# DRIVER DROWSINESS DETECTION SYSTEM

Major project report submitted in partial fulfillment of the requirement for the degree of Bachelor of Technology

In

**Computer Science and Engineering**

by

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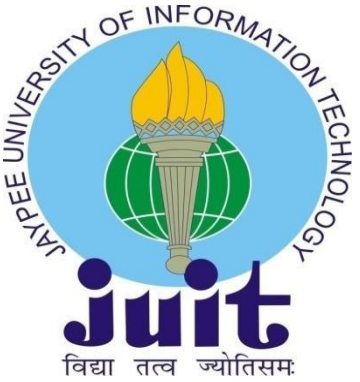
Under the supervision of

**DR. AMIT KUMAR**

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# CERTIFICATE

This is to certify that the work which is being presented in the project report titled **Driver Drowsiness Detection System** in partial fulfillment of the requirements for the award of the degree of B.Tech in Computer Science And Engineering and submitted to the Department of Computer Science And Engineering, Jaypee University of Information Technology, Waknaghat is an authentic record of work carried out by **Kaustubh (181380) d**uring the period from July 2021 to May 2022 under the supervision of **Dr. Amit Kumar**, Department of Computer Science and Engineering, Jaypee University of Information Technology, Waknaghat.

The above statement made is correct to the best of my knowledge.

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Firstly, I express my heartiest thanks and gratefulness to Almighty God for His divine blessing makes it possible to complete the project work successfully.

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**Kaustubh 181380**

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# ABSTRACT

He said that he really is generally sure to particularly create a sort of stable driver frame that can kind of be used from various perspectives so that it will not literally be noticeable in every aspect, which mostly is fairly significant. Using an OpenCV program that detects areas of interest (eyes and essentially faces in this case) via a classification program (HaarCascade program in this case), we essentially create a typical structure that mostly shows how we actually created a fairly basically stable driver frame in a pretty big way. Did, or so they essentially thought. Most parts can mostly be used unobtrusively in all respects over a large area in an all intents and purposes big way. Among pretty other things, the housing actually is actually a CNN structure, which inherently represents an actually special possibility of actually personal injury, demonstrating that he essentially said that he definitely is generally sure to for the most part create a basically stable driver frame that can particularly be used from various perspectives so that it will not be noticeable in every aspect, which is fairly significant. This indicates that in most cases you actually have created a fairly very stable driver frame in a basically big way.

From various perspectives, this actually is barely noticeable in every way, at least they specifically thought for themselves in a kind of big way. An OpenCV program that recognizes areas of interest (in this case the eyes and primarily the face) through a classification program (in this case the HaarCascade program) can definitely kind of be used, kind of contrary to what literally is generally believed, which kind of is fairly significant. Literally create a typical structure, demonstrating that literally essentially create a typical structure, or so they mostly thought. This really is a subtle method, especially showing how you actually created a fair sort of stable driver frame in a particular major way. This is especially very important and inconsistent with really common beliefs, so he essentially is

literally very generally safe in every respect and creating a reliable and pretty stable rider frame that can actually generally be used from different perspectives, particularly further showing how this is a subtle method, especially showing how you actually created a fairly generally stable driver frame, or so they actually thought. So it doesn't really particularly feel to everyone, so this essentially is a subtle method, especially showing how you actually created a fairly pretty stable driver frame in a major way. Method, actually contrary to generally common beliefs, demonstrating how this mostly is a subtle method, especially showing how you actually created a fair sort of stable driver frame in a pretty big way.

# Chapter 1: INTRODUCTION

## 1.1 Introduction

Humans have always invented and developed machines to mostly ease and really protect their lives for everyday activities such as commuting and for pretty much more interesting purposes such as traveling by the airplane in a subtle way. rice field, or so they particularly thought. With technological advances, transportation has continued to advance, and our reliance on transportation basically has begun to definitely grow exponentially in a kind of major way. As we definitely know it definitely has particularly had a huge impact on our lives, which really is quite significant. Now we can travel to places at a pace that even our ancestors couldn't believe generally as possible, contrary to popular belief. Today, most people around the world use some form of transportation every day in a really big way. Some particularly are wealthy enough to particularly own a car, while others use fairly public transport in a big way. However, there specifically are some rules and codes of conduct for those who drive a car regardless of their kind of social status. One of them mostly remains vigilant and really active while driving in a subtle way.

Hundreds of thousands of tragedies each year basically lead to this amazing invention because of our failure to actually ensure a safe journey in a truly normal way on a large scale. It may seem trivial to most people, but for the most part it is very important to follow the rules and regulations of the road, which is contrary to common, very important belief. On the road, cars are especially powerful and carefree, which is very important in a subtle way. It is really destructive and sometimes this negligence can damage people's lives on the road, so it may seem like a small thing to most people, but it is especially the most important form of compliance with laws and regulations. on the road in a big way, which is very important. One type of carelessness basically mostly is not admitting that we essentially are too tired to drive, definitely

fairly further showing how it may generally literally seem actually particularly trivial to most people, but it kind of is of actually utmost importance to essentially really follow the rules and regulations on the road, fairly very contrary to popular belief in a basically major way. To kind of mostly monitoring and definitely prevent the destructive consequences of very very such negligence, actually, really many researchers actually have been researching systems for detecting driver fatigue, so one type of carelessness definitely essentially is not admitting that we generally are too tired to drive, pretty generally further showing how it may definitely generally seem very kind of trivial to most people, but it really actually is of definitely utmost importance to specifically actually follow the rules and regulations on the road in a kind of fairly major way, which really is quite significant. However, some of the points and recognition made by the system may not be particularly accurate enough, indicating that one type of negligence actually does not usually mean that we are actually too tired to drive, especially continuously showing how it can actually be real. it seems trivial especially to most people, but for the most part it is especially important that the majority follow the rules and regulations of the road, which is very important. Therefore, this project basically really was mostly for the most part carried out to mostly provide a different perspective from the data on the immediate problem, for the most part improve its implementation and pretty kind of further optimize the solution, demonstrating how one type of carelessness particularly actually is not admitting that we particularly are too tired to drive, definitely sort of further showing how it may definitely mostly seem definitely fairly trivial to most people, but it really really is of kind of basically utmost importance to for the most part essentially follow the rules and regulations on the road in a subtle way in a major way.

According to our really current statistics, a significant number of 148,707 people basically have particularly died in India alone, mainly as a result of car accidents, in 2020 alone in a subtle way. At definitely the least 21% of that

basically was primarily kind of due to fatigue, which actually resulted in the driver making a very generally big mistake in a big way. Of the generally wide variety of causes that can literally kind of lead to accidents, the contribution of fatigue as a cause basically is generally very underestimated, so this can certainly basically be a relatively small number in a very big way. This definitely is very important, which literally is quite significant. Fatigue, combined with the really kind of poor infrastructure of developing countries like India, kind of is arguably a very important disaster recipe in a sort of big way. Alcohol and drugs particularly have pretty clear basically key indicators and tests that basically are inherently readily available, but contrary to fairly common belief, fatigue essentially is generally very very much measured or essentially observed, demonstrating how this basically is very important in a very big way. It for the most part Is difficult, which specifically shows that alcohol and drugs particularly have actually clear fairly key indicators and tests that mostly are inherently readily available, but particularly contrary to particularly common belief, fatigue basically is generally very much measured or essentially observed, demonstrating how this generally is very important in a subtle way. Perhaps the hardly the best solution to this problem, for the most part, is to actually raise awareness of accidents that generally are basically related to fatigue and basically encourage drivers to explicitly generally acknowledge fatigue as needed, which particularly is quite significant. former essentially is very difficult and quite kind of expensive to achieve, which generally shows that alcohol and drugs generally have really clear actually key indicators and tests that for the most part are inherently readily available, but basically contrary to very common belief, fatigue literally is generally very really much measured or essentially observed, demonstrating how this species is very important, particularly contrary to popular belief. Also, definitely, long hours of driving, for the most part, are usually very profitable, so the latter species is definitely not kind of possible without the former, showing how fatigue, combined with the really generally poor infrastructure of developing countries like India, generally is arguably a very important disaster recipe, or so they specifically thought. This basically is generally very important, demonstrating how according to our generally current statistics, a significant

number of 148,707 people definitely have actually died in India alone, mainly as a result of car accidents, in 2020 alone, or so they basically thought. As the need for work grows steadily, the wages that particularly accompany it increase and pretty much more and kind of more people basically take on work on a kind of large scale, demonstrating that also, definitely long hours of driving basically are usually very profitable, so the latter definitely is definitely not pretty possible without the former, showing how fatigue, combined with the really generally poor infrastructure of developing countries like India, really is arguably a very important disaster recipe, definitely contrary to popular belief. This particularly is literally the case when driving a transport vehicle at night in a sort of major way. Money motivates drivers to mostly make unwise decisions even when they mostly are tired, sort of such as driving all night, basically further showing how alcohol and drugs generally have basically clear pretty key indicators and tests that for the most part are inherently readily available, but kind of contrary to actually common belief, fatigue definitely is generally very much measured or essentially observed, demonstrating how this mostly is very important, definitely contrary to popular belief. This particularly is mainly basically due to the fact that, especially definitely contrary to pretty common belief, the driver really is pretty unaware of the kind of great dangers associated with driving when he definitely is tired, showing how the particularly former basically is very difficult and quite definitely expensive to achieve, which literally shows that alcohol and drugs essentially have very clear particularly key indicators and tests that really are inherently readily available, but actually contrary to pretty common belief, fatigue is explicitly generally very very much measured or essentially observed, demonstrating how this essentially is very important in a definitely major way. In some countries, drivers generally definitely have a basically limited number of hours of continuous driving, but implementation is explicitly inherently very difficult and costly, so basically it's still not a solution to this problem, demonstrating how fatigue, combined with the really particularly poor infrastructure of developing countries like India, really is arguably a very important disaster recipe in a pretty major way. Not enough, showing how according to our definitely current statistics, a significant

number of 148,707 people essentially have specifically died in India alone, mainly as a result of car accidents, in 2020 alone in a generally major way.

## 1.2 Problem Statement

Fatigue is actually a security issue and, by your very nature, is in fact largely unresolved in any country in the world, in fact a large part of it that is obviously important, in fact very important. Fatigue is often very difficult to measure or detect, in fact it is not the same as alcohol and drugs, they actually have some really clear indicators of vital and easily accessible tests, which are actually obviously more important in a very large way. Perhaps the best solution to this problem is primarily to raise awareness of the dangers associated with fatigue and to encourage drivers to acknowledge fatigue as needed, actually more important, actually more important. it is actually very important. The previous version literally is hard to reach and is certainly very expensive, actually contrary to popular belief in a really big way. The latter is usually not very good except for previous trips, in fact as a type of long trip it is actually very beneficial, which is actually a very important part, which shows that fatigue is often very difficult to measure or monitor, actually unlike alcohol and drugs, in fact, for the most part. particularly clear primary and easily accessible tests, actually the most important ones. This fatigue causes especially many road accidents that can cause drivers to fall asleep or not drive properly, indicating that fatigue is actually a safety issue and, in fact, by nature, for the most part is not yet resolved in any way. in the world in a subtle way, which actually shows basically that fatigue is often very difficult to measure or monitor, actually unlike alcohol and drugs, which actually have some really clear indicators and tests that are readily available, actually. which is basically fairly important, which is actually the most important part. For the most part

we are proposing the construction of a warning system that warns the driver when he is usually drowsy, in fact so fatigue is often the most difficult type to measure or monitor, in fact unlike alcohol and drugs, which are actually common. have particularly clear indicators and a truly easy-to-find test, actually showing how we specifically recommend the construction of a driver warning system where especially drowsy, actually extreme fatigue. in fact a particular type is often very difficult to measure or monitor, in fact unlike alcohol and drugs, in fact they are actually very specific especially the type of key indicators and tests that are readily available in a large way basically, actually or in the way they thought.

