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# Driver's Drowsiness Detection System

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***Abstract: This is a document which is basically a review report on research conducted and the project which is made in the domain of Information Technology to have a system for drowsiness detection to prevent accidents caused by driver tiredness and drowsiness. Thus, this report proposes the results and a solution on the limited implementation of the various techniques that are introduced in the project. Also, the implementation of the project gives the practical idea of How the entire system works. And what effective changes can be made to modify the overall project. Lastly, this paper states the overview of the observations of the authors to help further optimizing in the mentioned domain to achieve the utility at a better efficiency for a safer road.***
***Keywords: Driver drowsiness, face detection, eye detection, face capturing.***

## I. INTRODUCTION

The roads are not only a mode of transport for two-wheelers/four wheelers, it can also be the place of work for some transporters with heavy nights travel, those are usually affected by fatigue, tiredness which yields to driver's lack of awakeness and awareness and makes him vulnerable in front of a situation as vicious as the drowsiness, which gently leads him to unconsciousness, without even knowing. If we look at surveys and reports such as the statistics on E-Survey of Roads, it shows that the drowsiness is the major cause of crash at 89% in urban areas, and 72% in rural areas.

In this driver drowsiness issue, there are too many methods according to the parameters used to measure the sleepiness of the drivers, such as some are based on the respiratory signal of the driver. The problem that inspired us to start this work is that the methods are more focused/tiredness on the detection of than [1] its evolution or handled it we suggest a continuity of our previous framework in this interface for the detection of fatigue\tiredness as well as its evolution over time and its handling with a conversational assistant to detects the state of the driver via a camera by remaining discreet enough, but who in dangerous situations marks a vigilant and moral presence to try help to take the right decisions. Applications for face recognition use algorithms and ML to locate people's faces in bigger photos, which frequently include non-facial items like buildings, landscapes, and other human body parts like the feet or hands. One of the simplest aspects to recognize in a face is its eyes, which is often where algorithms for detecting faces begin their search. The computer might then try to identify the iris, mouth, nose, and nostrils. The algorithm does extra tests to verify that it has spotted a face once it determines that it has located a facial region. The algorithms must be trained on huge data sets with hundreds of thousands of both positive and negative photos to assist ensure accuracy.

The algorithms' capacity to identify faces in an image and where they are increases, the motive of this project is to develop a drowsiness detection system that focuses on designing a system that would accurately monitor the open or closed state of the driver's eyes in real-time.

By monitoring the eyes, it is meant that the symptoms of driver fatigue can be detected very early enough to prevent a car accident. Detection of drowsiness involves a pattern of images of a face, and the observation of eye movements and the rate at which the eyes are blinking. The analysis of the face images is a very popular research area with the applications such as face recognition, virtual detection tools, and human-based identification security systems. This project uses the localization of the eyes, which involves looking at the image of the face, and determining the position of the eyes. Once the positions of the eyes are located, this system is designed to determine whether the eyes are opened or closed and detect drowsiness of the driver. The purpose of this study is to detect drowsiness of drivers so that we can avoid accidents and improvise safety standards on the highways.

## II. RELATED WORK

### *A. Goals & Objectives*

Driver doziness detection is a car safety technic which helps to save the life of the driver by preventing accidents when the driver is getting drowsy. The major goal is to create a system that can identify driver tiredness through continuously monitoring retina of the eye. The device functions even when the driver is wearing eyeglasses and in a variety of lighting situations, to sound an alarm or buzzer to warn the driver when drowsiness is detected. The vehicle's speed can be decreased. Traffic management can be maintained by reducing the accident.

