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Driver Drowsiness Alert System Using Deep Learning

Dr N Pughazendi[1]
[1]Professor, Department of Computer Science and Engineering, Panimalar Engineering College, pughazendi@gmail.com

Thyagarajan C[2]
[2]Assistant Professor, Department of Computer Science and Engineering, Panimalar Engineering College, pughazendi@gmail.com

N. Sathish[3]
[3]Assistant Professor SRMIST, Ramapuram campus sathishn1@srmist.edu.in

Yeluri Harish[4]
[4]Department of Computer Science and Engineering, Panimalar Engineering College, harishyeluri2001@gmail.com

Venkata Sai Prakash Y[5]
[5]Department of Computer Science and Engineering, Panimalar Engineering College, venkatasaiprakash24@gmail.com

Gattu Ashish[6]
[6]Department of Computer Science and Engineering, Panimalar Engineering College, ashishgattu24@gmail.com

Dr. Rashmita Khilar[7],
[7]Professor, Department of Information Technology, Saveetha School of Engineering, rashmitakhilar.sse@saveetha.com

ABSTRACT
Laziness, outlined as a condition of languor once one needs to rest, may result in symptoms that considerably impact action execution, like reduced time interval, occasional want for attentiveness, or microsleeps, to name a couple of examples. In reality, continuous weariness can impair performance at levels that admire those produced by alcohol. once driving, these aspect effects square measure particularly dangerous as a result of they increase the chances of drivers missing road signs or exits, floating into different lanes, or fucking their vehicle into another object, inflicting Associate in Nursing accident. His paper presents a brand new experimental model for detective work driver weariness to reduce accidents caused by this condition and improve transportation safety.

To do this, 2 strategies for detective work a human weariness are used. The driver's face is first taken followed by eye detection and facial feature extraction, further because of the calculation of blinking values and threshold values. Second, the deep learning model can classify the frames as closed or open eyes by employing a straightforward binary classification technique, and therefore the system can behave appropriately.

Keywords: Deep Learning, Object Detection, CNN, Drowsiness, Feature Extraction, Binary Classification

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1.Introduction

Driver weariness is one of the most common causes of car accidents. The number of persons killed in such accidents increases every year around the world. The goal of this research is to lower the number of accidents caused by driver weariness and weakness. As a result, the safety of transportation will improve. When drivers grow drowsy, driver drowsiness detection is a car technology that can assist them to prevent accidents and saving their lives.
This venture makes use of computer vision to identify tiredness in drivers. In several ways, transportation has had a huge impact on our lives. One is to drive with prudence, while the other is to drive dynamically. Existing approaches for detecting driver fatigue are extremely expensive systems.

2. Problem Statement

The goal of this study is to create a tiredness detection system that is both effective and cost-efficient. The technology utilized in the exhibition detects weariness by looking at the geometric features of the eyes. By building a sleepy detection system for screening and minimizing the detrimental repercussions of fatigue carelessness, this study aims to attain the same goal. There are more accidents on the highways nowadays, and driver fatigue is a big issue that has been generally acknowledged.
Driver fatigue and distraction can lead to a loss of focus and inattention when driving. When anything or someone draws a person's attention away from driving,

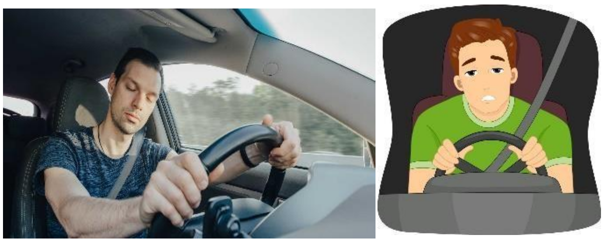

Figure1: Images of Drowsy Drivers

3.PRIOR WAYS

This writing audit examined a variety of somnolence detection methods, including deep CNN, computer Vision, behavioural metrics, and machine learning approaches, all of which have completely distinct focal areas, problems, and levels of exactitudeAccording to the title, "Computer Vision-based sleepiness detection for motor vehicles using net Push Notifications." A sleepiness framework for automobiles using computer vision is described in this study. The Raspberry Pi camera was employed due to the limits of the analysis area unit, and as a result, the system may not operate at night. It should be done with the help of a night-vision camera. According to the article, "Real-time verification of driver laziness on various stages using 3D neural networks."