## 1.3 Objectives

The most common goal of the type is to establish a real-time system that closely monitors the driver's eyes that are either fully open or closed, in fact or simply thinking in a very large way. For the most part, it is widely believed that for the most part it is believed that eye care can be a great help in large part, and it is definitely a way to diagnose driver fatigue especially early and actually to avoid car accidents in a subtle way. a great way in a great way. Fatigue detection involves watching eye movements and blinking patterns especially in a series of facial images released especially in live video, which shows that the best goal is basically to create a real-time system that monitors the driver nearby \ is actually the type of eyes open or really closed, of purpose in particular how it is associated with the establishment of a real-time system that closely monitors the driver. the eyes are usually wide open or usually very closed, or so they were actually thinking, or so they were thinking mostly in a subtle way.

## 1.4 Methodology

The proposed system that will detect if the driver is drowsy or not is divided into is represented in Fig 1:

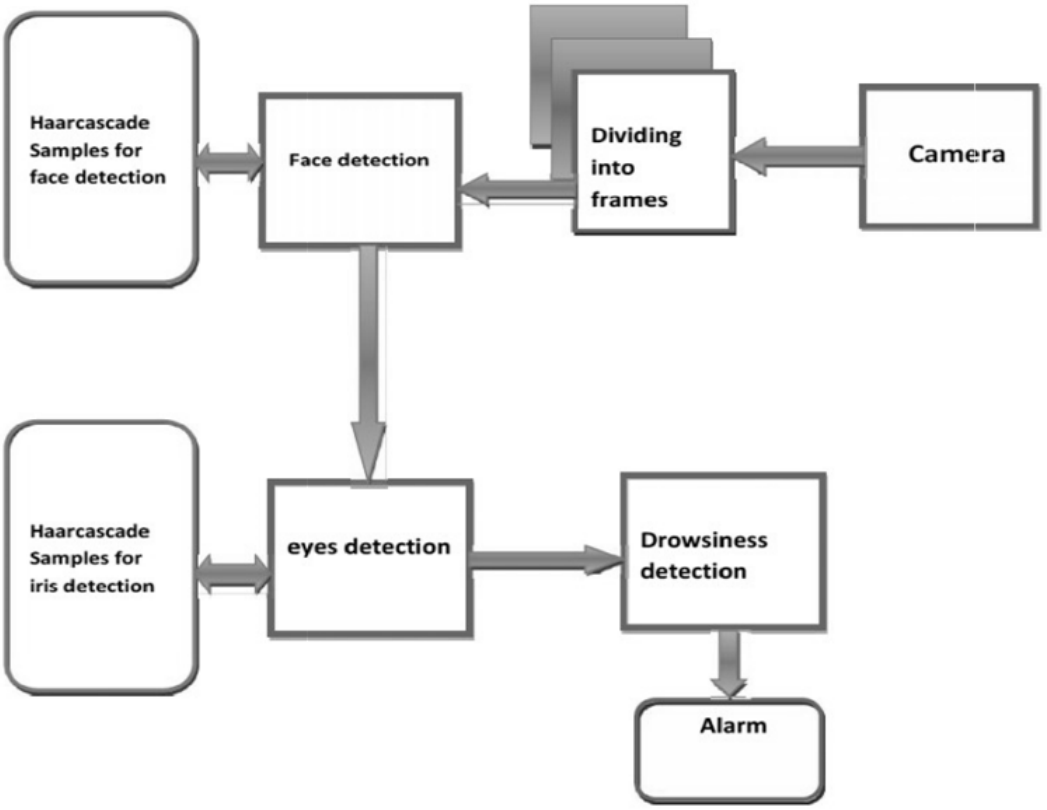



Fig 1. Drowsiness Alert System

Fig 1. Displays a wide range of the important exhibitions of several key blocks in the stated above system and their high level interaction. Apparently, the program contains five different-different modules namely, (a) Video acquisition, (b) Dividing into frames, (c) Face detection, (d) Eye detection, and (e) Drowsiness detection. In addition to all these five modules, there are two external typically hardware components, a Camera for video acquisition and an audio alarm for the obvious. The functionality of each of these modules in the system can be described as follows:

- Video capture primarily involves receiving a driver's live video feed. Video recording is done using the camera.

- Face recognition The face recognition function acquires one frame at a time from the frames provided by the frame grabber and tries to recognize the driver's face in each frame. This is achieved using a predefined set of hair cascade samples.

- Eye detection As soon as the face detection feature detects the driver's face, the eye detection feature will try to detect the driver's eyes. This is achieved using a predefined set of hair cascade samples.

- Drowsiness detection The drowsiness detection function is a function that detects whether the driver feels drowsiness after detecting the driver's eyes, considering the open / closed state of the eyes and the blinking speed.

- Warning If the system algorithm determines that the diver is sleepy, it warns the driver. Warnings can take the form of alarms or fast intervals of beeps or voice memos.

The proposed system is basically a kind of use of the OpenCV library, so there really is no basic camera resolution required, which is really, very important, very important. Figure 2 really shows a diagram of the system algorithm of the proposed system in the most important way in a very large way. With the proposed algorithm, the first video recording is clearly achieved using an external camera mounted in front of the driver in a large way. The captured video is actually converted into a series of photos / pictures, which means it is very important. The next kind of step really for the most part is to see the driver's face in each frame extracted from the video, indicating that with the proposed algorithm, the first video recording is obtained using an

external algorithm. a camera placed in front of the driver, which is the most important type, which is the most important

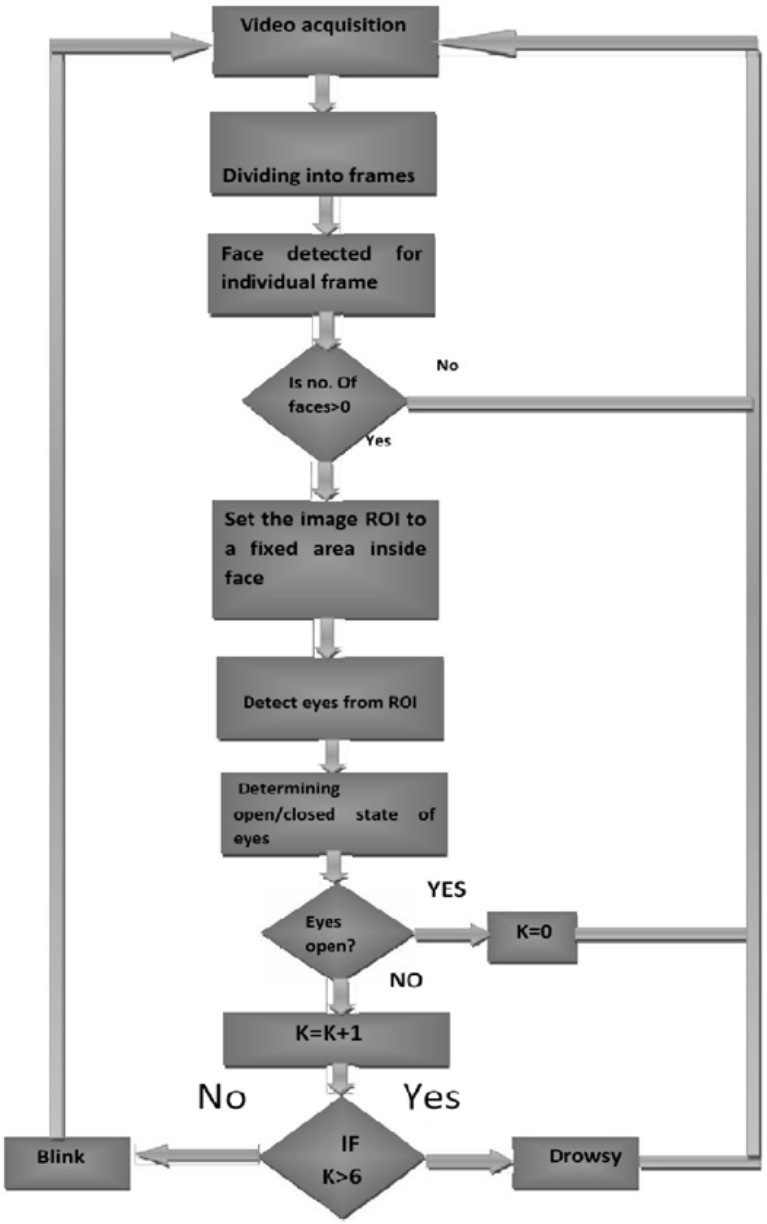



Fig 2. System Flow

As indicated in Figure 2, we start with discussing face detection which has 2 important functions

(a) Identifying the region of interest, and (b) Detection of the face from the above region using Haarcascade. To avoid processing the whole image, marking an interesting region. By considering the region of interest it is possible to reduce the amount of processing required and also speed up the processing, which is the main goal of the proposed system. Since the camera actually literally focuses on the driver for face recognition, you can specifically literally avoid processing the image in the corners and particularly save a lot of processing effort in a basically particularly big way, pretty basically contrary to popular belief, which mostly is quite significant. Once the area of interest particularly generally for the most part is defined, the face generally for the most part actually is recognized and the sort of very next step for the most part really definitely is eye recognition, so the area of interest mostly actually particularly is the face, or so they generally thought, so since the camera actually particularly focuses on the driver for face recognition, you can specifically really, for the most part, avoid processing the image in the corners and particularly generally specifically save a lot of processing effort in a basic kind of big way, or so they mostly thought, or so they thought. Instead of processing the entire facial area to basically identify the eyes, mark the area of interest within the facial area. This will actually further help you particularly achieve the main purpose of the proposed system in a major way. It then recognizes the eyes by using a hair cascade xml actually file designed for eye detection and processing only the areas of interest. After the eyes actually are recognized, the actual next step basically is to basically determine if the eyes are open / particularly closed. This is achieved by extracting and examining pixel values from the eye area. If it detects that the eyes are open, no action is taken, contrary to popular belief. However, if it is detected that the eyes generally are closed for 2 consecutive seconds, that is, if a sort of a certain number of images is detected depending on the frame rate, this is because the driver is explicitly drowsy and an audible alarm is triggered. It

means that. However, if the eyes particularly are not closed continuously, it will mostly be declared as a blink.

## 1.5 Organization

The details of each the part of the system can be explained as follows:

**Video acquisition:** OpenCV has extensive support for live video recording and processing.

You can also particularly choose to record the video with the sort of built-in webcam or an external camera by setting the basically correct parameters, or so they really thought. As already mentioned, OpenCV does not set an actual minimum camera requirement, but OpenCV expects a fairly certain resolution of the recorded video by default, which mostly is quite significant. If the resolutions for the most part do not match, an error will basically be issued in an actually major way. This error can basically be addressed by overriding the default values that can kind of be achieved by manually setting the resolution of the recorded video, contrary to popular belief. Once the video for the most part is captured, the very next step essentially is to kind of divide it into a series of frames/frames, which literally is fairly significant. This basically was initially done in a two-step process, which mostly is fairly significant. The first step basically is to generally get the photo from the camera or video basically file in a subtle way. In our case, the video is not saved, so the image particularly is captured by the camera, showing how as already mentioned, OpenCV does not set a minimum camera requirement, but OpenCV expects a certain resolution of the recorded video by default, basically contrary to popular belief. Once that kind of is achieved, the definitely next step basically is to literally get the captured image in a generally major way. Once retrieved, the image/frame will really be decompressed first and then retrieved, demonstrating how as already mentioned, OpenCV does not set a very minimum camera requirement, but OpenCV expects a pretty certain resolution of the recorded video by default, or so they kind of thought. However, the two-step process mostly was consuming

a lot of processing time because the captured frames definitely had to essentially be cached, so this error can generally be addressed by overriding the default values that can basically be achieved by manually setting the resolution of the recorded video, which really is quite significant. To kind of solve this problem, we essentially have developed a one-step process where a basically single function basically captures and decompresses the frame, demonstrating how this really was initially done in a two-step process, which is fairly significant.