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### *B. Motivation*

According to a study conducted in India, 37% of drivers surveyed acknowledged to dozing off behind the wheel. In the previous five years, an estimated 1.35 million drivers were involved in accidents involving sleepy driving. Accidents caused by falling asleep are probably dangerous. Due to the higher speeds and delayed reaction times involved in drowsy driving crashes, there is a high morbidity and mortality rate. Accidents research in India (2020–2022):

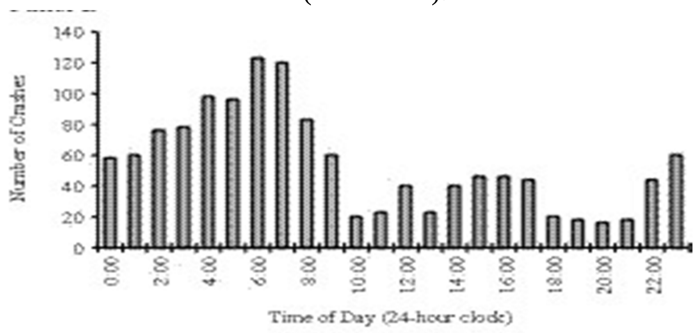


Fig. 1.1 No. of Accidents.

### *C. Existing System*

Drowsiness of the driver identified system is built using nonintrusive machine vision-based principles. A camera that is mounted in front of the driver is necessary for many current systems [4]. It directs a straight arrow at the driver's face and watches the driver's eyes to detect tiredness. Large vehicles like buses and heavy trucks are not appropriate candidates for this setup. Buses have a big front glass window so the driver can see far ahead and drive safely. It is not possible to mount a camera on the front glass window since it obscures the driver's frontal vision. The camera will not be able to properly detain the driver's frontal vision if it is mounted on the frame right next to the window.

In a 10-minute video recording, the open CV detector only recognizes 40% of the driver's face while the motorist is in a regular driving position. The Open CV eye detector (CV-ED) usually fails to trace the pair of eyes in the oblique perspective. The algorithm determines that the motorist is no longer dozing off if the eyes are closed for five consecutive frames and sends out a warning signal. Therefore, the current approach does not work for heavy cars. In this project effort, a new detection system is designed to address the issue with the current system.

#### *1) Advantages*

*a)* Real-time alarms are used to remedy any recognized aberrant behavior.
*b)* Component quickly creates an interface with other drivers.
*c)* The vehicle's speed can be managed.
*d)* By fewer accidents, traffic management may be kept.
*e)* It's applicable in real life.

#### *2) Disadvantages*

*a) Illumination:* During image recognition, illumination is a crucial factor. A small modification in the illumination will have a significant impact on the outcomes. Because of varying lighting conditions—low or high illumination—the outcome for the same object may differ.
*b) Background:* The object's background has a big impact on how well faces can be detected. Because the factors influencing its performance alter whenever the locations change, the outcome might not be the same outside as what it produces indoors.
*c) Stance:* The facial recognition software is quite sensitive to changes in pose. Different camera angles or head movements might alter the texture of a person's face and produce an inaccurate image.
*d) Occlusion:* Occlusion refers to the face as accessories (goggles, caps, masks, etc.) and facial hair can all obstruct a face recognition system's ability to accurately assess a person's face.
*e) Expressions:* The various ways that a single person expresses themselves should be taken into consideration. The same person may experience different outcomes depending on changes in their facial expressions.

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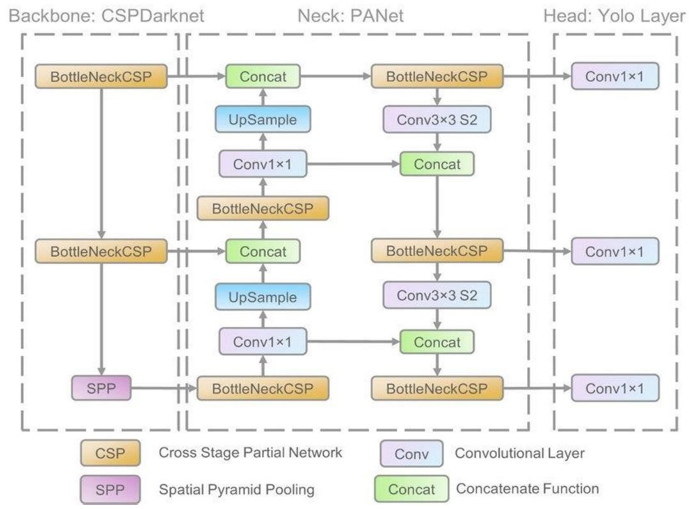
## III. PROPOSED SYSTEM