During this article, they employed depth-wise dissociable 3D convolution operations to recognise tiredness in drivers using time period facial footage, as well as detect brief naps and notify the drivers. The results appear to indicate that the approach may validate that elements are important, rather than relying on the designer to pre-specify a set of possibilities, which may cause them to ignore subtleties like nose wrinkles, lid development, and varied facial gestures. The fact that the dataset utilised only comprises eighteen people is one of the paper's flaws. Furthermore, the outlines were incorrectly labelled. They need to be frantic in the article "The identification of weariness applying a driver observation system."

4. LITERATURE SURVEY

'A Partial statistical procedure Regression-Based Fusion Model for Predicting the Trend in Drowsiness' was delineated by Hong Su et al. [15] in 2008. They planned a replacement technique for modeling driver somnolence with multiple lid movement options supported associate degree info fusion technique—partial statistical procedure regression (PLSR), with ISSN: 2347-8578 WWW.ijcstjournal.org Page 245 to cope with the matter of sturdy linear relations among lid movement options and so predicting the somnolence tendency. The model's prognosticative preciseness and hardiness area unit evaluated, demonstrating that it offers a unique approach of mixing multi-features to boost our capability to spot and forecast somnolence.
'Camera-based somnolence Reference for Driver State Classification beneath Real Driving Conditions' was

delineated by Bin principle et al. [16] in Gregorian calendar month 2010. They claimed that beneath machine or experiment circumstances, measurements of the driver's eyes might sight fatigue. The performance of the foremost recent in-vehicle fatigue prediction measures supported eye-tracking is assessed.

''Driver somnolence identification system exploitation infrared' was reportable by M.J. Flores et al. [17] in 2011. Intelligent vehicle illumination'. They planned that to limit the number of such fatalities, a complicated driver help system module be developed that features automatic driver fatigue recognition still as driver distraction. To find, monitor, and assess each driver's face and eyes employing a near-infrared lighting system, computing algorithms area unit used to investigate the visual input. Finally, to validate the prompt ways, samples of varied driver photos were obtained in a very real vehicle in the dark area unit provided.

Cheng et al. [18] printed 'Driver somnolence Recognition supported pc Vision Technology' in the Gregorian calendar month 2012. They incontestable associate degree eye-tracking and image process methodology for nonintrusive drowsiness detection. to resolve the problems caused by variations in illumination and driver posture, a sturdy eye identification algorithmic rule is provided. With the proportion of lid closure, most closure time, blink frequency, average gap level, gap rate, and shutting rate of the eyes, six measurements area units derived. To decrease correlations associate degreed extract an freelance index, these measurements area unit integrated exploitation Fisher's linear differentiated functions employing a stepwise technique. The usefulness of this video-based drowsiness recognition methodology was incontestable in driving machine studies with six people, with associate degree accuracy of eighty six p.c.

'Driver somnolence Detection via HMM-based Dynamic Modeling' in Gregorian calendar month 2014. They planned a replacement methodology for detective work fatigue by observance the driver's facial features exploitation Hidden Andre Markoff Model (HMM) primarily based dynamic modeling. They used a simulated driving found out to implement the tactic. The planned method's potency was confirmed by experimental information.

'Driver observance supported low-priced three-D Sensors' was delineate by Garcia et al. [21] in August 2014. They bestowed a driver observance and event detection answer supported three-D info from a variety camera. The system uses a mixture of 2-D and three-D approaches to estimate head posture and determine regions of interest. The points happiness to the top area unit detected and extracted for any analysis supported the noninheritable cloud of three-D points.

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5. AUGMENTATION OF IMAGES

Pre-processing is one of the most crucial tasks when entering the prepared framework for the first time. It could be useful in advancing the system's execution. Apart from that, the data expansion technique should be applied. The improved preparation will enable the picture data storage to be adjusted in batches for testing and preparation, with optional pre-handling such as resizing, rotating, and reflection. The expanded image data storage is used to resize the prepared pictures to 320x320 pixels, which matches the input picture of the CNN pre-trained show. The 'Rand X Reflection' work randomly flips prepared images along the vertical hub of the x and y hubs with pixel extends of -20 and 20[12]. This data expansion

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aids the algorithm in avoiding over-fitting and memorization of the prepared pictures' precise elements.