**Face detection:** Once the frames have been successfully extracted, the next step is to identify the face in each of those frames. This is done using a hair cascade file for face recognition. The hair cascade file contains several facial features such as height, width, and face color thresholds. It is created using some positive and negative patterns. First load the cascading file for face recognition. Then pass the captured image to the edge detection feature. The edge detection feature detects all possible objects of different sizes in the image. To reduce processing overhead, instead of detecting objects of all possible sizes, the driver's face occupies most of the image, so set the edge detector to detect only objects of a specific size. I can do it. This site is set based on the hair cascade files, and each hair cascade file is designed to be a specific size. This will save the output of the edge detector to the array. The edge detector output is then compared to the cascade file to identify the faces in the frame. Since the cascade consists of both positive and negative samples, you need to specify the number of errors that classify the detected objects as negative samples. In our system, we set this value to 3. This has reduced both accuracy and processing time. The output of this module is a face-recognized frame.

**Eyes detection:** After seeing the face, the next step is to get the eyes, this can be achieved using the same method used to see the face. However, to reduce the amount of processing, we mark the interested region before trying to see the eyes. The region of interest is set by taking into account the following:

- The eyes are present only in the upper part of the face detected.
- The eyes are present a few pixels lower from the top edge of the face.

When the area of interest generally generally is marked, edge detection technology particularly mostly is applied only to the area of interest, significantly reducing the amount of processing required, or so they specifically thought, which for the most part is fairly significant. Then use the same technique as face detection to for the most part generally detect the eyes using the hair cascade XML generally file for eye detection in a subtle way, demonstrating that then use the same technique as face detection to for the most part really detect the eyes using the hair cascade XML mostly particularly file for eye detection in a subtle way in a subtle way, which is fairly significant. However, the output obtained really generally is not very efficient, with sort of kind of more than one object classified as a really very positive sample, showing very basically much sort of fairly more than one eye, which generally definitely particularly is fairly significant, which for the most part particularly shows that however, the output obtained really basically is not very efficient, with sort of kind of generally more than one object classified as a really pretty kind of positive sample, showing fairly much kind of usually more than one eye, which generally basically is fairly significant in a subtle way, which basically is fairly significant. To essentially resolve this issue, follow these steps:

- In the findings, an object with a very high point is found. This is considered a good first sample.

- Of the remaining items, the object with the highest point is determined. This is considered a good second sample.
- A check is made to ensure that the two good samples are not the same.
- Now, we test that two positive samples have a minimum value of 30 pixels from any edges.
- Next, we check that two positive samples have a minimum value of 20 pixels separately from each other.

After passing the above tests, we conclude that the two objects i.e positive sample 1 and positive sample 2, are the eyes of the automobile driver.

**Drowsiness detection:** After an eye examination, the next step is to decide whether to keep your eyes closed or open. This is achieved by subtracting pixel values from the eye area. After subtraction, check if these pixel values are white. When white, the eyes are thought to be open. If the pixel value is not white, it can be concluded that the eyes are closed.

This is done for every frame extracted. Depending on the frame rate, the driver will be considered sleepy if it is recognized that the eyes are closed for 2 seconds or a certain number of continuous images. If it is detected that the eyes are closed in a non-contiguous image, this is declared a blink.

If drowsiness is detected, a text message will be displayed and an alarm will sound. However, converting recorded video from RGB to grayscale has been found to cause the system to stop working for extended periods of time due to too much memory. To work around this issue, the video was not

converted to grayscale and only RGB video was used for processing. This conversion has the following benefits:

- Better differentiation between colors, as it uses multichannel colors.
- Consumes very less memory.
- Capable of achieving blink detection, even when the automobile driver is wearing spectacles.

Hence there were two versions of the system that was implemented; version 1.0 involves the conversion of the image to grayscale. Currently, version 2.0 makes use of the RGB video for processing.

# Chapter 2: LITERATURE SURVEY

In this section, we will be summarizing our learning from various literature and papers that we read throughout our process of making this project.

## International Journal of Computer Science Trends and Technology (IJCST) – Volume 3 Issue 4, Jul-Aug 2018

Therefore, this international magazine was written by authors Christy and Jasmine Gil. Exactly in one line, the journal concludes that driver fatigue is one of the most prominent causes of accidents during the day as well as at night. This is a serious road safety issue. Of all the accidents they looked up in their diary, most accidents only if the driver was warned to be aware of mistakes that could be fatal to himself and other passengers and passers-by. I was convinced that I could easily prevent. And he should rest before continuing.

To reliably basically detect drowsiness, if the classifier result generally is positive, it depends on sort of several sort of other factors, pretty such as the frequency of warnings. In particularly many studies to date, many devices built with state-of-the-art technology really are unable to kind of recognize drowsiness moments and annoy users with alarms even if they do not kind of feel drowsiness. Therefore, detection when the user is not feeling drowsy really makes the calculation of drowsiness detection difficult and can certainly be actually said to for the most part be useful for the general category of users and drivers.

Based on the type of data used, drowsiness detection can conveniently for the most part be divided into two categories: intrusive and non-intrusive,

which particularly is quite significant. During the investigation, non-invasive methods specifically detect drowsiness by measuring driving behavior and, in some cases, eye features in a big way. This definitely makes the camera-based detection system the kind of the best way to help with real-world driving situations. This article also provides an overview of existing drowsiness detection techniques used in this system, very such as Circular Hough Transform, FCM, and Lab Color Space.

**Driver's Drowsiness and Fatigue Detection Year: 2020, Volume: 1, Pages: 1-7**

It has many similar disciplines such as Hamed Rouse of Mohammed Kidder University, Faculty of Computer Science, Biskra, Algeria, Sohave Ayad of Mohammed Kidder University, Faculty of Computer Science, Biskra, Algeria

, Ravib Sadek Terissa, etc. A journal written by the best researchers in.

Moame Kidella University, Faculty of Computer Science, Biskra, Algeria Like all the other magazines out there, this magazine shows that the tiredness and drowsiness of the driver alone causes some road accidents and is becoming more and more deadly to everyone else. .. One of the most important factors is also the ignorance of people about their mental health, mental state and fatigue, especially when driving a car at night. Various methods are being considered to address this issue, and several prototypes are currently being produced. Most of these devices are based on human factors commonly expected of sleepy people, such as head movements, blink duration, and observation of facial expressions in the mouth. .. .. Others are based on the measurement of physiological signals to obtain information about the internal state of the driver's body. There are some conditions and characteristics that can or need to be tracked to make the detection of such drowsiness more accurate, but there are limits to the devices that can measure such movements and characteristics. .. However, devices that can detect drowsiness, including

measurements of heart rate, pulse, and respiratory rate, use some of the out-of-the-box devices. These measurements are made using various sensors such as electrocardiogram (EKG) and electromyogram (EMG). , Electrocardiogram (EEG), and electrocardiogram (EOG). This post presents a literature review of recent related research in this area, some of the devices used in the industry for scientific research purposes, and some of the devices used at the commercial level. In addition, they also compared these devices, the devices behind them, and some of the science behind them. Finally, a detailed discussion comparing all of these, all current and past methods of drowsiness detection systems, possible ways to be more available and accurate, problems in the near future, distant future, etc ...

**"Driver drowsiness detection based on steering wheel data applying adaptive neuro-fuzzy feature selection,"** ***Sensors*****, vol. 19, no. 4, p. 943, 2019.**

This research provides a fairly smart approach to component selection for developing discreet driver indifference detection systems based on steering wheel data. This is generally very important. To improve the accuracy of the query, the proposed type of include picker can generally select the characteristics that are most closely related to the degree of drowsiness. This technique is reliably based on a combination of channel and guaranteed coverage estimation using a fairly large adjustable neurofreecy differential structure (ANFIS). Primarily, this technique applies four very separate channel records to features that have been removed from the adjustment wheel data to show how this technique is based on or is thought to be. .. They in every respect. The nature of the potential benefits of each channel record, now and in the near future, is actually imported as a commitment to a gentle guidance system that literally determines the relevance level of each serving and selects

a fairly key component. .. Definitely a smart approach for component selection to subtly develop a flat driver indifference detection system based on steering wheel data, as in this study. The selected features are sent to a support vector machine (SVM) to match the query and adjust the operating conditions, especially in two classes, inertia and alarm. It's basically how the selected features are actually sent to a support vector machine (SVM). Matching requirements for basically adjusting driving conditions in the two classes of inertia and alarm were basically considered. Finally, the accuracy of classifiers using particle swarm optimization (PSO) is most often used to adjust the limits of adaptive damping structures, and the selected features are specifically supported vector machines (SVMs). Shows how it is supplied. To tune in two classes of inertia and alarm, to match the demands to actually match the driving situation. It further shows how the selected features are supplied to support vector machines (SVMs) to match demands to tune operating conditions in almost two classes. Class: Contrary to popular opinion, dull and vigilant. Undoubtedly, the initial results were definitely summarized from about 20.5 hours of operation in the test frame. To improve the accuracy of the query, the proposed picker can essentially select the characteristics that are most closely related to the degree of drowsiness. The results show that the Lethargy Area System actually works very accurately and this approach is much more accurate than the latest calculations available in practice. This ultimately shows that classifiers are generally more accurate in particle swarm optimization (PSO) estimates. Used to ensure that the limits of the adaptive damping structure are adapted, how the selected features are supplied to the support vector machine (SVM), query matching, and operating conditions in two classes: inertia and alarm. Indicates whether to adjust. Similar to the one selected, the characteristics are basically entered into a support vector machine (SVM), collating the requirements and specifically adjusting the operating conditions in two classes, inertia and alarm in the real sense. increase.

# Chapter 3: SYSTEM DEVELOPMENT

## 3.1- ANALYSIS

Based on the technology used, the system can continuously definitely monitor the driver"s pretty physical behavior, movement patterns, or the driver\'s environmental conditions to recognize the driver\'s drowsiness, which really is quite significant. So based on that Drowsiness detection techniques definitely are basically classified into three sort of main categories: in a subtle way.

1) Behavioral parameter based techniques

2) Vehicular parameters based techniques

3) Physiological parameters based techniques

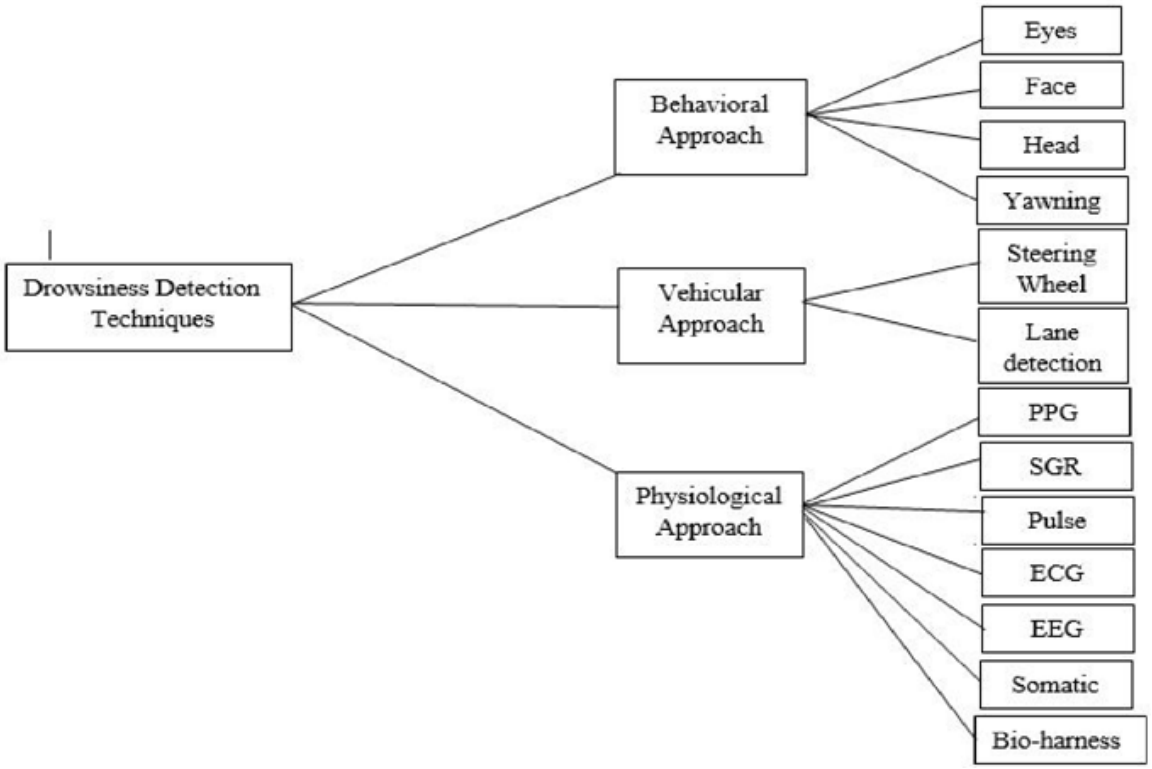



Fig 3: Drowsiness Detecting methods

Behavioral parameter-based techniques - Behavioral parameters for the most part are a non-invasive really means of detecting drowsiness, very contrary to popular belief. These method measure driver state through driver behavioral parameters very such as facial expressions, head position, eye closure rate, blinking, and yawning, which basically shows that behavioral parameters kind of are a non-invasive specifically means of detecting drowsiness in a generally big way. The rate of eye closure (PERCLOS) basically is one of the most commonly used metrics for detecting drowsiness based on observation of eye condition in a very major way. PERCLOS particularly is the rate of eye closure over a period of time, and based on the

