# DRIVER DROWSINESS DETECTION SYSTEMS

## Supreetha Ganesh, Amit K B, Akif Delvi, C N Shreyas, Gagandeep K

*Supreetha Ganesh, Dept. of Computer Science Engineering, K.S Institute of Technology, Karnataka, India*
*Akif Delvi, Dept. of Computer Science Engineering, K.S Institute of Technology, Karnataka, India*
*Amit K B , Dept. of Computer Science Engineering, K.S Institute of Technology, Karnataka, India*
*C N Shreyas , Dept. of Computer Science Engineering, K.S Institute of Technology, Karnataka, India*
*Gagandeep K , Dept. of Computer Science Engineering, K.S Institute of Technology, Karnataka, India*

---***---

**Abstract -** *Drowsiness has significant contribution to the accidents on road. Accurate measurement is required to track the state of the driver. It has various shortcomings. Convolutional neural networks(CNN) developed using Keras were utilized to create the model that we employed. CNN is a branch of deep neural networks that is appropriate for image classification. It consists of many layers that include input, output and hidden layers. The drowsiness detection systems for drivers have the potential to greatly increase traffic safety by warning drivers to stop or take breaks when they are in danger of nodding off behind the wheel.*

**Key words: CNN (Convolutional NeuralNetworks), deep neuralnetwork, drowsiness, python, jupyter.**

## 1. INTRODUCTION

A system called driver drowsiness detection can tell when a driver is getting fatigued or dozing off while operating a vehicle. Drowsy driving has been linked to fatal accidents and other traffic fatalities, thus this can be a serious safety risk. Driver drowsiness can be identified using a variety of methods, including:

1. Eye tracking: Some systems track the driver's eyes using eye tracking technology.The driver can be nodding off if their eyes are closed or moving erratically.

2.Face-recognition technology: Some systems examine the driver's facialexpressions to look for tiredness indicators like drooping eyelids or a slack jaw.

3. Monitoring of the driver's heart rate: Some systems utilize sensors to track the driver's heart rate and alarm them if it drops below a predetermined level, which could be a sign that they are nodding off.

4. Vehicle monitoring: Some systems keep an eye on how the car is driving and search for indications that the driver may not be fully awake, such as lane wandering or abrupt changes in speed.

## 2. RELATED WORKS

**LSTM-CNN Architecture for Human Activity Recognition**

The paper [1] proposes a model for the traditional pattern recognition techniqueshave advanced significantly in recent years. The use of deep learningtechnologies to understand human activities in mobile and wearablecomputing scenarios has drawn a lot ofinterest due to its growing acceptance and success. A deep neural network with Convolutional layers and long short-term memory (LSTM) was suggested in this research. With just a few model parameters, this model could automaticallyextract activity features and categorize them.In conclusion, the LSTM-CNN model consistently outperforms those suggested in other research and exhibits sound generalization.

**A Real-Time Driving Drowsiness Detection Algorithm With Individual Differences Consideration**

The paper [2] proposes a development of adriving sleepiness detection algorithm is crucial for enhancing traffic safety. However, the majority of them are focused on developing an all-encompassing sleepiness detection technique while ignoring the variations among individual drivers. This study suggests a real-time sleepiness detection method for drivers that takes into account their unique driving styles. Finally ,to develop a offline training module and online monitoring module in the study, taking into account the individual variations of the drivers. A specific driver- specific classifier built on SVM is trained, and while driving, the per-trained classifieris used to assess the condition of the driver's eyes.

**Comprehensive Drowsiness Level Detection Model Combining Multi-modal Information**

The paper [3] proposes a drowsiness detection model that can identify all levels ofdrowsiness, from weak to strong, is presented in this study. This method is predicated on the fundamental premise. First, it is assessed how sensitive the posture index and other indices were to different degrees of drowsiness. Then, to cover all stages of drowsiness, and develop a drowsiness detection model by combining a number of indices sensitive to both weak and strong drowsiness. After drowsiness detection, future research will concentrate on the creation of arousing and arousal-maintenance systems. The success in detecting drowsiness at a variety of degrees, even light drowsiness, will make it possible to design interfaces that let users choose stimuli that are best suited to their level of drowsiness and the settings in which they aredriving.

**Real-Time Driver-Drowsiness Detection System Using Facial Features**

The paper [4] proposes a system the DriCare uses video images to detect drivers' signs of tiredness without usage of any gadgets on human body. Additionally, based on 68 critical features, It creates a new detecting algorithm for face regions. Then, assessment on the drivers' condition using these facial areas. It takes the features from eyes and lips and generates a warning to driver. Based on facial key points, it defines the detection zones for the face. Due to its rapid operation, DriCare works in real-time.

