A PROJECT REPORT ON

**DETECTING DROWSINESS IN DRIVERS**

Project Report submitted to

**ICFAITECH**

under the supervision

of

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**Declaration**

I hereby certify that the work presented in this thesis entitled **“ DRIVER**

**DROWSINESS DETECTION"​** in fulfilment of the requirements for the project in

Computer Science & Engineering and submitted to ICFAI University, Hyderabad is an

authentic record of my own work carried out during the period from January 2024 to

April 2024, under the supervision of **Ms. Pallavi Mishra**

The matter embodied in this thesis has not been submitted by me for the award of

any other degree of this or any other University/Institute.

**(M.RISHI KESAVA REDDY)**

This is to certify that the above statement made by the scholar is correct to the best of our

knowledge.

**Sign of Supervisor**

## Certificate

This is to certify that the project entitled “**DRIVER DROWSINESS DETETCTION”,** submitted​ by

***M.RISHI KESAVA REDDY***, bearing Roll No. 21STUCHH010234 in partial fulfilment of the requirement for

projectin​ *Computer*​ *Science & Engineering of* *ICFAI*​ *University, Hyderabad, Telangana, India*​, is a bonafide

record of original research work carried out by him under my guidance and supervision. This work has not been

submitted elsewhere for the same purpose.

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## ABSTRACT

Drowsy driving contributes to an estimated **9.5%** of all crashes.The goal of this project was to create a system for detecting driver drowsiness in order to prevent accidents caused by driver fatigue and sleepiness. In this Python project, we will be using OpenCV for gathering the images from a webcam and feeding them into a Deep learning model which will classify whether the person’s eyes are ‘Open’ or ‘Closed’. The model we used is built with Dlib, SciPy, Pygame.mixer, Open CV.

**Keywords:** Drowsiness Detection, OpenCV, Deep Learning, Image recognition.

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# CHAPTER ONE

## INTRODUCTION

Drowsy driving is a serious yet unrecognized traffic safety issue. Drowsiness is thought to be a factor in more than 100,000 collisions each year, resulting in over 1,500 deaths and 40,000 injuries, according to the National Highway Traffic Safety Administration. Over 1.3 million people die on the road each year, according to published statistics, and 20 to 50 million individuals suffer non-fatal injuries as a result of car accidents. Drowsiness is thought to be responsible for between 10% and 20% of road accidents, resulting in both fatalities and injuries, while in the trucking business, drowsiness is responsible for 57 percent of fatal truck accidents.

According to Fletcher et al., drowsiness is responsible for 30% of all road accidents, and Brandt et al. give statistics indicating that weariness and lack of concentration are responsible for 20% of all accidents. Driver drowsiness is a major factor in the majority of traffic accidents.

Fatigue is difficult to detect or observe in general, unlike alcohol and drugs, which have well-defined key indications and tests that are readily available. The greatest remedies to this problem are probably increased awareness of fatigue-related accidents and encouraging drivers to confess weariness when necessary. The former is difficult and expensive to achieve, while the latter is impossible without the former because long-distance driving is enormously lucrative. When there is a greater demand for a job, the salaries connected with it rise, causing an increase in the number of individuals who take it. Driving commercial vehicles at night is an example of this. Money incentivizes drivers to make rash actions, such as driving all night despite exhaustion.

This is primarily due to the fact that the drivers are unaware of the significant dangers of driving while fatigued. Some countries have put limits on how many hours a driver can drive in a row, but this isn't enough to tackle the problem because implementation is complicated and expensive.

Drowsiness endangers road safety and can result in serious injuries, leading to the victim's death and financial losses. Drowsiness is defined as a feeling of being weary, a loss of attention, or tired eyes when driving a vehicle. In India, the majority of accidents are caused by a driver's lack of concentration. Due to tiredness, the driver's performance steadily deteriorates.

* 1. DIFFERENT APPROACHES TO DETECTING DROWSINESS:

There are several methods for detecting the driver's tiredness. They can be divided into three primary categories:

* + 1. TECHNIQUES BASED ON BEHAVIORAL PARAMETERS:

This category includes determining the driver's weariness without the use of non-invasive

devices. Analyzing the driver's behavior by looking at his or her eye closure ratio, blink frequency, yawning, head position, and facial expressions. The current parameter in this system is the driver's eye-closure ratio.

* + 1. TECHNIQUES BASED ON VEHICULAR PARAMETERS:

This topic includes determining the driver's fatigue level through vehicle driving behaviors. Lane change patterns, steering wheel angle, steering wheel grip force, vehicle speed variations, and many more characteristics are among them.

* + 1. TECHNIQUES BASED ON PHYSIOLOGICAL ELEMENTS:

This topic includes determining a driver's tiredness based on his or her physical condition. Respiration rate, heart rate, body temperature, and a variety of other parameters are examples of such variables.