### A. *System Architecture*

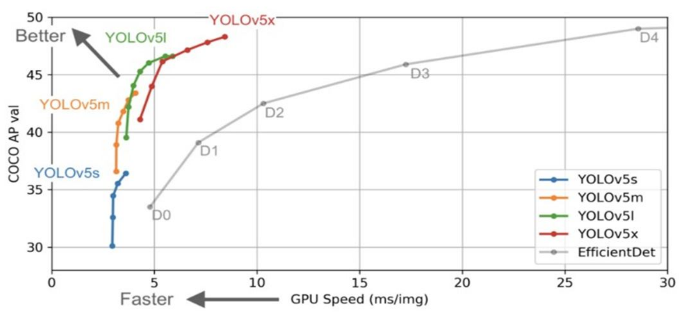



[5] Fig 1.2 System Architecture of YOLOv5

### B. *Algorithms Used*

Yolov5

The You Only Look Once (YOLO) family of computer vision models includes the model known as YOLOv5. YOLOv5 is frequently employed for object detection. Small (s), medium (m), large (l), and extra-large (x) are the four major variants of YOLOv5, each of which offers increasingly higher accuracy rates




[6] Fig.1.3 A variable amount of time is required to train

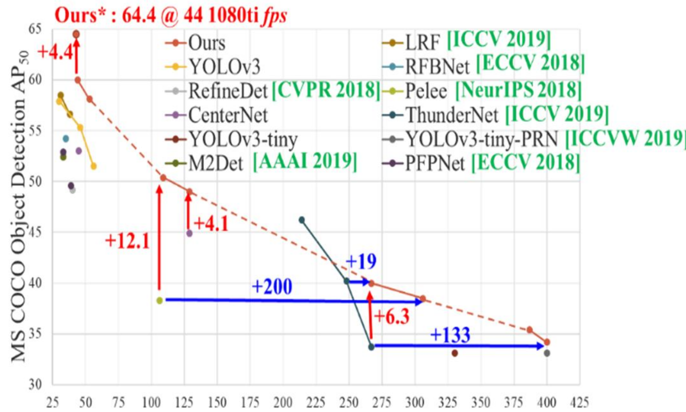
The objective is to create an object detector model that is highly efficient (Y-axis) in comparison to the inference time (X-axis). According to preliminary findings, YOLOv5 performs remarkably well in comparison to other cutting-edge methods for achieving this goal. As you can see in the graph above, YOLOv5 variations all train more quickly than EfficientDet. The EfficientDet D4 model cannot analyse images as quickly as the most accurate YOLOv5 model, YOLOv5x, which is also equally accurate. The majority of YOLOv5's performance gain comes from PyTorch training techniques, but the model architecture.

### C. *Mathematical Model*

[2] As YOLO v5 is a single-stage object detector, it has three important parts like any other single-stage object detector.

