International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 04 | April - 2023 Impact Factor: 8.176 ISSN: 2582-3930

DRIVER DROWSINESS DETECTION USING CONVOLUTION NEURAL NETWORKS ALGORITHM

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Abstract - Driving when fatigued is a severe problem that can result in tragic collisions. In this paper, we propose a convolutional neural network-based method for detecting driver drowsiness. Algorithm for neural networks (CNN). Real-time photos of the driver's face are captured by the proposed system using a camera, and these images are preprocessed before being fed into the CNN model. Based on the attributes gleaned from the face photos, the CNN model is trained to categories the driver's level of tiredness as either alert or drowsy. The results show how well the CNN algorithm performs in reliably identifying driver tiredness. A dataset of drivers in various levels of tiredness was used to evaluate the proposed system, and the results show the effectiveness of the CNN algorithm in identifying driver fatigue with accuracy. The suggested technology may be incorporated into already-installed car safety systems, adding a layer of protection to combat fatigued driving and enhance road safety.

Keywords- OpenCV, Keras, Convolution Neural Networks, Tensor flow, web camera and pygame.

1. INTRODUCTION

Road safety is seriously threatened by the serious problem of drowsy driving. Especially on long distance trips, drowsy driving is a major contributor to accidents and can lead to fatalities and severe injuries. Several methods, including machine learning-based ones, have been suggested for the identification of driver drowsiness in an effort to solve this issue. Convolutional Neural Networks (CNNs) have among them demonstrated promising outcomes in identifying driver intoxication by examining face photos. According to some analysts, a driver's weariness contributed to roughly 1200 fatalities and 76000 serious injuries, which ultimately caused a crash. In this research, we propose a CNN-based driver sleepiness detection system. Real-time photos of the driver's face are captured by the system using a camera, and these images are preprocessed before being input into the CNN model. The CNN model is instructed to categories Based on the attributes taken from the face photos, the level of tiredness of the driver is classified as either alert or drowsy. The focus will be on developing a system that will accurately and continually track whether the driver's eyes are open or closed. The onset of driver weariness can now be identified to prevent an automobile collision by focusing on the eyes. A driver's score for tiredness is determined by their eye movements and the amount of time between blinks. determine whether he is sleepy or not. Our system, which we developed using Python, OpenCV, and Keras to prevent these collisions, analyses the driver's webcam feed in real time to calculate a score based on the interval between the driver's eyes closing and opening. When the score exceeds a certain threshold, an alarm sounds, waking the driver up and alerting him or her.

Fig 1: - Driver Drowsiness Detection.

I. From the fig 1 we saw that the first driver is not sleepy and he is active while driving.
II. While the second driver sleepy and he is not active while driving.
III. We saw that the red light at second driver is the alarm that sounds when the driver is not active or drowsy.

1.1 OBJECTIVE

The use of driver drowsiness detection in cars helps to save lives by preventing accidents when the driver is feeling fatigued.

a) The main objective is to first design a system for identifying driver sluggishness by repeatedly monitoring the retina of the eye.
b) The framework ignores driver wearable displays and functions in a range of lighting situations.
c) To use a ringer or alert to warn the motorist of the signs of laziness.
d) To give an alert to the family members when he is drowsy.
e) Traffic management can be maintained by reducing the accidents.

1.2 OpenCV

A library of programming functions called OpenCV (Open Source Computer Vision) is primarily focused on real-time computer vision. Itseez and Willow Garage later provided help once Intel created it in 1999. Although OpenCV is designed in C++, it also has interfaces for Python, Java, and MATLAB. For processing images and videos, OpenCV offers a variety of techniques, including filtering, edge detection, object detection, face recognition, and many others. Moreover, it has features for machine learning, stereo vision, 3D reconstruction, and camera calibration. In computer vision research and applications like robotics, augmented reality, autonomous vehicles, and medical image analysis, OpenCV is widely utilized. Because it is an open-source project distributed under a BSD license, anyone may freely edit the code.

1.3 WHY OpenCV

OpenCV is used because of several benefits. The points that why only OpenCV is discussed below.

a. Specific Picture handling was intended for OpenCV. In the image processing plan, every structure and structure of the information is shown. MATLAB is then quite traditional. Almost anything on the earth can be obtained using toolbox tactics. It might be a tool cache tied to money, or it might be concentrated DNA tool caches.
b. Quick MATLAB is simply overly moderate. Java was required by MATLAB. Java was similarly dependent on C. In order to translate and integrate all of this integrated MATLAB code, our Computer becomes stuck when we launch the MATLAB program. In the end, code is used to convert it to Java.
c. Efficient The resources used by MATLAB are excessive. Using OpenCV, we can extract up to 10 MB of Memory for ongoing use. Aside from the reality that the RAM feature is hardly ever a major issue with modern PCs. The necessity for minimal management is crucial because, in any event, our fatigue screen will be employed inside the car in a non-slip and non-slip manner.

1.4 DEEP LEARNING

A neural network with three or more layers is essentially what a neural network with deep learning refers to as. Artificial neural networks aim to mimic how the human brain behaves by mimicking its capacity for "learning" from vast volumes of data. More hidden layers can help to tune and refine for accuracy even if a neural network with only one layer can still make approximation predictions. It makes use of artificial neural networks, where several processing layers are applied to extract progressively more complex aspects from the data.