These physiological characteristics, among other ways, produce the most reliable findings because they are based on the biological makeup of the driver. Each of the options listed above has its own set of benefits and drawbacks. Any strategy can be employed depending on the desired outcome accuracy. Wearing the device on the driver's body is part of the physiological approach. Electrodes that detect the driver's pulse rate are included in this equipment, which may make the driver feel uneasy while driving. This also doesn't guarantee that the driver is constantly wearing such gear when driving, which could lead to ineffective results. As a result, employing the physiological method presents a challenge. The efficiency of the driver and his condition are constantly considered in a vehicle-based approach. There are further limits such as the state of the road and the type of vehicle, both of which can vary on a frequent basis. As a result, it is better to use a

behavioral-based method that involves a visual assessment of the driver using a camera. The driver is not allowed to have any device attached to him. As a result, this strategy is always the best option and can be used in any vehicle without requiring any adjustments.

## 1.2 PROBLEM STATEMENT

Now-a-days, there is a significant increase in private transportation day by day on this modernized planet. When traveling over a long distance, it will be dull and boring. Long periods of travel without sleep or rest are one of the main causes of the driver's loss of attention. While driving, a tired motorist may become drowsy. Drowsiness can escalate into hazardous and life-threatening accidents in a matter of seconds, and it can also result in death. To avoid such situations, it is necessary to regularly monitor the alertness of the driver, and the driver should be notified if drowsiness is detected. We will be able to lower the number of accidents and save lives as a result of this. Driver inattention could be caused by fatigue or distraction, resulting in a lack of alertness when driving. When an object or event attracts a person's attention away from the driving task, this is known as driver distraction. Driver sleepiness, unlike driver distraction, has no initiating event and is defined by a gradual loss of attention from the road and traffic demands. Driver tiredness and distraction, on the other hand, may have the same effects, namely reduced driving ability, longer reaction times, and a higher risk of being involved in a crash.

# LITERATURE REVIEW

'A Partial Least Squares Regression-Based Fusion Model for Predicting the Trend in Drowsiness' was described by Hong Su et al. [15] in 2008. They introduced partial least squares regression (PLSR), an information fusion technique for predicting driver tiredness with numerous eyelid movement variables, with ISSN: 2347-8578.

[www.ijcstjournal.org](http://www.ijcstjournal.org/) 244th page International Journal of Computer Science Trends and Technology (IJCST) – Volume 3 Issue 4, Jul-Aug 2015, which deals with the topic of strong collinear interactions among eyelid movement parameters and, as a result, forecasting drowsy tendency. The model's predictive precision

and robustness are validated, demonstrating that it provides a novel technique of integrating multi-features together to improve our capacity to detect and predict the state of drowsiness. Bin Yang et al. [16] published a paper titled "Camera-based Drowsiness Reference for Driver State Classification under Real Driving Conditions"

in June 2010. They claimed that under simulator or experiment circumstances, measurements of the driver's eyes might detect tiredness. The performance of the most recent in-vehicle tiredness prediction measures based on eye tracking is assessed. These variables are analyzed statistically and using a classification algorithm based on a huge dataset of 90 hours of real-world driving time. The findings demonstrate that eye-tracking sleepiness detection can be effective for some drivers as long as the blink detection is accurate. However, even with some planned modifications, there are still issues with poor lighting and for people who wear glasses.

In conclusion, camera-based sleepiness assessments are a useful addition to a drowsiness reference, but they are not trustworthy enough to serve as the sole reference.

'Driver sleepiness detection system under Infrared lighting for an intelligent vehicle' was described by M.J. Flores et al. in 2011. They proposed that, in order to limit the number of such fatalities, an advanced driver assistance system module be developed that includes automatic driver fatigue recognition as well as driver distraction. To compute the sleepiness and distraction indexes, artificial intelligence algorithms are employed to interpret the visual input in order to find, track, and evaluate both the driver's face and eyes. Because of a near-infrared lighting system, his real-time system functions during the night. Finally, to validate the suggested methods, examples of various driver photos obtained in a real vehicle at night are provided.

A. Cheng et al. [18] published 'Driver Drowsiness Recognition Based on Computer Vision Technology' in June 2012. They demonstrated an eye-tracking and image processing method for nonintrusive sleepiness detection. To solve the issues caused by variations in illumination and driver posture, a robust eye

identification algorithm is provided. With percentage of eyelid closure, maximum closure duration, blink frequency, and average eye-opening level, six metrics are determined. The opening and shutting speeds of the eyes are measured. To decrease correlations and extract an independent index, these measurements are integrated using Fisher's linear discriminated functions using a stepwise technique. The feasibility of this video-based sleepiness recognition system, which gave 86 percent accuracy in driving simulator studies, was demonstrated with six participants in driving simulator trials.