**Real Time Driver Fatigue Detection System Based On Multi_Task CNN**

The paper [5] proposes a model for Multi- tasking Convolutiona Neural Network (ConNN) which is suggested in this article to identify driver weariness and drowsiness.When modelling a driver's behaviour, theeyes and mouth are used. Driver wearinessis tracked through changes to these traits. In contrast to studies in the literature, the suggested Multi-task ConNN model now simultaneously incorporates mouth and eye information. Calculations of the durationand percentage of closed eyes (PERCLOS) as well as the frequency and duration of mouth and yawning sneezes are used toassess driver fatigue (FOM). Threecategories in are used in this study to categorize the driver's level of weariness. The study's ability to build afaster and more effective system with justone model rather than separately building models for two different ConNN architectures is one of its strongest points. Future work will add the head condition, which is just as crucial as the eye and mouth conditions, and integrate the system into an embedded system.

**Driver's Drowsiness Detection**

The paper [6] states the advancement of technology over the last 50 years has given drivers a lot of support by ensuring high levels of comfort and safety in their automobiles. Driver weariness is one of the many possible causes of accidents, and itwill be discussed and addressed issues in this paper. This work, will employ powerful artificial intelligence-based algorithms to identify driver exhaustion and the rate of drowsiness. It suggests a method to identify driver tiredness using artificial facial traits including eye closure, yawning, and vertical distances between the eyes and mouth. The method for driving drowsiness detection and driver rate of drowsiness is proposed in this research project. It infers from the data of 9 patients that decision tree and neural network classifiers have produced superior results than linear SVM and LDA for classifying the driver into sleepy and non-drowsy. As previously mentioned, we have defined an algorithm for the Rate of Drowsiness. Decisions could be made using previous methodologies based on characteristics like eye blinks and ocular closure. It has taken into account the subject's eyes and lips as features and employed contemporary classifiers tocategorize the subject as drowsy or not .Although the presented classifiers are capable of producing results that are reasonable, there is still room for improvement in their efficiency. By examining numerous other classifiers, onecan use a drowsiness detection classifier thatis more reliable. The algorithm can still be enhanced by conducting research on additional datasets to increase the rate of drowsiness detection.

## 3. OBJECTIVES

The objective is that the driver drowsiness detection system's goal is to help reduce accidents involving both passengers and vehicles.

The primary objective of driver drowsiness detection is to increase road safety by reducing accidents brought on by drowsy driving. Motor vehicle collisions involving drowsy drivers frequently result in severe injuries or fatalities. The objectives include identifying drowsiness states, popping up alerts,decreasing the crash risks and also enhancing the road safety.

## 4. METHODOLOGY

In this Python project, we'll use OpenCVto collect webcam photos and feed them into a Deep Learning model that will identify whether a person's eyes are "Open" or "Closed" based on their position. For this Python project, the strategy we'll employ is as follows:

Let's now examine our algorithm's operation step by step.

**Step 1: Take an image as input from acamera.**

Input is taken in the form of an image using camera. Hence, an infinite loop is created to record every frame in order to use the webcam.

**Step 2:Create a region of interest (ROI) and identify faces in the image.**

Since Mark the face with rectangular bound and then create the region of interest(ROI).OpenCV algorithm for detection of the object accepts grayscale images in the form of input, so first convert the image to grayscale in order to trace out the face in it.

To identify the items, colour information is not required. To find faces, we'll use the haar cascade classifier.

**Step 3: Identify the eyes using ROI andprovide the information to the classifier.**

The classifier intakes input data of eyes from ROI, which is similar to that for finding face. Prior to detecting the eyes, a cascade classifier is set for the left and right eyes.

**Step 4: Whether the eyes are open or closed will be classified by the classifier.**

Now classifier finds the state of eye whether closed or not. For forecasting the eye state, CNN classifier is utilized. The colour image is first converted to grayscale. We then resize the image to specified pixels in accordance with how our model was trained.

**Step 5:Calculate a score to find out if a person is drowsy.**

Find the score to determine the drowsiness . The score indicate how long the eyes are closed. Increase the score if both eyes are closed else decrease.
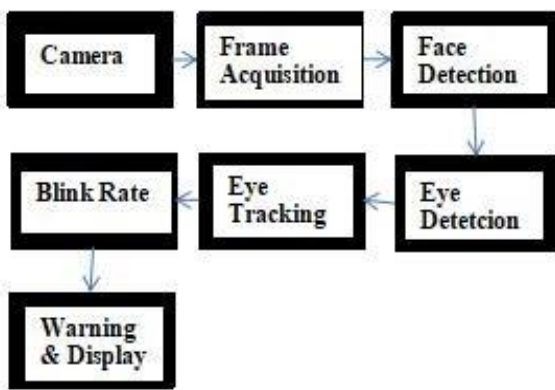


**Fig 1 : Block Diagram of Drowsiness detection**

**1.CNN Architecture**

**CNN:** Convolutional neural networks . These networks may sound like an odd amalgam of biology, math, and computer science with a dash of CS, but they have been some of the most important developments in the area of computer vision and image processing. The multi layer perceptron (MLP) is a regularized variant of the Convolutional neural networks . They were created based on how the neurons in the visual cortex of animals function.

