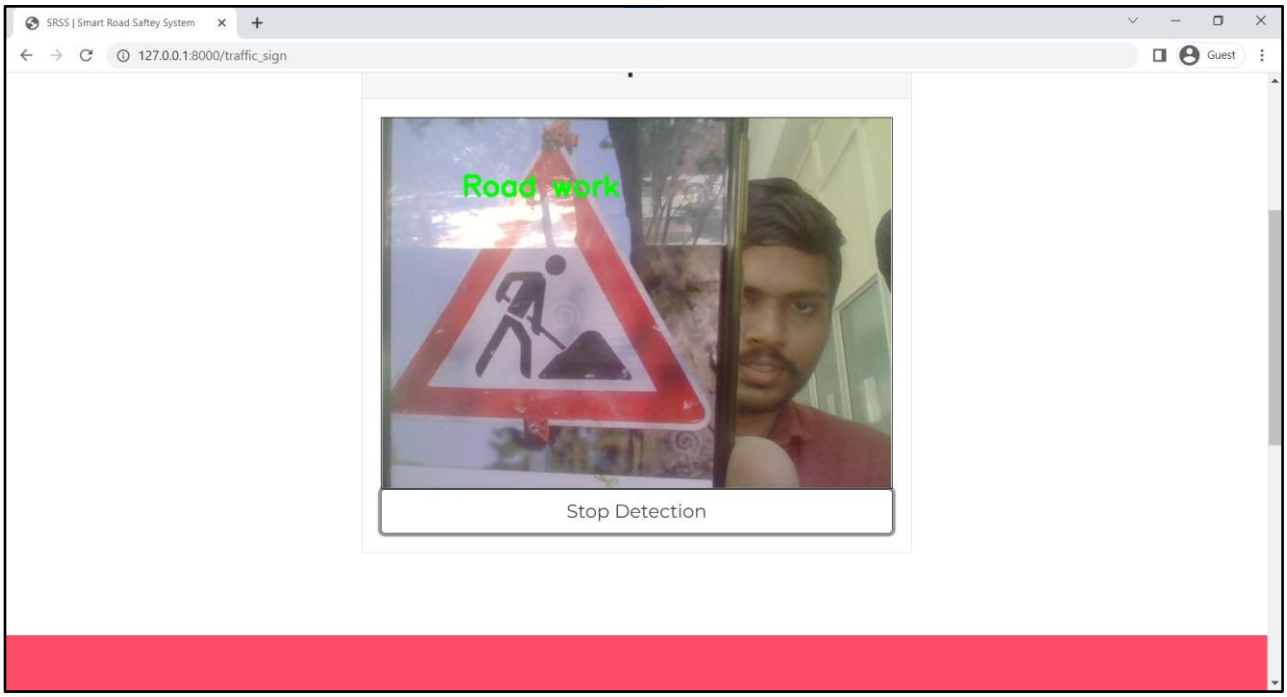


Fig 8.2.16 Output Screenshot

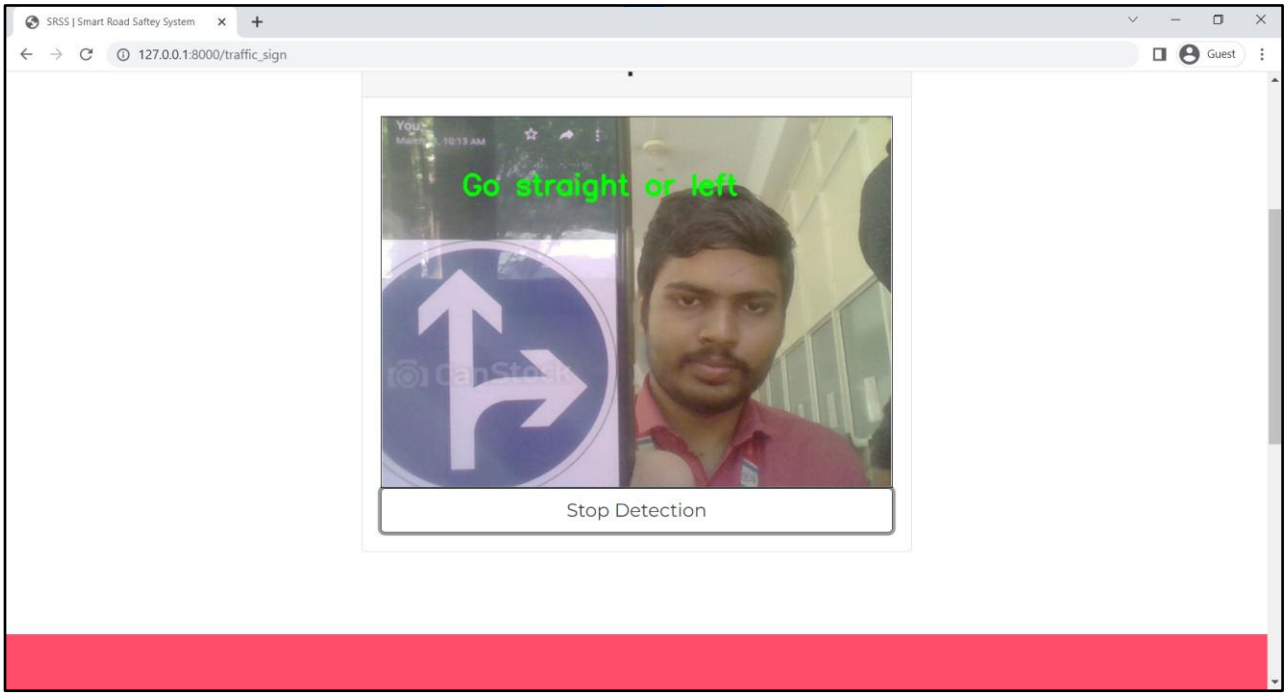


Fig 8.2.17 Output Screenshot

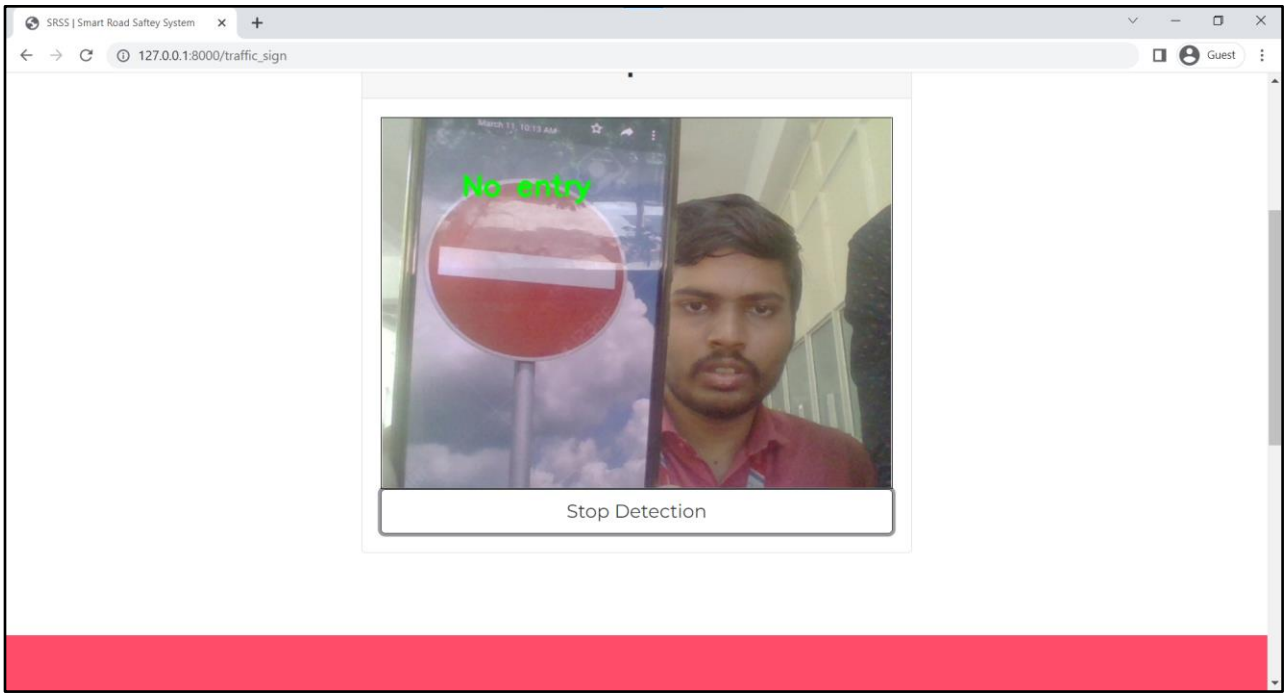


Fig 8.2.18 Output Screenshot

CHAPTER 9

CONCLUSION AND FUTURE WORK

9.1 Conclusion:

Drowsiness Detection will help drivers to remain active during driving and also reduce the number of accidents.The system helps in reducing the frequency of an accident of some special nature i.e. of right angles accidents.It will help to management the speed of vehicles by identifying speed limit signs in real time.Also, Real Time Traffic sign detection offer for an orderly movement of traffic. It will help to manage the speed of vehicles by identifying speed limit signs.

9.2 Advantages

The System can be used by various transport organizations to improve road safety by avoiding the accidents due to drowsiness and ignorance to the traffic signs.it can be used by the administrator of the transportation organizations to keep an on their employees(drivers).It can also be used to generate reports,analyze them and take appropriate steps to improve the overall road safety and reduce road accidents.It will help to management the speed of vehicles by identifying speed limit sign.Also, Real Time Traffic sign detection offer for an orderly movement of traffic.

9.3 Limitations

Due to Poor illumination, bad weather conditions and also due to use of accessories like Sunglasses, Mask, Scarf,Cap, Hat, etc it can create obstacles in accurately identifying the symptoms of Drowsiness and also in detecting and identifying traffic signs.Also there are many busses, trucks and vehicles which are outdated or do not fulfill required hardware and software requirements due to which the application may not run in their case.