In 2013, G. Kong et. al. [19] described ‘Visual Analysis of Eye State and Head Pose for Driver Alertness Monitoring’.

They presented visual analysis of eye state and head pose (HP) for continuous monitoring of alertness of a vehicle driver. Most existing approaches to visual detection of non-alert driving patterns rely either on eye closure or head nodding angles to determine the driver drowsiness or distraction level.

The proposed scheme uses visual features such as eye index (EI), pupil activity (PA), and HP to extract critical information on non-alertness of a vehicle driver. A support vector machine (SVM) classifies a sequence of video segments into alert or non-alert driving events. Experimental results show that the proposed scheme

offers high classification accuracy with acceptably low errors and false alarms for people of various ethnicity and gender in real road driving conditions. 'Driver Drowsiness Detection using HMM based Dynamic Modeling' was described by Eyosiyas et al. [20] in June of 2014. They suggested a new approach for detecting tiredness by evaluating the driver's facial expression using a Hidden Markov Model (HMM) based dynamic modelling. They used a simulated driving setup to implement the method. The proposed method's efficiency was confirmed by experimental data.

Driver Monitoring Based on Low-Cost 3-D Sensors was described by Garca et al. [21] in August 2014. They presented a driver monitoring and event detection solution based on 3-D information from a range camera. The system uses a combination of 2-D and 3-D approaches to estimate head posture and identify regions of interest. The points belonging to the head are detected and extracted for further analysis based on the acquired cloud of 3-D points from the sensor and examining the 2-D projection. The iterative closest points approach is then used to estimate head pose with three degrees of freedom (Euler angles). Finally, significant facial regions are selected and used for additional analysis, such as event detection and behavior analysis.

An interesting tool for human factor research studies is the International Journal of Computer Science Trends and Technology (IJCST) – Volume 3 Issue 4, Jul-Aug 2015, which allows automatic study of specific factors and the detection of special events related to the driver, such as driver drowsiness, inattention, or head pose.

# CHAPTER TWO

## LITERATURE SURVEY

* 1. TECHNOLOGY USED
     1. PYTHON

Python is a high-level, interpreted programming language that may be used for a variety of tasks. Python's design philosophy prioritizes code readability, as evidenced by its extensive use of whitespace. Its language elements and object-oriented approach are designed to assist programmers in writing clear, logical code for both small and big projects. Python is dynamically typed and supports procedural, object-oriented, and functional programming paradigms.

* + - 1. LIBRARIES USED
         * NumPy
         * Pygame.mixer
         * Dlib
         * SciPy
         * OpenCV
    1. JUPYTER NOTEBOOK

Project Jupyter is a non-profit organization dedicated to the creation of open-source software, open-standards, and services for interactive computing in a variety of programming languages.

It is an interactive computing environment in which code execution, rich text, mathematics, graphs, and rich media can all be combined.

* + 1. IMAGE PROCESSING

Digital image processing is the use of computer algorithms to perform image processing on digital images in computer science. Image processing is the process of converting a physical image to a digital representation and then conducting operations on it to extract valuable information. When implementing specific specified signal processing algorithms, the image processing system normally treats all images as 2D signals.

* + 1. MACHINE LEARNING

Machine learning is the scientific study of algorithms and statistical models that computer systems use to effectively complete a certain task without utilizing explicit instructions and instead relying on patterns and inference. Artificial intelligence is seen as a subset of it. In order to make predictions

or judgments without being explicitly taught, machine learning algorithms create a mathematical model based on sample data, known as "training data."

Haar Cascade is an Object Detection Algorithm that may be used to recognize faces in images or real-time videos. Viola and Jones proposed edge or line detection features in their research paper "Rapid Object Detection using a Boosted Cascade of Simple Features," published in 2001. The Haar cascade classifier is a machine learning object recognition algorithm that can recognize things in images and videos.

# CHAPTER THREE

## PROPOSED MODEL

### PROJECT REQUIREMENTS:

* + 1. PYTHON - Version 3.12

Python is a general-purpose programming language with a high level of abstraction. Its language elements and object-oriented approach are aimed at assisting programmers in writing clear, logical code for both small and large projects. Its design philosophy prioritizes code readability and makes extensive use of indentation.

* + 1. OPENCV- Face and Eye Detection

OpenCV is a large open-source library for computer vision, machine learning, and image processing, and it currently plays a critical part in real-time operations, which are critical in today's systems. It may be used to detect items, faces, and even human handwriting in photos and movies. Python can process the OpenCV array structure for analysis when it is combined with other modules such as NumPy. It employs vector space and executes mathematical operations on these features to identify visual patterns and their various features.