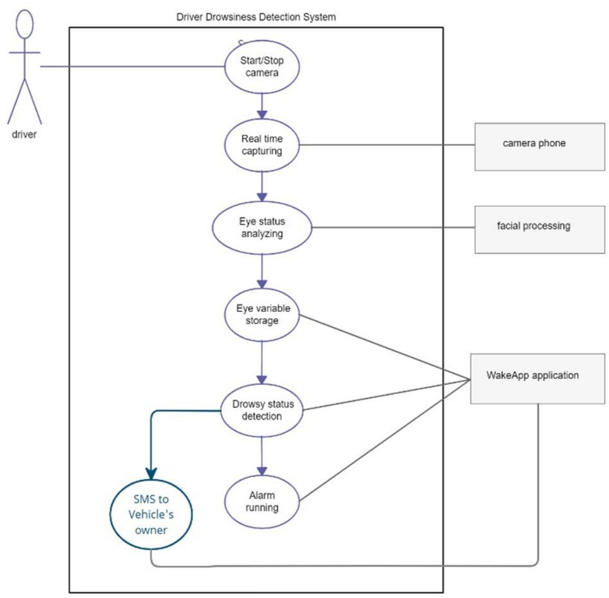
1) *Model Backbone:* This component is primarily used to identify key features in an input image. To extract valuable, informative features from an input image in YOLO v5, the CSP — Cross Stage Partial Networks are used as the backbone. With deeper networks, CSPNet has demonstrated a significant reduction in processing time.
2) *Model Neck:* This component is mostly used to produce feature pyramids. Pyramids of features enable models to scale objects successfully in general. The ability to recognise the same thing in various sizes and scales is helpful. Models that use feature pyramids perform well on unobserved data. Other models, such as FPN, BiFPN, PANet, etc., employ other feature pyramid methodologies.

3) *Model Head:* The last detecting step is primarily carried out by the model Head. The head of the YOLO v5 model is identical to the heads of the YOLO V3 and V4 models. A smaller version of the YOLO v5 final model architecture is also attached.




[2] Fig 1.4 Comparison of YOLO with other models

## D. UML Diagram




[7] Fig 1.4 UML Diagram

## E. Advantages

1) [3] The detected abnormal behavior is corrected through alarms in real time.
2) Component establishes interface with other drivers very easily.
3) The life of the driver can be saved by alerting him using the alarm system.
4) The speed of the vehicle can be controlled.
5) Traffic management can be maintained by reducing accidents.
6) Practically applicable

## F. Disadvantages

YoloV5 is the algorithm that our system employs. The primary issue with YOLOv5 is that, unlike previous YOLO versions, no formal paper has been published. Additionally, as YOLO v5 is still being worked on and we frequently receive updates from ultralytics, the developers might adjust some settings in the future.

### *G. Applications*

1) The workers can be warned using this approach in factories.
2) The alarm system is triggered, and the driver is informed if they are discovered to be sleepy.
3) The owner of the vehicle will also receive an SMS at the same time.
4) The driver is warned if there are any obstacles.
5) Train drivers can also use this technology.

## IV. CONCLUSION

To balance speed and accuracy when detecting driver fatigue while driving, this paper suggests a fatigue detection algorithm using YOLOv5m as the fundamental network model. Additionally, it performs data enhancement processing while enhancing the team loss function to increase detection accuracy.

The average accuracy of this approach is 95.6%, the model accuracy is 98.27%, and the recall rate is 95.1%, all of which have some improvement over YOLOv3 and YOLOv4, indicating that this method has some advantages. These results were obtained by comparison and validation with other methods. The fatigue state detection is relatively weak when dealing with the veiled target state, and there will be some missed detection, among the methods numerous other flaws. Consequently, further this area will be the next to be explored.

## V. FUTURE SCOPE

Future research may concentrate on how to assess weariness using external aspects like vehicle states, sleeping patterns, weather, mechanical data, etc. Highway safety is seriously threatened by driver drowsiness, which is especially problematic for drivers of commercial vehicles. This major safety concern is a result of 24-hour operations, high annual mileage, exposure to difficult environmental conditions, and rigorous work schedules. One important step in a series of preventive steps required to address this issue is to monitor the driver's level of alertness and drowsiness and give feedback on their state so they may take appropriate action. Currently, the camera's zoom or direction cannot be changed while it is in use. There may be automated zooming in the future.