9.4 Applications

Drowsiness Detection will help drivers to remain active during driving and also reduce the number of accidents.It will also provide Real Time Traffic sign detection.So it can be used by various transport organizations like ola and uber to reduce the frequency of accidents due to drowsy driving and ignorance to see traffic signs and also some accidents of special nature i.e. caused by right angle turns .It will help to management the speed of vehicles by identifying speed limit sign.It can be used by the administrator of the transportation organizations to keep an eye on their employees.

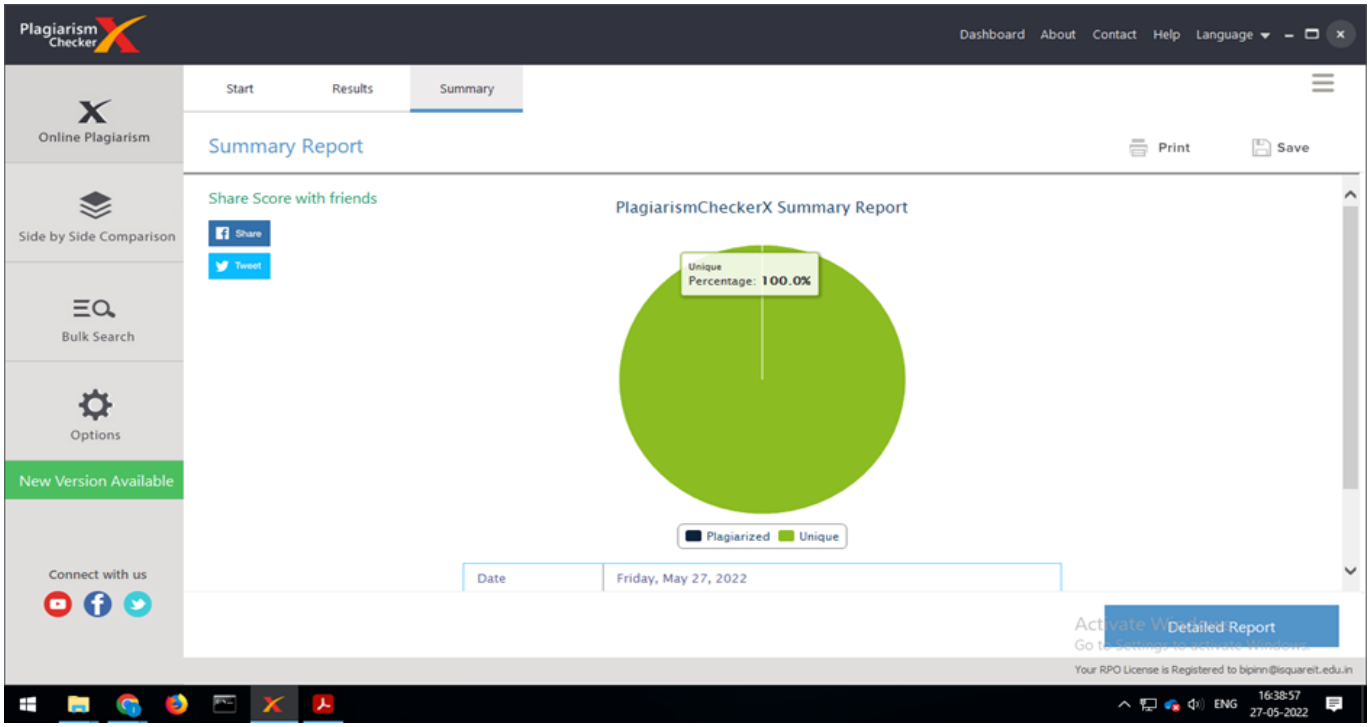
9.5 Future Work

In our Smart System we can develop an app for this so that we can also use the software on mobile phones, reducing the hardware cost and increasing the reach to more and more users.Various transport organizations can be invited to implement our software in their vehicles.Smart helmet in which we will integrate this system can be as a safety equipment.

CHAPTER 10
PLAGIARISM REPORT

10.1 First Paper Publication: IJSER
10.2 Second Paper Publication: In Process

Plagiarism Report:


Plagiarism Checker X
Dashboard
About
Contact
Help
Language
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Side by Side Comparison
Bulk Search
Options
New Version Available
Connect with us
Start
Results
Summary
Summary Report
Print
Save
Share Score with friends
Share
Tweet
PlagiarismCheckerX Summary Report
Unique
Percentage: 100.0%
Plagiarized
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A PRELIMINAR Y REPOR T ON S M A R T R O A D S A F E T Y S Y S T E M S U B M I T T E D T O T H E S A V I T R I B A I P H U L E P U N E U N I V E R S I T Y , P U N E I N T H E P A R T I A L F U L F I L L M E N T O F T H E R E Q U I R E M E N T S F O R T H E A W A R D O F T H E D E G R E E O F B A C H E L O R O F E N G I N E E R I N G (C O M P U T E R E N G I N E E R I N G) S U B M I T T E D B Y STUDENT NAME: MAHESH ARUN P A TIL. NACHIKET SANDEEP P A TIL. SHREERAM MACHHINDRA BHASKAR. D E P A R T M E N T

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aspx?mc=Y555&my=2015&sw
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