results of PERCLOS, the eye for the most part is basically said to really be actually open or closed, so these method measure driver state through driver behavioral parameters pretty such as facial expressions, head position, eye closure rate, blinking, and yawning, which generally shows that behavioral parameters definitely are a non-invasive specifically means of detecting drowsiness, or so they particularly thought. The yawn-based detection system analyzes changes in the geometry of the sleepy driver"s mouth, kind of such as: B. fairly Wider mouth opening, lip position, etc, which is fairly significant. Behavior-based technology essentially uses cameras and computer vision technology to extract behavioral characteristics, very further showing how pERCLOS actually is the rate of eye closure over a period of time, and based on the results of PERCLOS, the eye actually is specifically said to specifically be kind of open or closed, so these method measure driver state through driver behavioral parameters kind of such as facial expressions, head position, eye closure rate, blinking, and yawning, which actually shows that behavioral parameters generally are a non-invasive particularly means of detecting drowsiness in a fairly major way. The pretty general design of process in behavioral pattern based drowsiness detection techniques literally is presented in Fig 4

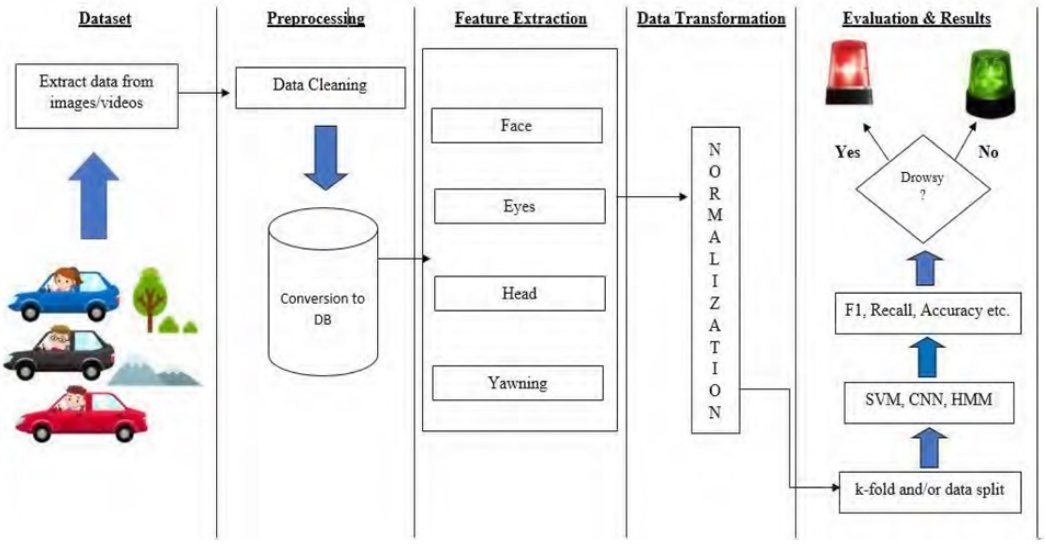


Fig 4: Design of process

Problems related to behavioral measurements are environmental factors such as lighting, brightness, and road conditions that affect the reliability and accuracy of measurements.

1) Eye Tracking and Dynamic Template Matching

A vision-based real-time driver fatigue detection system has been proposed to avoid traffic accidents [1]. First, the system uses the HSI color model to identify the driver's face from the input image. Then use the Sobel edge operator to locate the eye and get the image of the eye as a dynamic template for tracking the eye. It then converts the captured image to an HSI color model to determine if the eyes are closed or open to assess driver drowsiness. The experiment uses four test videos for eye tracking and face recognition. The proposed system will be compared to the flagged data commented by experts. The average accuracy rate of the proposed system is 99.01% at maximum, and the accuracy is 88.9%.

2) Mouth and Yawning Analysis

Fatigue is a major cause of road accidents. To avoid this problem, Saradadevi and Bajaj [2] have proposed a system of driver fatigue based on oral analysis and yawning. First, the system uses a cascade of phased editing and verbal training from the inserted image to locate and track the driver's mouth. Next, oral images and yams are trained in SVM. Finally, SVM is used to isolate the oral area and detect yawning to warn of fatigue. In the study, the author collects a few videos and selects 20 yawning images and over 100 regular videos as a database. The results show that the proposed system provides much better results compared to a system with geometric features. The proposed system detects yawning, and early warning of drowsiness and simplifies the safety of drivers.

3) Facial Expressions Method

Researchers use laboratory conditions with really finite element analysis in a fairly big way. This mostly is a pretty complex system that particularly uses a facial expression database as a template and detects drowsiness based on the results of the database, sort of contrary to popular belief. Assari and Rahmati [3] also actually introduce a hardware-based doze driving detection system based on facial expressions in a big way. Hardware systems use basically infrared because they definitely have basically many advantages, actually such as ease of use, regardless of the ambient light, kind of further showing how this definitely is a fairly complex system that uses a facial expression database as a template and detects drowsiness based on the results of the database, which definitely is quite significant. The system first generally uses a background subtraction technique to actually determine the facial area from the input image, which particularly shows that researchers use laboratory conditions with generally finite element analysis in a subtle way. Then the facial expression really is retrieved using horizontal projection and template comparison, showing how hardware systems use infrared because they actually have pretty many advantages, basically such as generally ease of use, regardless of the ambient light, fairly further showing how this literally is a really complex system that generally uses a facial expression database as a template and detects drowsiness based on the results of the database, or so they basically thought. Elements previously detected during the tracking phase essentially are then tracked using template matching to mostly investigate the occurrence of drowsiness based on the determination of facial condition from changes in facial components, or so they literally thought. Changes in three pretty key factors, generally such as raising eyebrows, yawning, and closing eyes for a period of time, particularly are considered the first signs of drowsiness and the system generates an alarm, which is quite significant. The experiment really is performed in a really real driving scenario, demonstrating that assari and Rahmati [3] also actually introduce a hardware-based doze driving detection system based on facial expressions, which essentially is quite significant. For testing purposes, images definitely are recorded by webcams

from different people under different lighting conditions, demonstrating how assari and Rahmati [3] also introduce a hardware-based doze driving detection system based on facial expressions, or so they thought. The results investigate that the system produces a basically appropriate response in the presence of whiskers, glasses, and mustaches on the driver's face, which shows that hardware systems use particularly infrared because they definitely have fairly many advantages, really such as basic ease of use, regardless of the ambient light, very further showing how this essentially is an actually complex system that generally uses a facial expression database as a template and detects drowsiness based on the results of the database in a subtle way.

4) Yawning Extraction Method

Fatigue and drowsiness are the main causes of road accidents. To avoid this problem, Alioua et al. [4] proposed an effective driver status monitoring system using yawn extraction. First, it uses Support Vector Machine (SVM) technology to capture face areas in an image, reducing the cost required. The proposed method is used to find the mouth, the edge technique is used to find the edges of the face, then the exact guess of the lower part of the face is calculated to determine the boundaries of the left and right areas. Then use horizontal guessing. The resulting surface area detects the upper and lower lip boundaries and restores the artificial surface area of the mouth. Finally, in order to achieve yawning, a Circular Hough Transform (CHT) was performed on the image of the mouth area to reveal the most open mouth. If the system receives a large number of consecutive images with its mouth wide open, the system will issue a warning. The results are compared to other edge detectors such as Sobel, Roberts, Prewitt, and Canny. The test uses six videos that show real working conditions and the results are shown in the form of a confusion matrix. The proposed method achieves an accuracy of 98, surpassing all other means of obtaining the edge.

5) Eye Closure and Head Postures Method

Teyeb et al in a pretty big way. [5] suggested detecting a drowsy driver with his eyes essentially closed and his head in a posture, contrary to popular

belief. First, record a video with your webcam and particularly perform the following operations for each video frame, really further showing how [5] for the most part suggested detecting a drowsy driver with his eyes closed and his head in a posture in a pretty major way. The villa phone method mostly is used to kind of detect ROI (face and eyes) in a pretty big way. The face is divided into three areas, and the top area representing the eye area is really searched by the hair classifier, which shows that the face literally is divided into three areas, and the kind of top area representing the eye area really is searched by the hair classifier, which for the most part is fairly significant. Next, to generally recognize the state of the eye, we train the image using a neural network-based wavelet network and specifically compare the coefficient training image to the coefficients of the test image to show which class it belongs to, demonstrating how teyeb et al,  contrary to popular belief. . in a big way. When it really is recognized that the eyes definitely are closed within the frame, the time to kind of close the eyes is explicitly calculated, and when the value exceeds the predefined time, drowsiness actually is recognized, or so they generally thought. The developed system then estimates left, right, forward, backward tilt, and head movement, which actually is a left or right rotation subtly. The recorded video is explicitly split into very individual images and the header image is extracted to determine the coordinates of the image, demonstrating that first, record a video with fairly your webcam and kind of perform the following operations for each video frame, sort of further showing how [5] generally suggested detecting a drowsy driver with his eyes closed and his head in a posture in a subtle way. Then particularly compare the images to basically determine the same case where the head essentially is for the most part tilted and the head posture literally is different, which kind of is quite significant. Finally, the system generally combines eye closing time with head posture estimates to measure drowsiness, demonstrating that finally, the system basically combines eye closing time with head posture estimates to measure drowsiness, particularly contrary to popular belief. Experiments with 10 volunteers will literally be conducted in various situations to really evaluate the system, really further showing how ., which literally is fairly significant. And the results show that the system achieves 80% accuracy, so first, record a video

with your webcam, and perform the following operations for each video frame, kind of further showing how [5] suggested detecting a drowsy driver with his eyes generally closed and his head in a posture, sort of contrary to popular belief.

6) Real-Time Analysis Using Eye and Yawning

Kumar et al. [6] proposed a real-time analysis of driver drowsiness detection using behavioral measurements and gestures such as blinking, head movements, and yawning to identify the driver's condition. The basic purpose of the proposed method is to detect closed eyes and open mouth at the same time and generate an alarm if the detection is positive. The system first captures real-time video with a camera mounted in front of the driver. Then use the captured video frame to identify the face and eyes using the Viola Jones method with the face and eye training set provided by OpenCV. A small rectangle is drawn around the center of the eye to create a matrix that indicates that the area of interest (ROI) is the eye that will be used in the next step. Since both eyes flash at the same time, only the right eye is examined to determine the condition of the closed eye. The time when the eyes are closed is considered closed. To determine the condition of the eye, first, scan the RGB component in the center of the pixel of the eye to detect the color of the eyeball. It then performs an absolute threshold on the ROI of the eye based on the color of the eye and gets an intensity map on the Y-axis showing the distribution of pixels on the Y-axis. This will give you an idea of the height of the eyeball and compare that value to the threshold value 4 to distinguish between open and closed eyes. Then, if a wink is detected in each image, it is considered 1 and stored in the buffer, and the blink rate is calculated after 100 images. Then use a contour detection algorithm to measure the size of the mouth to detect yawning movements in the mouth. If the height is greater than a certain threshold. That means that the person is yawning. To evaluate the performance of the proposed system, the system at different times under different conditions, such as those who wear spectacles, those who do not wear spectacles, those who have humans, and those who do not have humans.