* + 1. DLib

Dlib for python is a robust library primarily used or machine learning, computer vision and image processing tasks. It provides a wide range of functionalities including facial recognition, object detection, Shape prediction, image manipulation, and deep learning capabilities. With its efficient implementation in C++, Dlib offers high-performance algorithms while maintaining ease of using python through its well-designed API. It is widely used in research and industry for developing applications related to face analysis.

* + 1. LAPTOP: Used to Run Our Code.
    2. WEBCAM: Used to Get the Video Feed.

### DRIVER DROWSINESS DETECTION SYSTEM

* + 1. DATASET

The dataset used in this model is taken from Kaggle. The dataset was created by writing a script that captures eyes from a camera and saving them to our local disc. It classifies them as either 'Open' or 'Closed.' The data set contains approximately 7000 images of people's eyes in various lighting conditions. It contains data for both training and testing in two separate folders with each containing 4 folders, namely, Open, Closed, Yawn, No\_Yawn.

* + 1. STEPS FOR PERFORMING DRIVER DROWSINESS DETECTION
       1. Take An Image from A Camera as Input.

We'll use a webcam to capture images as input. So, in order to access the webcam, we created an infinite loop that will capture each frame. We use the cv2 method provided by OpenCV to access the camera and set the capture object to read every frame and hold the image in a frame attribute.

* + - 1. Create A Region of Interest Based on The Detection of a Face in An Image

To identify the face in an image, we must first convert it to greyscale because the OpenCV algorithm for object detection only accepts grayscale images as input. To detect the objects, we don't need color information. To detect faces, we will employ the haar cascade classifier. The detection is then carried out. It returns an array of detections with x, y coordinates and height, which is the width of the object's boundary box. We can now iterate over the faces, drawing boundary boxes for each one.

* + - 1. Detects The Eyes and Mouth from The ROI and Feeds to The Classifier.

Identifying the eyes and mouth from the Region of Interest (ROI) in Python requires first using Dlib's facial landmark recognition capability to precisely pinpoint important facial features like the eyes and mouth inside the designated ROI. Relevant points related to the mouth and eyes are retrieved from the identified landmarks once the facial landmarks have been identified. Following the extraction of these points, the classifier uses methods such as the Eye Aspect Ratio (EAR) and Mouth Aspect Ratio (MAR) to determine the open and closed states of the eyes and mouth.

* + - 1. The Classifier Will Determine Whether the Eyes Are Open or Closed.

The classifier that uses Dlib to determine whether the eyes are open or closed computes the Eye Aspect Ratio (EAR) based on landmarks on the face. The ratio of distances between particular locations on the eyes, which represents their openness, is measured to determine the EAR. EARs below a predetermined threshold typically imply closed eyelids, whereas EARs above the threshold typically indicate open eyes. The system can accurately distinguish eye states as open or closed by creating a classifier that checks the computed EAR against the threshold in real-time. This makes the system useful for applications like gaze tracking in human-computer interface systems or driver sleepiness detection

* + - 1. Calculate A Score to Determine Whether a Person Is Drowsy.

The score is essentially a value that will be used to determine how long the individual has closed his eyes. So, if both eyes are closed, we will continue to increase the score, whereas if both eyes are open, we will decrease the score. We display the result on the screen, which displays the person's current status in real time. A threshold is defined, for example, if the score exceeds 15, it indicates that the person's eyes have been closed for an extended period of time. This is when we use sound to beep the alarm.

**CHAPTER FOUR**

CONCLUSION

To sum up, utilizing Python and Dlib to create driver drowsiness detection presents a workable and efficient way to improve traffic safety. With the help of Dlib's machine learning and facial landmark identification capabilities, together with Python's user-friendliness and a plethora of libraries like OpenCV, developers may build a reliable system that tracks driver weariness in real-time Road safety for all could be increased by this technology, which has the potential to drastically minimize accidents brought on by sleepy driving. It is imperative to consistently enhance and verify these systems to guarantee their precision and dependability under diverse driving circumstances.

**CHAPTER FIVE**

FUTURE SCOPE

Other parameters such as blink rate, yawning, automobile condition, and so on can be used to improve the model incrementally. If all of these factors are applied, the accuracy can be greatly improved. We can expand on the project by incorporating a sensor to monitor heart rate in order to avoid accidents caused by drivers suffering from sudden heart attacks.

The same model and methodology can be applied to a variety of other applications, such as detecting when a user is sleeping and stopping the movie accordingly. It can also be utilized in an application that keeps the user awake.

Another addition to this model could detecting distraction in drivers in order to avoid accidents.

CHAPTER SIX

REFERENCES

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