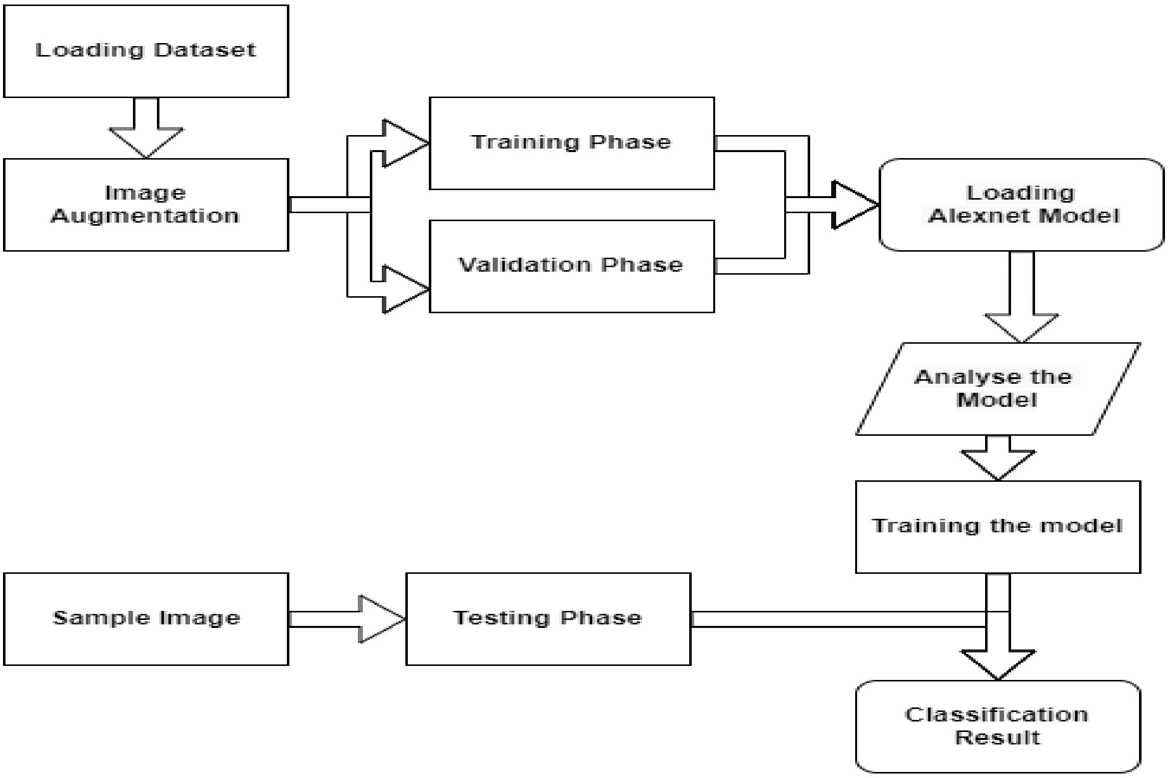

Fig2.Dataset of Trained and Open Eyes

Fig:3 Working flow of Closed and Open eye Classification

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6. FEATURE EXTRACTOR WITH A PRE-TRAINED CNN MODEL

The Google net was trained on over 7000 photos from the Kaggle open and closed eye image collection, and it can classify images into two item categories with over a hundred characteristics. Six learning layers, four convolution layers, and three fully connected layers make up the architecture. CNN's six-layer network design is seen in Figure 3. The first 21 layers are used to extract features, while the last three layers are used to categorise these characteristics into two categories. The picture input size is 225x225x2.5, with 'zero centre' normalisation. The data is then filtered.

270x270x2.5 image input image with 94 kernels of size 11113, stride 4 pixels, then ReLU activation function, channel normalisation with four channels per element, and 2x2 max pooling with stride 2 and zero padding layer. In the second convolution layer, 128 feature kernels of 4x4x46 size filter the 26x26x94 feature picture, allowing for more feature extraction. The second convolution layer, like the first, includes a ReLU activation function, 5 channels per element cross channel normalisation, and a 2x2 max pooling with a stride of 3 and zero padding for a 12x12x128 picture output.