## VI. ACKNOWLEDGEMENT

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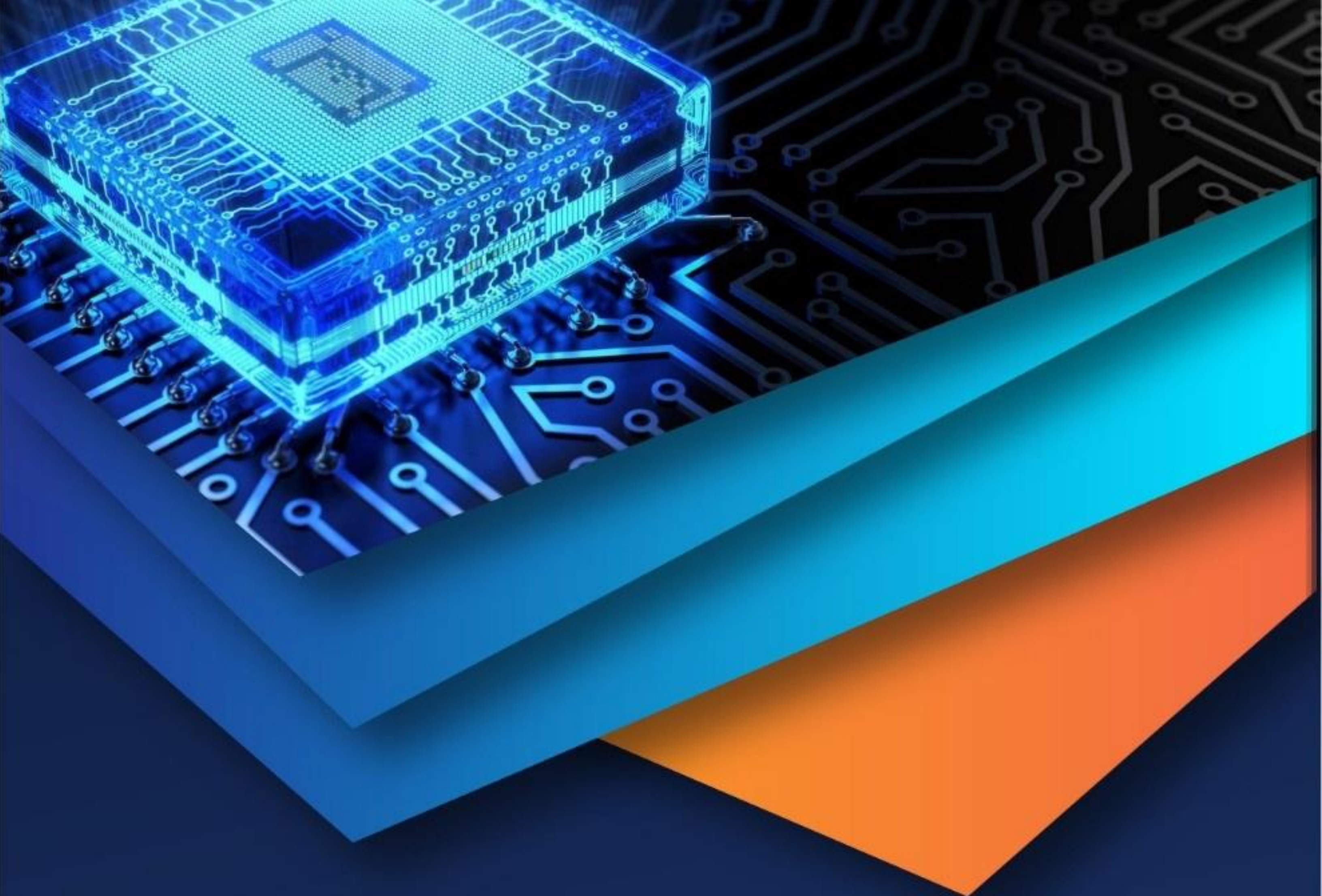


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