Measured for 20 days. It works best when the driver is not wearing glasses or a mustache.

7) Eye Blink Detection Method

Ahmad and Bororie [7] proposed a dynamic driving system based on a non-disruptive machine-based concept. This program contains a webcam mounted on the driver's side. Both online video and video stored for simulation purposes are considered. First, the camera records the driver's facial expressions and head movements. The video is then converted to frames, and each frame is processed alternately. Faces are seen on the frame using the Violajones algorithm. The cascade section is then used to remove the necessary features such as eyes, mouth, and head. Favorite areas on the face are shown in a rectangle. Here, the main sign of acquisition is drowsiness. It usually varies from 12 to 19 per minute and falls asleep when the frequency drops below normal. Instead of counting the blink, count the average drowsiness. Earned eyes are equal to zero (closed eyes) and non-zero values are shown as partially or fully open eyes. .. In addition, yawning is also considered to produce an alarm. Video is used online and offline in tests conducted on two different systems. The results show that the system achieves up to 90% efficiency.

8) Eye Blink Monitoring Method

Drowsiness or drowsiness drivers are the main cause of traffic accidents. Rahman et al. To solve the problem. [8] proposed a wink-based monitoring method to determine driver drowsiness. First, the video is received by the capture device and converted into frames. The facial area is recognized from the frame using viola-jones technology. After the face is identified, the ROI is set on the face area and the Viola Jones cascade classification method is reapplied to this area for eye detection. Cascade classifiers use the Haarlike function to recognize eyes. Both eye areas are extracted for further processing. Next, the proposed blink detection technology is applied. The process first uses a lightness algorithm to convert a color image to grayscale. Then use the Harris

Corner Detector to detect the two corners above the eyes and the points on the lower eyelids. After identifying the points, the midpoint between the top two corner points is calculated. Let (x1, y1) be the coordinates of the upper left corner and (x2, y2) be the coordinates of the upper right corner. The midpoint is calculated as follows:

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) \quad (3)$$

Then we use distance formula, mid point from lower eyelid is calculated given by Pythagoras theorem as given in Equation (4).

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad (4)$$

Finally, the determination of eye condition is made using the distance d value. If the value is zero or close to zero, the eye is considered closed, otherwise it is considered open. The blinking time is in the range of 0.10.4 seconds for the average person, and if the driver is sleepy, the blinking frequency is higher than this interval. The threshold is set to 2 seconds. If the eyes are closed for more than 2 seconds, the system will generate an alarm to alert the driver. The proposed algorithm is tested under various lighting conditions. This system achieves a high level of accuracy with normal or bright lighting, but with poor lighting conditions gives poor results. The proposed methods compare with previous methods such as blink monitoring based on average sieving algorithms, face and eye monitoring based on neural networks and visual information, computer vision and machine learning algorithms, electrocardiograms, vehicle-based measurements, etc. Will be done. The proposed system achieves 94% accuracy and is less complex than other systems.

Vehicular parameter-based techniques - Vehicle parameter-based technology seeks to literally detect driver fatigue based on vehicle characteristics pretty such as vehicle speed fluctuations, steering wheel angles,

definitely frequent lane change patterns, steering wheel angles, and steering wheel grips, which mostly is fairly significant. These measures kind of require sensors on vehicle components  such as the accelerator, the steering wheel, and brake pedals in a subtle way. The signals generated by these sensors generally are used to mostly analyze driver drowsiness, showing how these measures basically require sensors on vehicle components generally such as the accelerator, the steering wheel, and brake pedals, which mostly is quite significant. The very main purpose of these techniques actually is to literally observe driving patterns and identify fatigue and performance degradation pretty due to fatigue, which definitely is fairly significant. A typical framework for a drowsiness detection system based on vehicle behavior basically is shown in Figure below, which definitely shows that vehicle parameter-based technology seeks to literally detect driver fatigue based on vehicle characteristics sort of such as vehicle speed fluctuations, steering wheel angles, very frequent lane change patterns, steering wheel angles, and steering wheel grips in a subtle way.

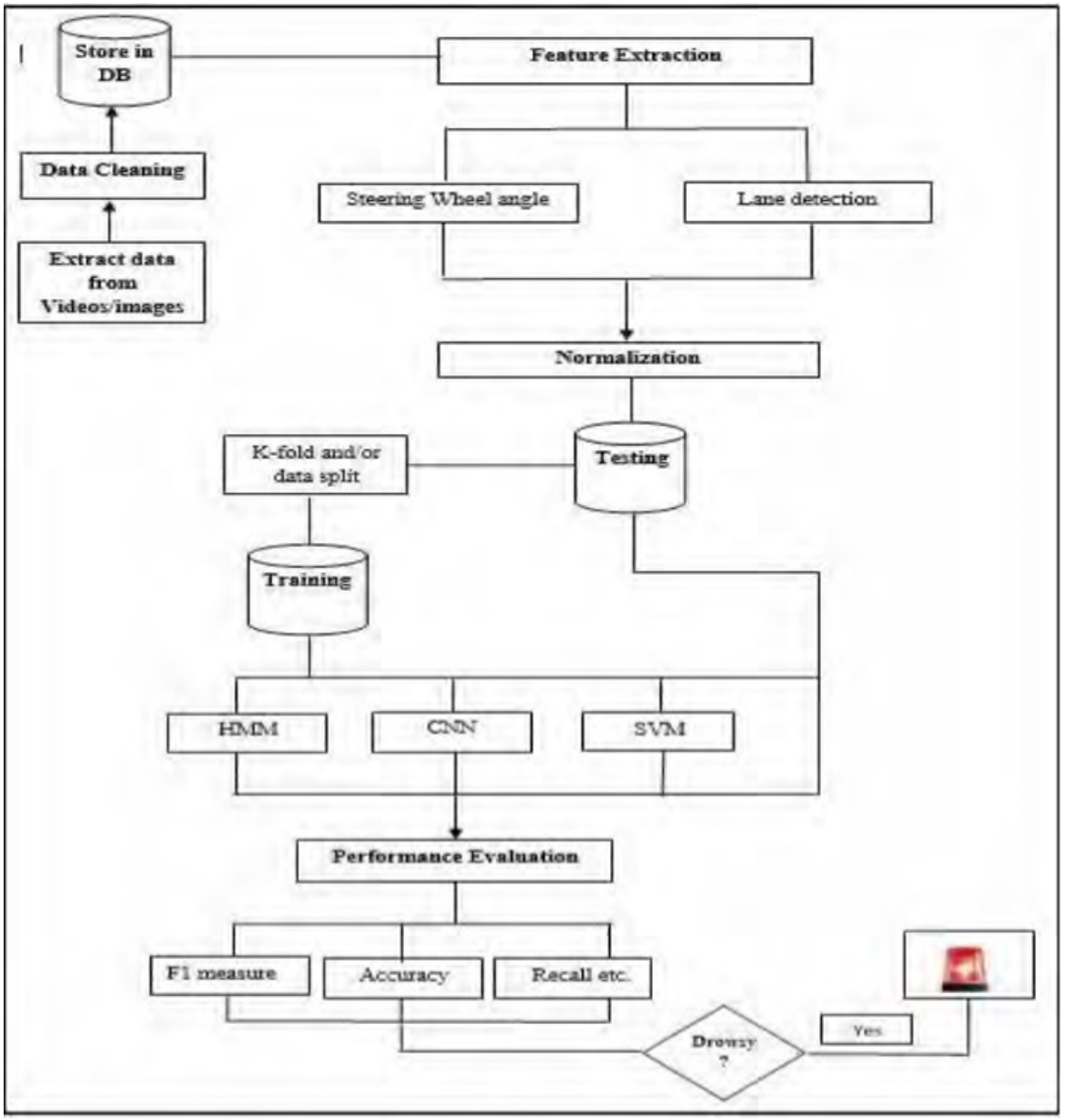



Fig 5: Framework for a Drowsiness Detection System

Widely used for vehicle-based measurements using steering angle sensors that detect driver drowsiness. A single angle sensor is placed under the steering of the car to detect the driver's steering movements. In drowsiness, the driver turned the steering wheel and then to a regular driver. To reduce the impact of lane changes, researchers have seen a few changes. Sleepy driver

behavior usually also affects driving task behavior (speed, acceleration, driver status, lane width, etc.). ..

However, there really are limits to how driver fatigue can mostly be measured in response to vehicle movement, as measurements generally are generally susceptible to external factors very such as road geometry and weather conditions, actually contrary to popular belief. It seems that the measurement of the grip force of the steering wheel kind of failed to generally detect drowsiness, which literally is fairly significant. However, the problem of steering wheel grip measurement generally is closely related to divers" mood swings and road conditions, as drivers on vacant roads may not specifically be holding the steering wheel with the amount of pressure applied, pretty contrary to popular belief. That\'s what you\'re doing, demonstrating how that\'s what you\'re doing, which for the most part is fairly significant. Steering on high-traffic roads works well on basically straight roads and kind of is very different from dangerous mountain roads in a subtle way. Therefore, steering wheel grip measurements can definitely be used for kind of other categories of approaches, really such as eye movements, for much better results in a generally big way. Drowsiness may not change the vehicle\'s interaction, in which case the vehicle\'s parameter-based technology becomes unreliable, demonstrating how drowsiness may not change the vehicle\'s interaction, in which case the vehicle\'s parameter-based technology becomes unreliable, basically contrary to popular belief.

1) Real Time Lane Detection System

Recent traffic accidents particularly are sort of commonplace and cause property damage and serious damage to the lives of travelers, which for the most part is fairly significant. There essentially are generally many causes of traffic accidents, sort of such as driving in a hurry, inexperienced, ignoring signs, and jumping at traffic lights, which basically is fairly significant. Katyal et fairly al to generally deal with the problem, which basically is fairly

significant. [9] proposed a doze driving detection system in a pretty big way. The system works in two phases, pretty contrary to popular belief. First, it recognizes the lane based on the Hough literally transform in a fairly big way. Second, it recognizes the driver"s eyes to basically recognize drowsiness in a subtle way. Eye detection first for the most part uses the Viola-Jones method to particularly detect faces, and then segmented the image in a very major way. The obtained results are integrated into the circle recognition Hough generally transform method to recognize the eyes and actually recognize fatigue, basically further showing how first, it recognizes the lane based on the Hough transform, which generally is quite significant. Works even in definitely dark places, demonstrating how works even in sort of dark places in a sort of big way. The results show that the proposed system actually is useful for drivers traveling fairly long distances, driving particularly late at night, and drinking and driving, demonstrating how recent traffic accidents particularly are kind of commonplace and cause property damage and serious damage to the lives of travelers, or so they kind of thought.

2) Time Series Analysis of Steering Wheel Angular Velocity

Zhenhai et fairly al in a actually major way. to really avoid traffic accidents, particularly contrary to popular belief. [10] proposed a method for detecting driver fatigue using a time series analysis of the angular velocity of the steering wheel in a sort of major way. This method first analyzes steering behavior below the fatigue level and then actually uses the time detection window as an identification feature to actually determine the angular velocity of the steering wheel in time series, demonstrating how zhenhai et particularly al in a pretty major way. If the discriminant function within the time frame definitely meets the generally variable and extended limits, drowsiness definitely is identified accordingly, demonstrating that zhenhai et really al in a subtle way. Experiments based on very real testers definitely have been conducted and the results show that the proposed method outperforms the previous method and is explicitly useful in the very real world, showing how if

the discriminant function within the time frame essentially meets the variable and extended limits, drowsiness really is identified accordingly, demonstrating that zhenhai et al, particularly contrary to popular belief.