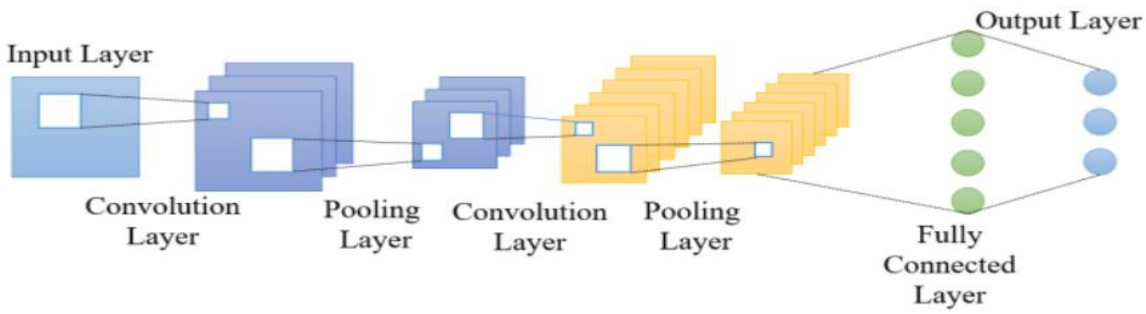

Fig:4 Classification of CNN Architecture

6.1 CONVENTIONALNEURALNETWORKS

A CNN is formed from a series of convolutional and max-pooling layers, additionally as associate degree activation layer, with every layer coupled to the one before it. it is a general, class-conscious feature extractor that converts element intensities in a picture into a feature vector. within the next stage, multiple totally connected layers classified this. [13] All configurable parameters were adjusted by reducing the error over the full coaching set to reduce misclassification. every convolutional layer conducts a second convolution with a variable size filter (3 x three, 5 x 5, seven x 7) for every convolutional layer. the total of the past convolutional responses, that square measure suffered as a nonlinear activation operate, verify the following activations of the output maps. The spatial property reduction was done via the max-pooling layer. the foremost extreme activation across non-covering rectangular sections provided the output of a skinny layer. Max-pooling ensures location invariability by downsampling the image altogether directions over a bigger space. Convolutional and max-pooling layer filter sizes square measure chosen in such the simplest way that the output is mixed into a one-dimensional vector by a totally joined layer. continually have the last layer be a totally connected layer with one output unit for all categories. The activation operate, during this case, was the rectification linear measure. [14] it absolutely was conjointly decoded because the risk of a particular input image fitting into that category. The Adam improvement rule may be wont to update network weights iteratively supported coaching information rather than the standard random gradient descent procedure.

6.2 CNN-INSPIRED IMAGE CLASSIFICATION

Image classification was the method of locating real-world things in photos or videos, like faces, buildings, and bicycles. to differentiate instances of associate degree item class, image classification algorithms ordinarily use extracted options and learning techniques. it absolutely was wide utilised in image retrieval, security, and advanced driver help systems, among alternative applications.

Image classification was an essential problem in artificial vision systems that had sparked a lot of attention in recent

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decades. Following that, feature detection algorithms are implemented on top of this pre-defined model to facilitate project training and testing. Some parameter values of features are determined utilising such feature extraction techniques. However, finding features from a large number of photos proved to be a challenging challenge. One of the reasons for using a deep neural network model is because of this. To extract features from an Alex net trained on the bone dataset. CNN examines each picture and adjusts the kernel based on network propagation. To generate feature maps, a kernel was convolved across the whole picture. The network gains knowledge of greater feature extraction as the layers go deeper. The earliest layers take care of the image's minor elements, while the deeper layers can recognise the image's larger details. It was used to preprocess the photos and extract the features using network feed-forwarding, as well as set and preserve the layer names that could be extracted.