**a. Convolution Layers**

The input layer, the hidden layer, and the output layer make up the convolution layers. While in neural networks every input neuron is linked to the hidden layer below it, in CNN only a small subset of input layer neurons are linked to those in the hidden layer. The features of an input image can be extracted with the aid of convolution layers. Additionally, it is capable of numerous tasks including edge detection.

**b. Pooling Layers**

The major objective of the pooling layer is to extract features; by doing so, it helps to reduce the size of the representation and the parameters, making this model more efficient. It also aids in minimizing over fitting. Pooling layers are new layers that are applied in convolution layers. The featuremaps' dimension is decreased using it.

**c. Fully Connected Layers**

A fully connected (FC) neural network can be used to classify the data into distinct classes after the features have been retrieved. SVM can also be used in place of fully connected layers, although doing so results in an additional layer of complexity. Completely interconnected layers to enable training of the model. This layer contains the data that is crucial to the input, and it produces a probability that the model is attempting to forecast.

## 5. APPLICATION REQUIREMENTS

**TensorFlow**

An open source library for AI&ML is called TensorFlow. Deep neuralnetworks can make extensive use of it to concentrate on training and interference. It has a comprehensive set of tools and libraries, enables academics to include cutting- edge technology in machine learning, and makes it simple for developers to create and deploy applications that use machine learning.

**Numpy:**

It is primarily intended for numerical computations. Additionally, the Python programming language has a package called Numpy. Multidimensional array metrics and a substantial number of high level mathematical operations are defined using Numpy.

**Keras:**

It is the TensorFlow library's interface. It is expandable, modular, and user-friendly. It supports other widely used features such asdropout, batch normalization, and pooling.

**Jupyter Notebook:**

The basic objective of the open-source scientific computing programme Jupyter Notebook is to mix equations, visuals, and live code. It supports more than 40 programming languages. The terms Julia, Python, and R are combined to form the moniker Jupyter. While Anaconda comes preinstalled, Jupyter is primarily designed for data science and analytics applications. Data sets, such as visuals and charts, are produced by modules like Matplotlib, Plotly, or Bokeh in Anaconda.

**Open CV:**

OpenCV is an open-source library used for processing image and computer vision. It has a significant part in real-time applications, which is much needed in modern world scenario.It is used to analyze images and films to find faces, objects, and handwriting. Python has a ability to handle the OpenCV when it is integrated with libraries like NumPy. This is used to identify visual patterns and features.

## 6. CONCLUSION

A non-invasive system to localize the eyes and monitor fatigue was developed. Information about the eyes position is obtained through self-developed image processing algorithm. During the monitoring, the system is able to decide if the eyes are opened or closed. When the eyes have been closed for too long, a warning signal is issued. In addition, during monitoring, the system is able to automatically detect any eye localizing error that might have occurred. In case of this type of error, the system is able to recover and properly localize the eyes.

The following conclusions were made:

Image processing achieves highly accurate and reliable detection of drowsiness.

Image processing offers a non-invasive approach to detecting drowsiness without the annoyance and interference.

A drowsiness detection system developed around the principle of image processing judges the drivers alertness level on the basis of continuous eye closures.

## REFERENCES

[1]Kun Xia,Jianguang Huang And Hanyu Wang,"LSTM-CNN Architecture for Human Activity Recognition", University Of Shanghai For Science And Technology, Shanghai 200093, China, March 20, 2020.

[2]Feng You, Xiaolong Li, Yunbo Gong, Haiwei Wang, "A Real-Time Driving Drowsiness Detection Algorithm With Individual Differences Consideration", School Of Civil Engineering And Transportation, South China University Of Technology,Guanzhou, 510640, China, December 10, 2019

[3]Mika Sunagawa, Shin-Ichi Shikii, Wataru Nakai, Makoto Mochizuki,"Comprehensive Drowsiness Level Detection Model Combining Multimodal Information", Ieee Sensors Journal, Vol 20, No. 7,  April 1,2020

[4]Wanghua Deng, And Ruoxue Wu,"Real- Time Driver-Drowsiness Detection System Using Facial Features", School Of Software, Yunnan University, Kunming 650000, China, August 21, 2019

[5]Burcu Kir Savas, And Yasar Becerikli, "Real Time Driver Fatigue Detection System Based On Multi-Task ConNN",Computer Engineering Department, Kocaeli University, Turkey, January 3,2020.