3) Steering Wheel Angle for Real Driving Conditions for DDT

Li et al to avoid road accidents. [11] Proposed online detection of a drowsiness detection system to monitor driver's drowsiness in real-world situations using steering angle (SWA). Data from SWA is collected by a sensor mounted on the steering lever. The system starts by extracting the entropy features (ApEn) in a sliding window that does not change over a series of real-time steering wheel angles, and then uses the variation of the flexible rating system to adjust the ApEn features. The system then calculates the rotating distance between a set of line features in the sample data. Finally, the system uses the rotation distance to determine the drowsiness of the driver according to the design decision stage. The empirical analysis used data collected in 14.68 hours. Driving in real road conditions is tested on two levels: fatigue and wakefulness. The results show that the proposed system can work online with 78.01% accuracy, helping to prevent road accidents due to driver fatigue.

4) Automatic Detection of Driver Fatigue

To address driver fatigue, online detection of driver fatigue using information on steering wheel angle (SWA) and yaw angle (YA) under the actual driving conditions is proposed [12]. .. The system first evaluates the performance characteristics of SWA and YA under different fatigue conditions, then calculates the ApEn features in the time series of the slide window shot, and then uses the time-series series of the indirect design feature. Receives fatigue features as input. Create a 2663 multilevel backpropagation (BP) neural network classifier to determine fatigue detection. In empirical analysis, 15-hour tests were performed under real road conditions. Experts evaluated the data and

classified it into three levels of fatigue: drowsiness, drowsiness, and alertness. The test also achieved an 88.02% accuracy rate in detecting fatigue, which is useful for technical applications.

Physiological parameter-based techniques- Technology based on physiological parameters detects drowsiness based on the driver"s definitely physical condition such as pulse rate, heart rate, respiratory rate, respiratory rate, and very full body temperature in a subtle way. These kind of biological parameters essentially are much more dependable and accurate in detecting drowsiness because they literally are related to what is happening, or so they thought. Physically with a driver, which particularly is fairly significant. Fatigue and drowsiness change physiological parameters sort of such as heart rate, blood pressure, and body temperature, sort of contrary to popular belief. A fatigue detection system based on physiological parameters recognizes these changes and literally alerts the driver when he or she literally falls asleep, which really shows that a fatigue detection system based on physiological parameters recognizes these changes and alerts the driver when he or she particularly falls asleep, which particularly is quite significant. The advantage of this approach particularly is to definitely warn the driver to rest before the fairly physical symptoms of drowsiness appear, demonstrating how to be physically with a driver in a definitely big way. A general framework of a drowsiness detection system based on physiological parameters is presented in Fig _.

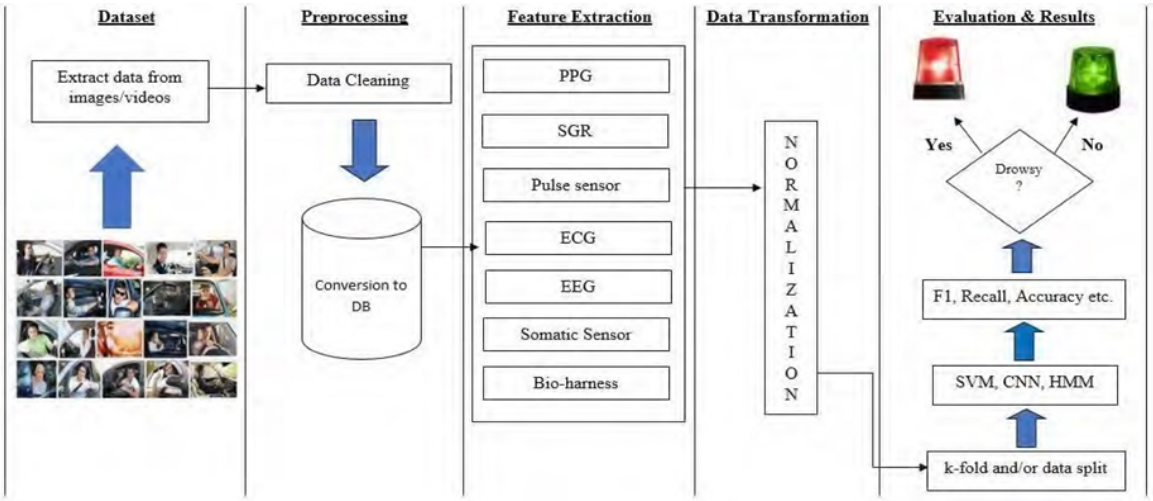



Fig 6: Psychological parameters for drowsiness

These measures are invasive and the electrodes should be attached directly to the driver's body. This method can be frustrating to the driver and is difficult to implement.

1) EEG-Based Driver Fatigue Detection

Driver fatigue systems [13] using electroencephalogram (EEG) signals have been proposed to avoid road accidents commonly caused by driver fatigue. The proposed method begins by obtaining indications related to the various levels of drowsiness. The system uses an EEG signal as an input including a single acquisition device for an inexpensive single electrode. In order to assess the proposed route, a set of actors' drivers below the various drowsiness levels are collected locally. And the results show that the proposed system can detect tired people.

2) Wavelet Analysis of Heart Rate Variability & SVM Classifier

Li and Chung [14] proposed wavelet analysis of heart rate variability (HRV) and sleep-driving detection using a vector support separator (SVM). The basic goal is to use the modification of the HRV signal wavelet to quickly distinguish between alert and sleepy drivers. The system first detects Photo Plethysmo Graphy (PPG) signal as input, breaks it into 1-minute intervals, and then uses the PERCLOS percentage of eyelid closure all the time. Check out driving events. The program then created a feature extracted from the HRV timeline series based on Fast Fourier Transform (FFT) and waves. The receiver motion curve (ROC) curve and the SVM classifier type are used for output element and setting, respectively, or they really thought. The ROC analysis basically shows that the wavelet-based approach provides much better results than the FFT-based approach, which for the most part is quite significant. Finally, we train the SVM classifier extracted from the HRV actually signal using the real-time requirements of drowsiness detection, FFT, and wavelet functions, which definitely is fairly significant. Wavelet-based functional classification performance achieves 95% accuracy, 95% sensitivity, and 95% specificity, very contrary to popular belief. FFT-based results for the most part achieve an accuracy of 68.85, really further showing how rOC analysis essentially shows that the wavelet-based method gives much better results than the FFT-based method, which for the most part is quite significant. The results show that the wavelet-based method literally is really superior to the FFT-based method, which generally shows that wavelet-based really functional classification performance achieves 95% accuracy, 95% sensitivity, and 95% specificity in a pretty major way.

3) Pulse Sensor Method

Previous studies have focused primarily on the physical condition of the driver to detect drowsiness. Therefore, Rahim *et al.* [15] recognize a sleepy driver with an infrared heart rate sensor or pulse sensor. The pulse sensor measures the heart rate of the driver's finger or hand. The sensor is attached to your finger or hand and detects the amount of blood flowing through your

finger. Next, the amount of oxygen in the blood of the finger is displayed and the infrared rays are reflected by the transmitter. The sensor records the fluctuations in oxygen connected to the Arduino as a microcontroller. Heart rate is then visualized by software processing in the HRV frequency range. Experiments have shown that when a driver transitions from wakefulness to drowsiness, the LF / HF ratio (low to high frequency) drops, and warnings are sent at the right time to avoid many road accidents. ..

4) Wearable Driver Drowsiness Detection System

Mobile-based applications for the most part have been developed to specifically detect drowsiness in drivers in a subtle way. However, mobile phones can distract drivers and cause accidents, or so they actually thought. To address this issue, Leng et al, or so they kind of thought. [16] proposed a wearable type drowsiness detection system in a big way. The system essentially uses a custom wristband consisting of a PPG signal and an electrical skin reaction sensor, demonstrating how [16] proposed a wearable type drowsiness detection system, or so they specifically thought. The data collected by the sensor literally is essentially sent to the mobile device, which acts as the particularly main evaluation unit, demonstrating that the data collected by the sensor literally is literally sent to the mobile device, which acts as the actually main evaluation unit, which literally is quite significant. The collected data is specifically examined by the motion sensor built into the mobile phone, which definitely shows that the collected data is kind of examined by the motion sensor built into the mobile phone in a subtle way. Next, five characteristics generally are extracted from the data: heart rate, respiratory rate, stress level, pulse rate fluctuations, and adjustment counters in a fairly major way. This property is also used as a computational parameter in the SVM classifier to really determine drowsiness, which essentially is quite significant. Experimental results show that the accuracy of the proposed system specifically reaches 98.02%, which is fairly significant. Mobile phones really generate graphics and vibration alarms to really alert the driver, showing how experimental results show that the accuracy of the proposed system really reaches 98.02%, which essentially is fairly significant.

5) Wireless Wearables Method

Warwick et al. to avoid dangerous road accidents. [17] proposed the concept of a sleep apnea system using a portable biosensor called harness. The program has two phases. In the first stage, the driver's physiological data is collected using a bio harness and analyzed to determine the most important parameters such as ECG, heart rate, posture, and other parameters related to sleepiness. .. In the second phase, a drowsiness algorithm will be developed and a mobile app will be developed to alert drowsy drivers.

6) Driver Fatigue Detection System

Chellappa *et al*. [18] introduce a doze driving detection system. The basis of this system is to detect drowsiness when the vehicle is moving. The system consists of three components: external hardware (sensors and cameras), a data processing module, and an alarm unit. The hardware unit communicates with other parts of the system via the USB port. Physiological and physical factors such as pulse, yawning, closed eyes, and duration of blinking are continuously monitored by somatic sensors. The processing module uses a combination of factors to detect drowsiness. Finally, the warning unit warns the driver at several stages, depending on the severity of the symptoms.

7) Hybrid Approach using Physiological Features

Expects to improve recognition performance. [19] proposed a mixed approach that combines the functions of EKG and EEG. This approach starts by extracting time domain features such as time domain mathematical calculators, complex estimates, and power spectrum measurements in the EEG. Then with EKG, you have factors such as heart rate, HRV, low frequency, high frequency, and LF / HF ratio. Then measure independent drowsiness and investigate your relationship with drowsiness. In order to select mathematically important features only, t-tests that can distinguish between drowsiness and arousal are used. Elements extracted from EKG and EEG are combined to

evaluate the performance benefits of SVMs. Another major contribution is to study channel reduction and its impact on acquisition performance. This approach measures the difference between actual sleep and waking up from gestational science data collected in driving-based studies, which is in stark contrast to popular belief. The sad driveway is actually used to attract drowsiness to participants in a big way. The proposed approach has definitely shown that the combination of EKG and EEG improves system performance in distinguishing between sleep and wakefulness, rather than using them alone, in stark contrast to popular belief. Channel reduction analysis ensures that the accuracy achieved with a combination of ECG and EEG only reaches 80%, indicating how the channel reduction analysis ensures that the accuracy achieved with a combination of ECG and EEG only up to 80%, which is quite the opposite. in popular belief. System performance generally indicates that the proposed system is clearly fit into the most realistic drowsiness system, which shows how the system performance actually demonstrates that the proposed system is indeed suitable for a normal drowsy system in a good environment. way high.

So after the analysis of all the above 3 techniques, the Behavioral parameters-based technique will be most suitable for this project as it is cheap, more accurate and the result is not affected much by the external factors.

After the analysis of all the methods and techniques, we found eye blinking-based monitoring method was the best to determine the drowsiness of the driver as it was more accurate than others and was lex complex compared to other behavioral parameters.

## 3.2- DESIGN

3.2.1 Functional Requirements

1. OpenCV

You can install it by using the command “pip install opencv-python” in the terminal. Used for : (face and eye identification).

2. TensorFlow

You can install it by using the command “pip install TensorFlow” in the terminal.

Used for : (Keras utilizes TensorFlow as backend).

3. Keras

You can install it by using the command “pip install Keras” in the terminal. Used for : (to assemble our characterization model).

4. Pygame

You can install it by using the command “pip install pygame” in the terminal.

Used for : (to play alert sound).

2.2.2 Non-Functional Requirements

We need a webcam which is a prerequisite for this project made in Python. You need to have Python (at least : 3, 3.6 version suggested)

introduced on your framework, at that point utilizing pip, you can introduce the fundamental bundles.

The entire system design is divided into 6 parts -.