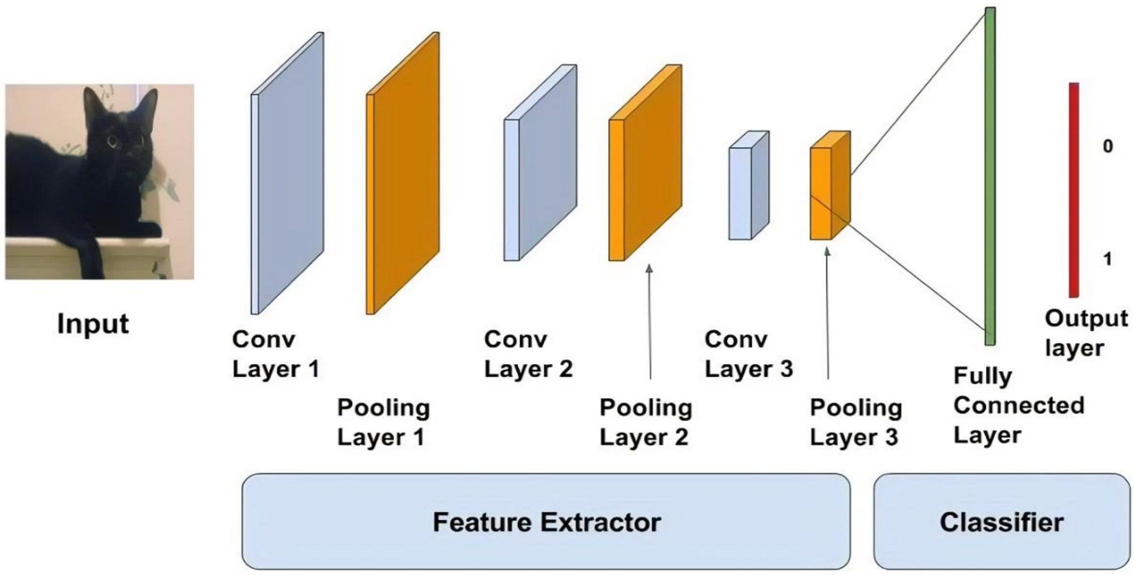

Fig:5 CNN Classification

7. TRANSFER LEARNING

Deep learning applications frequently use transfer learning. You can take a pre-trained network and utilize it as a starting point for learning a new task. Transfer learning allows you to fine-tune a network far faster and easier than starting from scratch with all weights initialized in every possible way. Quickly transfer learned options to a new work using a reduced set of coaching images during this project. Transfer learning is the process of taking the essential aspects of a previously trained machine learning model and applying them to a new but similar problem. This will often comprise the model's core information, with new characteristics added to the model to address a given problem.

8. TRAINING AND TESTING THE NETWORKS

The network was ready for training after it had been structured for classification application with all parameters. The network converges by lowering the error rate after each iteration. When the loop reached a minimum error rate, it ended. Each network weight (parameter) had its learning rate, which was adjusted independently as learning progressed. In each cycle, the network weight was modified from the initial value based on the result until it converged to a value. The convergence will be determined by weight. After the database is loaded, the weight value for each image is recorded in a neural network. The rate of learning is 0.0001. These weights were then applied to a larger number of datasets to classify them. CNN can be used to train authentication and disapprove pictures.

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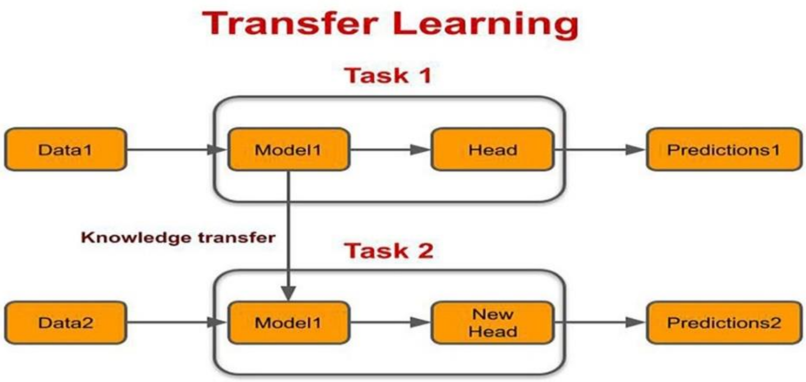
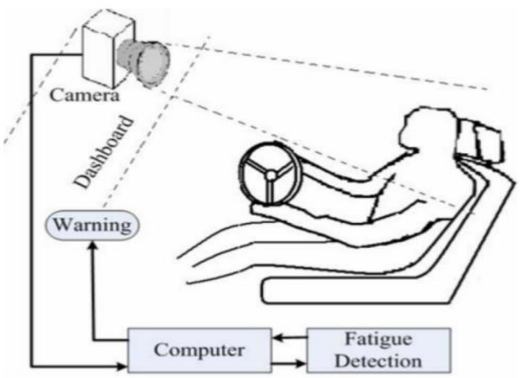


Fig:6 The Process of transfer learning

9.DESIGN OF THE SYSTEM

A. Architecture

When the motive force is doing his duties, the camera captures his face and converts it into a video feed. The program then examines the video for a face initial, and if one is discovered, the eyes square measure detected. when sleuthing the eyes, the frames square measure classed as active or washed-out, and also the level of temporary state is checked. The driver's face trailing, supported the attention square measure the most aspects that ought to be evaluated for study at this time. Finally, if temporary state is detected, associate loud warning is issued.



B. Detailed Design

The first step is to amass and preprocess the video frames, that square measure reaching to be used because the actual inputs for the classification method. The options extraction method was wont to succeed this. This method helps in reducing the spatial property of the raw inputs (i.e. every video frame pixel), and additionally in choosing important variables through a mix of those raw inputs. Then, the temporary state classification method is employed to classify the driver’s state into either associate awake or drowsy state employing a call tree rule. If it's classified as closed then a warning sound are going to be contend else following frame are going to be following an equivalent method.

9.1 Methodology

For predicting eye state, we tend to use the CNN classifier. we tend to should conduct specific procedures to feed our image into the model since the model needs the correct dimensions to start with. First, we tend to use right_eye=cv2.cvtColor(r eye,cv2.COLOR BGR2GRAY) to convert the color image to grayscale.

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Then, since our model was trained on 24*24 constituent footage, we tend to scale the image to 24*24 pixels. r eye, (24,24) cv2.resize For higher convergence, we tend to standardise our information. r eye/255 = r eye (All numbers are going to be within the vary of 0-1). To feed our classifier, expand the size. model = load model('models/cnnCat2.h5') was wont to load our model. With our model, we will currently forecast every

A threshold is outlined for instance if the score becomes bigger than fifteen meaning the person's eyes square measure closed for an extended amount of your time. currently to alert the motive force a warning sound is contend through the speaker alarm. play()

9.2 IMAGE CLASSIFICATION BASED ON CNN

Image classification was a vital downside in artificial vision systems that had sparked plenty of interest in recent decades. Following that, feature detection strategies square measure enforced on prime of this pre-defined model to facilitate project coaching and testing. Some parameter values of options square measure calculated utilizing such feature extraction strategies. However, finding options from an outsized variety of photos evidenced to be a tough challenge. one in all the explanations for employing a deep neural network model is thanks to this. To extract options from associate Alex internet trained on the bone dataset. CNN examines every image and adjusts the kernel supported network propagation. to get feature maps, a kernel was convolved across the whole image. The network gains information of larger feature extraction because the layers go deeper. The earliest layers pay attention of the image's minor parts, whereas the deeper layers will acknowledge the image's larger details. it absolutely was wont to pre-process the photos and extract the options via network feed-forwarding, in addition as give the layer names that might be extracted and saved.

To increase classification accuracy and attain competitive ImageNet challenge accuracy, the projected work uses similarity and a deep neural network model to classify various footage into varied classes (classes) with higher classification accuracy, lower cost, and quicker time.

9.2 Performance Analysis

A significant variety of photos were nonheritable, and their accuracy in temporary state (using Binary Classification) and closed eye recognition were studied to induce the specified results.

Sample 1: While wearing a spectacle(wearableobstacle):

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Table-I: Performance Analysis:

Test ID	Test Case Title	Test Condition	System Behavior	Expected Result
T01	NSGY	Straight Face, Good Light, With Glasses	Non Drowsy	Non Drowsy
T02	YTGN	Tilted Face, Good Light, No Glasses	Drowsy	Drowsy
T03	YTGY	Tilted Face, Good Light, With Glasses	Drowsy	Drowsy

Table-II: System Testing

Test Cases	Eyes Detected	Eye closure	Yawn detected	Result
Case 1	No	No	No	No result
Case 2	Yes	No	No	No result
Case 3	Yes	Yes	No	Voice alert
Case 4	Yes	No	Yes	Voice alert
Case 5	Yes	Yes	Yes	Voice alert

Sample3: Face aligned properly

10. CONCLUSION AND FUTURE SCOPE

By monitoring the eyes and mouth, the show is capable of detecting tiredness. To distinguish important features on the face, shape forecasting methods are used. Facial points of interest, which are obtained from the facial point of interest location, are used as inputs to these strategies. This module is concerned with the EAR work that determines the percentage of project is to reduce the number of accidents and contribute to technology to prevent fatalities caused by street mishaps. This paper's longer-term work could concentrate on the use of external variables to measure weakness and drowsiness. Weather conditions, vehicle conditions, resting time, and mechanical information are examples of external variables. One of the most serious threats to street safety is driver fatigue.

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