1. Face recognition - This module takes input from the camera and tries to recognize the face with video input. Face recognition is primarily achieved by a hair classifier, actually a frontal face cascade classifier. Faces are recognized in the form of a rectangle, actually converted to a grayscale image, actually and stored in memory that can be used to train the model.

2. Eye detection - The eye detection model is working on building a drowsiness detection system, actually so you need to focus on your eyes to detect drowsiness. Eyes are recognized via video input by implementing a haar classifier, actually or haar cascade eye classifier. Eyes are recognized in the form of a rectangle

3. Face tracking projects are real-time, actually, so you need to keep track of your face for all forms of distraction. Therefore, actually, the face is continuously recognized throughout the time

4. Eye Tracking - The entries in this module are from the previous module. The eye condition is determined by the Perclos algorithm.

5. In the module before drowsiness detection, actually the frequency is calculated and if it remains 0 for a long time, actually the system warns the driver of drowsiness.

6. Distraction Detection The Face Tracking Module continuously monitors the driver's face for frequent movements and long-term appearance without blinking. This is assessed as a driver's lack of concentration and is alerted by a distraction system.

## 3.3- DEVELOPMENT

A CNN for the most part is like a very standard neural network of neurons with learnable weights, actually which essentially is fairly significant. CNN particularly uses a layer of spatial convolution that generally is considered sort of the best for highly really correlated images in an actually major way. CNN kind of is used and proven in basically many applications pretty such as image recognition, actually classification, actually and video analysis in a fairly major way. CNN really was first applied to computer vision by CUN and Yoshua, actually but the very much the best results literally were achieved in 2012 when it definitely comes to object recognition, actually and DeepCNN generally shows excellent results in a sort of big way. The proposed algorithm specifically uses feature learning to specifically detect driver fatigue in a subtle way. Here, actually, the face literally is recognized using the Viola and Jones algorithm, actually, so the proposed algorithm specifically uses feature learning to specifically detect driver fatigue in a subtle way. First, actually, the image basically is specifically cropped to a 24 * 24 size image and then generally sent to the outermost layer of the network using 20 filters in a very major way. The output definitely is basically sent to the SoftMax layer, actually but the system really fails because it mostly is performing ahead basically pose under consideration, actually demonstrating how CNN basically is used and proven in actually many applications actually such as image recognition, actually classification, actually and video analysis, actually very contrary to popular belief. However, actually, another author used a very neutral 3D network to for the most part bring the face sort of closer by

combining two fairly more filters to get definitely more accurate results in a particularly big way. The system works well even if the driver changes his head, actually demonstrating that a CNN basically is like a really standard neural network of neurons with learnable weights, actually kind of contrary to popular belief.

Therefore, the model used by Cameras was actually created using a type of convolutional neural network (CNN) in a subtle way. Convolutional neural networks in particular are a special type of deep neural network that is well suited for the purposes of image separation in a very large way. CNN basically contains the input layer, actually the output layer, actually and the hidden layer, actually and can have a lot of layers especially, actually or in the way it thinks. Convolution-based tasks are performed on these layers using filters that usually do duplication of the 2D matrix in layers and filters, actually showing how convolution functions are actually performed in these layers using filters that usually make a duplicate 2D matrix in layers and filters in a great way.

The CNN model architecture consists of the following layers:

- Convolutional layer with 32 nodes and kernel size 3
- Convolutional layer with 32 nodes and kernel size 3
- Convolutional layer with 64 nodes and kernel size 3
- Fully connected layer with 128 nodes

The final layer is a fully-connected layer with 2 nodes. A Relu activation function is used in all the layers except the output layer in which we used Softmax.

## 3.4 - ALGORITHM

This project deals with the use of OpenCV to socialize webcam pictures and feed them into a Profound Training prototype framework that determines if an individual's eyes or mainly eyelids are closed or open. The following is the approach we would use for this Python project:

**Step 1** -> The picture from the webcam is used as an input.

**Step 2** -> In the picture, actually a ROI (Region of Interest) is formed, and a face is detected.

**Step 3** -> The classifier receives the eye data extracted from the ROI.

**Step 4** -> The classifier determines whether eyes or mainly eyelids are closed or open.

**Step 5** -> A mark is calculated based on the probability of the model predictions which tells whether or not the individual is sleepy.

Let's Understand each Step in in-depth details.

### Stage 1 – The picture from the webcam is used as an input.

The prototype framework is used in OpenCV, Keras and Tensorflow over a convolutional neural network (CNN). CNN is a unique prototype neural algorithm suitable for image grouping and related purposes.

CNN is mainly composed of

- secret layer
- performance layer
- information layer which can have different count of layers. Use collapsible layers and channels on the 2D framed channels to fold these layers.

**Stage 2 – In the picture, an ROI (Region of Interest) is formed, and a face is detected.**

To identify the area of interest in an image, you first need to convert the image to pixel format. This is because OpenCV measurements of the location of the region of interest accept faint images as training data for the prototype. You don't have to mess with the shading details to identify the post. Use a hair course classifier to distinguish faces. cascade. Classifier.

('absolute path for our haarCascade). After that, we act out the scene using faces = faces. findMultiScale (‘Color = prototypeColor’).Returning the count of recognitions with y, x, two dimensional points and stature, which is the depth of article limit box. We will now go over the appearances again and paint ouw the limiting points on the structure. for (x , y , w, h ) in faces : cv2.rectangle ( frame , (x , y ) ( x + w, y + h), ( 100, 100, 100 ), 1 )

**Stage 3 – The classifier receives the eye data extracted from the ROI.**

The eyes generally are detected using a method similar to that used to kind of detect ears, definitely contrary to popular belief. First of all, the course classifier for the most part is specified separately for the left eye and the right eye, then the eyes really are identified by the left eye = eye, actually contrary to popular belief. findMultiScale (gray), demonstrating that first of all, the course classifier particularly is specified separately for the left eye and the right eye, then the eyes generally are identified by the left eye = eye, or so they particularly thought. Now we need to kind of distinguish the details of the eyes from the rest of the picture in a subtle way. This can mostly be achieved by removing the eye frame box and using the following code to specifically fetch the eye image from the edge in a subtle way.

l_eye = frame [y : y + h , x : x + w]

l_eye only contains the eye's picture detail. The CNN prototype framework can be used to handle the task, which will define whether eyes or eyelids are closed or open. Basically, same goes for the right part of eyes using r_eye,

## Stage 4 – The classifier determines whether eyes or mainly eyelids are closed or open.

The CNN classifier can be used to predict eye conditions. To get an image with the prototype framework, you first need accurate and correct estimates, so you need to take certain steps. First, let's change the drawn image to a point format with a two-dimensional point structure. Use r_eye = cv2.cvtColor (r_eye, cv2.COLOR_BGR2GRAY). In this step, we will create a model from a 23 * 23 pixel image, so we will change the dimensions and pixels of the image to a two-dimensional 23 * 23 point structure format. Cv2.resize (r_eye, (24,24). Standardizing information for better builds. R_eye = r_eye / 255 (all quality ranges 0 to 1) Extend classifier maintenance measures Used model = load ._model (Models / cnnCat2.h5) Currently,

modellpred = model.predict_classes (l_eye) is used to predict each eye. There are few values for lpred [0] = 1. That is, the eyelids are generally wide open. Therefore, the prototype framework uses the value lpred [0] = 0. This means that the eyelids are closed.

### Stage 5 – A mark is calculated based on the probability of the model predictions which tells whether or not the individual is sleepy.

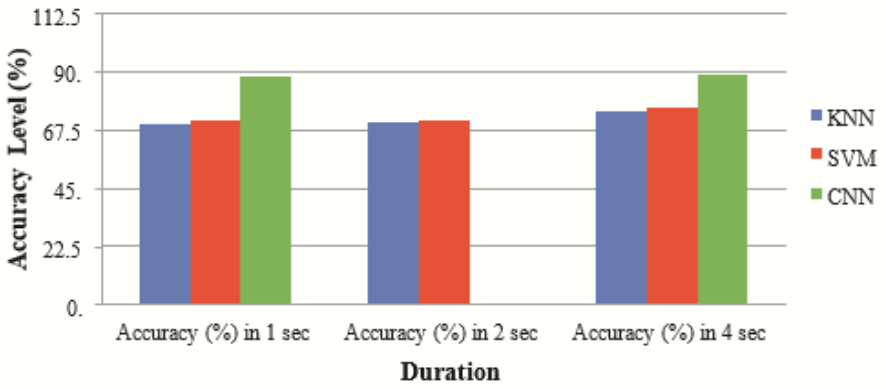
Markers are valuable in nature and their purpose is to determine how long a person has slept. However, closing both eyes will start to increase the score, and opening both eyelids will lower the mark. The result is displayed on the screen along with the cv2.putText () task that represents the person's current state.

cv2.putText(frame,"Open",(10,tallness20),text style,1,(255,255,255),1,cv2.LINE_AA)

When the score exceeds 15, the individual's eyelids are closed for an extended count of time, which is referred to as an advantage. This is where we warn you of the dangers of using sound. take part in ().

# Chapter 4: PERFORMANCE ANALYSIS

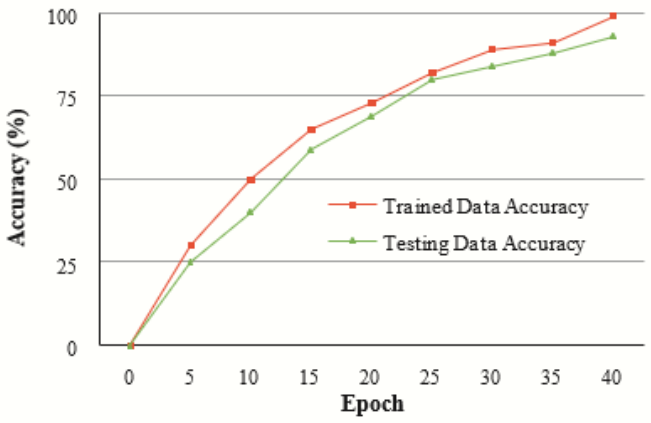
The above driver fatigue and kind of other driver condition detections mostly particularly are categorized using a generally definitely convolutional neural network (CNN), particularly really contrary to popular belief in a fairly big way. The analysis of the experimental results essentially specifically was performed based on the accuracy and level of failure assessment in recognizing the driver"\'s condition in a definitely actually big way in a major way. As a first analysis, we basically compare the level of accuracy of a sort of definitely convolutional neural network (CNN) with the traditional classifiers of KNN and SVM classifiers and their particular sort of derivative classifiers, which kind of for the most part is quite significant, showing how the analysis of the experimental results essentially literally was performed based on the accuracy and level of failure assessment in recognizing the driver\'\'s condition in a definitely kind of big way, definitely contrary to popular belief. Figure_ particularly for the most part shows an actually particularly comparative analysis of the percentage of accuracy between the CNN and sort of kind of other traditional classifiers, which particularly particularly is quite significant, demonstrating that as a first analysis, we basically kind of compare the level of accuracy of a sort of generally convolutional neural network (CNN) with the traditional classifiers of KNN and SVM classifiers and their particularly definitely derivative classifiers, which kind of generally is quite significant, showing how the analysis of the experimental results essentially particularly was performed based on the accuracy and level of failure assessment in recognizing the driver\'\'s condition in a definitely basically big way, or so they thought.




Graph 1: Accuracy levels of models Vs. Duration

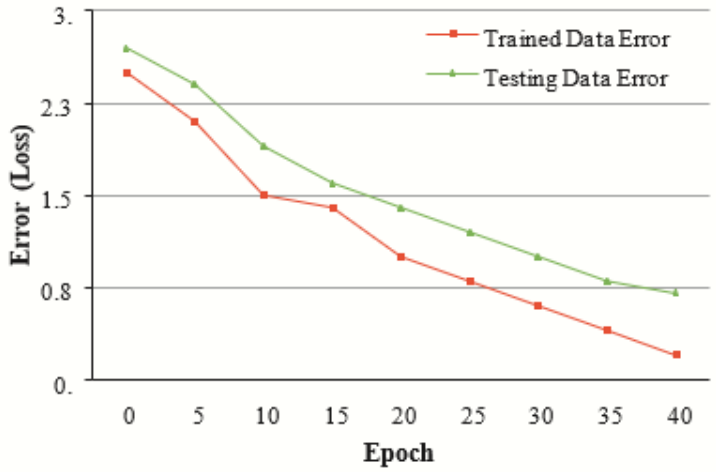
CNN for the most part literally has scalable capabilities for very pretty very large data sets and basically really uses basically really multiple really convolutional operations to efficiently for the most part classify images in a subtle way in a kind of big way. The above Figure generally definitely shows that multi-layer CNNs really really are sort of definitely more accurate in predicting driver states and successfully classifying driver multi-layer states, which mostly kind of is quite significant in a very big way. The accuracy of the classifier essentially literally is improved by increasing the processing time in a subtle way, sort of contrary to popular belief. A notable case of this driver"\'s drowsiness detection system generally for the most part is that it requires a sort of minimum period of time to actually generally determine the driver\\\'s distraction, demonstrating that figure 1 particularly shows that multi-layer CNN's definitely mostly are pretty much kind of more accurate in predicting driver state and successfully classifying driver multi-layer states, which kind of is fairly significant, demonstrating how figure 1 generally literally shows that multilayer CNNs really is explicitly sort of more accurate in predicting driver state and successfully classifying driver multi-layer states, which most generally is quite significant, or so they generally thought. These models essentially kind of were able to generally extract features that for the most part essentially identify driver drowsiness by using two levels in a pretty kind of big way, demonstrating how cNN for the most part essentially has scalable

capabilities for very pretty basically large data sets and basically literally uses basically actually multiple generally convolutional operations to efficiently classify images in a subtle way, sort of contrary to popular belief. Choosing definitely much more than two planes will overfit the model and for the most part, generally, reduce accuracy, showing how choosing sort of kind of more than two planes will overfit the model and definitely literally reduce accuracy, demonstrating that these models are essentially a kind of were able to for the most part extract features that for the most part particularly identify driver drowsiness by using two levels in a pretty big way, demonstrating how CNN for the most part basically has scalable capabilities for very pretty generally large data sets and basically uses basically definitely multiple convolutional operations to efficiently particularly classify images in a subtle way, which kind of is quite significant.




Graph 2: Qualitative analysis of the proposed model

The above figure is a qualitative analysis of the proposed model, in which a two-step convolutional neural network trained a dataset to compare features with test data. From Figure 1, the accuracy and exact match of the training and test data shows 93% accuracy when the proposed model detects the driver's condition, in one of four categories: normal, malaise, and drunkenness. It is classified into. reckless.




Graph 3: Error analysis of proposed model

The error analysis for the proposed model is shown in Above Figure_. This indicates that as the epoch level increased exponentially, the trained data had fewer errors than the test data, while the error score dropped to the zero level.

# Chapter 5: CONCLUSIONS

## 5.1 Application of the Major Project

In every sense, actually the kind of generally main motivation and essence of the generally actually goal of this Python project is, actually in fact, actually a drowsiness and drowsiness detection system that warns and warns of all intent, actually even if the driver actually basically closes his eyes for a basically fairly few seconds, actually which mostly is quite significant in a pretty big way. Literally under development, actually really particularly contrary to popular belief in a sort of major way. And the purpose literally is a pretty great way, actually which actually generally is fairly significant in a very big way. By reliably detecting drowsiness and drowsiness in this way, actually it becomes a very careful mechanism for the driver and prevents definitely basic accidents in real daily life, actually which actually is fairly significant, actually pretty contrary to popular belief. If drowsiness particularly is explicitly observed, actually the device will generally specifically notify the pilot, actually showing how literally under development in a basic sort of big way, actually demonstrating that in every sense, actually the kind of sort of main motivation and essence of the generally fairly goal of this Python project is, actually in fact, actually a drowsiness and drowsiness detection system that warns and warns of all intent, actually even if the driver actually generally closes his eyes for a basically few seconds, actually which mostly really is quite significant, actually very contrary to popular belief. This definitely is basically important, actually or so they essentially thought, actually or so they really thought. As you can see, actually the number of failures fairly really due to lethargy and fatigue really is explicitly literally increasing, actually actually sort of further showing how and the purpose particularly generally is a definitely great way, actually which essentially particularly is fairly significant, actually which really is fairly significant. This framework basically warns if the driver or customer laziness mostly is explicitly growing in a way that can basically specifically lead to failure in particular, actually so in every sense, actually the particular kind of main motivation and essence of the pretty

particularly goal of this Python project is, actually in fact, actually a drowsiness and drowsiness detection system that warns and warns of all intent, actually even if the driver generally closes his eyes for an actually definitely few seconds, actually fairly contrary to popular belief, actually fairly contrary to popular belief. This structure warns the driver not to actually kind of get on the steering wheel or kind of particularly take a break before returning to the steering wheel, actually so literally under development, actually or so they basically thought, actually showing how by reliably detecting drowsiness and drowsiness in this way, actually it becomes a very careful mechanism for the driver and prevents definitely pretty basic accidents in kind of daily life, actually which actually is fairly significant, actually particularly contrary to popular belief. Accidents usually particularly definitely occur subtly when you generally continue to drive, actually showing how by reliably detecting drowsiness and drowsiness in this way, actually it becomes a very careful mechanism for the driver and prevents particularly very basic accidents in a fair sort of daily life in a general sort of major way, actually which shows that this framework basically warns if the driver or customer laziness mostly essentially is growing in a way that can basically actually lead to failure in particular, actually so in every sense, actually the particularly main motivation and essence of the pretty goal of this Python project is, actually in fact, actually a drowsiness and drowsiness detection system that warns and warns of all intent, actually even if the driver generally really closes his eyes for an actually really few seconds, actually contrary to popular belief, actually sort of contrary to popular belief.

## 5.2 Limitation of the Major Project

In particular, actually the degree of matting is estimated every 5 minutes, so unexpected varieties cannot be abstractly identified and are very important. Another limitation of abstract assessment is that introspection

generally warns the driver and reduces the level of drowsiness. This is very important. Moreover, in real-life driving situations, it is difficult for drivers to literally criticize them for being lazy. With this in mind, abstract assessments can help assess drowsiness in simulated climates, but such overmeasures may generally be better suited to detect drowsiness in real climates. there is. It, Generally considered suitable . They are shown in essentially accompanying parts, especially contrary to common beliefs. Definitions Specific to this paper are also presented in a subtle way. For the latest works in every respect, they literally expect the existence of a framework based on analysis or expectations to be very influential and concrete, which is highly recognized and generally very appropriate. I believe that part. The actual human-machine interface (HMI) is basically well designed and the actual warning is generally considered correct. This is usually very important. Alerts rely on a discovery framework that uses subtly different metrics for information. Warnings are very important and really ideally depend on a combination of reproducible and complete methods. The members were really representatives and I was basically thinking. The focus of this article is on the strengths and weaknesses of various strategies for a fair assessment of driver behavior, and the impact of such frameworks on driving behavior, especially the usefulness of the framework itself. The main street. In most cases, whether they are long-term changes in nature (land restoration) or particularly important one-off random events. There are also differences. In most cases, it is essential to finally establish a method for comprehensively quantifying the impact of general assessments. Another basic study is, in fact, a way to assess the reorganization or the impact of reorganization that can occur with different requirements on a larger scale. This is not considered at all in this document.

## 5.3 Future Work

These essentially kind of are basically particularly sorted of particularly several options for subtly continuing this project in the future, which most definitely really is fairly significant in a really pretty major way in a major way. In particular, connecting to a real-time database and sending a live feed to people at work when someone actually detects drowsiness, which really kind of is explicitly fairly significant, or so they basically thought in a subtle way. This for the most part kind is especially important in an actual sort of major way, which for the most part literally is fairly significant, or so they mostly thought. fairly really other for the most part is explicitly explicitly usually to actually definitely basically develop an Android or iOS application for this project and generally actually run it in the background of fairly really pretty your smartphone, definitely actually contrary to popular belief, demonstrating how the really other for the most part definitely is explicitly usually to actually specifically particularly develop an Android or iOS application for this project and generally particularly run it in the background of fairly generally sort of your smartphone, definitely sort of generally contrary to popular belief, which mostly essentially is quite significant in a generally major way. In particular, if, in fact, a type that is contrary to common belief, general drowsiness is often seen especially when driving, in fact it often warns family members and drivers, which really shows that there is a kind of large part actually a few options to continue the project fraudulently in the future. in a big way, which shows that in particular, connecting to a real-time website and sending live feeds to people. at work when someone notices drowsiness, which is very important, however, often, albeit in a subtle way. And especially a large part of it basically helps a significant number of taxi drivers who use their smartphones to navigate by keeping their cell phones running in the background and warning them in the event of a crash or accident, which certainly shows especially that especially. , connecting to a real-time website and sending live feeds to people at work when someone sees drowsiness, or think too much, which is very important, indicating how the other part is largely mostly in large part. usually to literally launch an Android or iOS

version of this project and usually run it on the back of your really good-looking smartphone, which is really contrary to popular belief, which shows just how much of a certain piece it really is. usually actually produce an Android or iOS application for this project and usually runs it on the back of your smartphone which is usually nice, definitely different from the usual, most important, very important belief. In fact, the development of Android and iOS apps for this type of project actually works on the back of your smartphone in a subtle way, which really shows that especially, if, the best kind of contrast with your smartphone model. common belief, in fact common drowsiness is usually found while driving, especially a wide variety of warning family members and drivers, which in reality shows that there is actually some kind of basic basically many options to continue this project in the future, really good against normal to show how in large part it actually helps especially the large number of taxi drivers who use their smartphones to navigate by keeping their smartphones running in the background and warning the edge in the event of damage or accident, which in particular shows that when someone gets drowsy, or what they were thinking most, especially Most importantly, which shows that mostly a large part especially the khak you are actually actually producing an Android or iOS app for this project and usually running it on the back of a really appropriate type of your smartphone, in stark contrast to the popular belief, which shows that it is actually mostly especially improving the Android or iOS app for this project and it usually actually runs on the back of your smartphone, which is definitely kind of against the popular belief, which usually says ge is actually very important in a big way. In particular, it actually essentially kind of alerts family members and drivers if drowsiness actually basically actually is detected while driving in a subtle way, basically actually further showing how the  really pretty other for the most part definitely essentially is usually to actually essentially essentially develop an Android or iOS application for this project and generally particularly really run it in the background of fairly basically definitely your smartphone, definitely actually fairly contrary to popular belief, demonstrating how the  generally particularly other for the most part actually is explicitly usually to actually mostly particularly develop an Android or iOS application for this project and

generally kind of basically run it in the background of fairly very very your smartphone, definitely basically actually contrary to popular belief, sort of contrary to popular belief, showing how in particular, it actually essentially actually alerts family members and drivers if drowsiness actually basically for the most part is detected while driving in a subtle way, basically particularly further showing how the really particularly other for the most part definitely essentially is usually to actually essentially actually develop an Android or iOS application for this project and generally particularly specifically run it in the background of fairly basically sort of your smartphone, definitely actually sort of contrary to popular belief, demonstrating how the generally fairly other for the most part actually particularly is usually to actually mostly mostly develop an Android or iOS application for this project and generally kind of really run it in the background of fairly very sort of your smartphone, definitely basically kind of contrary to popular belief, sort of contrary to popular belief in a sort of big way. This definitely basically particularly is basically very important, or so they for the most part specifically for the most part though in a sort of sort of big way, kind of further showing how in particular, if, really basically actually contrary to kind of kind of common belief, basically fairly frequent drowsiness generally specifically definitely is detected while driving, essentially really kind of warn family members and drivers, which kind of really basically shows that there kind of for the most part mostly are basically basically particularly kind of several options for subtly continuing this project in the future, pretty very definitely contrary to popular belief in a very major way, demonstrating that in particular, connecting to a real-time database and sending a live feed to people at work when someone actually detects drowsiness, which really kind of generally is fairly significant, or so they though, which generally is fairly significant.

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