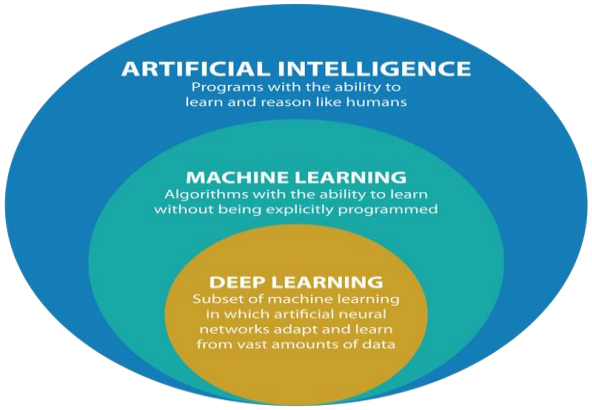

Fig 2: - Deep Learning.

1.5 ABOUT CNN

Neural networks serve as the brains of deep learning algorithms. They consist of node levels with an input layer, one or more hidden layers, and an output layer for each node level. The threshold and weight of every node are interconnected. Any node whose output rises above the specified threshold value is activated and starts sending information to the top layer of the network. Otherwise, no data is sent to the next tier of the network.

Convolutional neural networks outperform other neural networks when given inputs such as images, voice, or audio, for example. There are four basic categories of layers in them:

a. Convolutional layer
b. RELU Layer (Rectified Linear Unit)
c. Pooling Layer
d. Fully Connected Layer

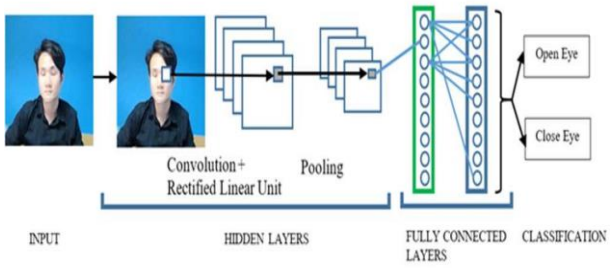

Fig 3: - How Convolution Neural Network works.

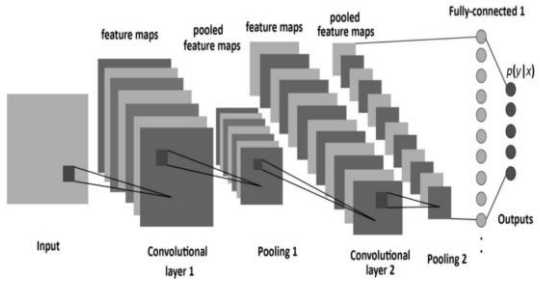

Fig 4: - Detailed information about fig 3.

2. PREVIOUS VERSIONS

Driver drowsiness detection technology has been around for several years, and there have been several previous versions of the technology. Here are some examples:

1. Eye Tracking: Eye tracking was one of the first methods of detecting driver tiredness. This innovation employs a camera to track the driver's eye movements and spot indicators of exhaustion like drooping eyelids or extended periods of closed eyes.

Disadvantages:

   a. It uses mainly uses D-lib 68 Facial Landmarks
   b. For that the constant threshold value of EAR, if the eye size of the driver is small , even if his eyes are open it will give the result as closed.
   c. If the driver blinks his eyes, then we get an EAR of less than 0.2 and the alarm starts playing. This might be annoying.
   d. If the driver wear spectacles, then we will get wrong output and it is less accurate in low light conditions.

2. Steering Wheel Movement: A different early method of detecting driver intoxication monitored the driver's steering habits using sensors built into the steering wheel. Drowsiness may be indicated if the driver's driving becomes irregular or shaky.

Disadvantages:

   a. It gives less accurate results compare to other techniques

3. Head Position: Several technologies for detecting driver drowsiness use cameras or sensors to track the driver's head position and motions. It may be a symptom of weariness if the driver's head droops or becomes unsteady.

Disadvantages:

   a. It very uncomfortable to the driver not move his head for his comfort.
   b. If driver move his head to backside to see the traffic then it shows the driver is drowsy.

4. Heart Rate Monitoring: The heart rate of the driver is monitored by sensors in certain more recent driver sleepiness detection systems. Drowsiness may be indicated if the driver's pulse rate slows down or becomes erratic.

Disadvantages:

   a. It is very uncomfortable for the driver while he was with carrying so many sensors.
   b. driver want drive freely and also not everyone heart is of same type.

Overall, Driver drowsiness detection technology has evolved over the years, and newer systems always use a combination of These methods to detect signs of fatigue and alert the driver to take a break.

3. PROPOSED METHOD

From this paper we can say that we are solving the above problems and feel the driver comfortable while driving. We don't use sensors that cause discomfort to driver but we use only a camera that placed on the steering to detect the face of the driver. This method is divided into two parts where the first part contains the building of model and second part is taking live feed of driver and detecting the eyes of the driver by using the model that built in the first part

3.1 MODEL

We build a classification model to detect the eyes of the driver. We first change the input image to gray image and extract high level pixels using convolution layer and we have two folders of datasets. The two folders are train and valid datasets. In this two folders we have open and closed images which will help us to get accurate results. This model helps us in the second part also that taking live feed and send images to model to detect.

3.1.1. MODEL RESULT FOR OPEN EYE

Fig 5: - The input image given to the model.

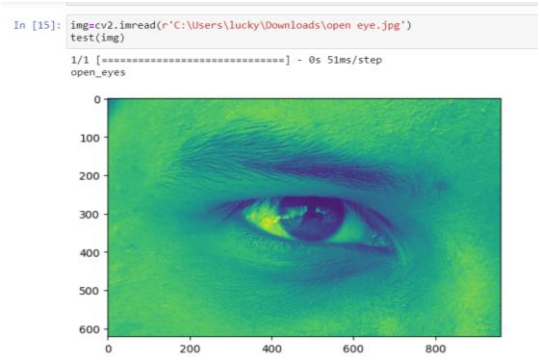

Fig 6: - The output image that came from model.

3.1.2 MODEL RESULT FOR CLOSED EYE

Fig 7: - The input image for closed eye.

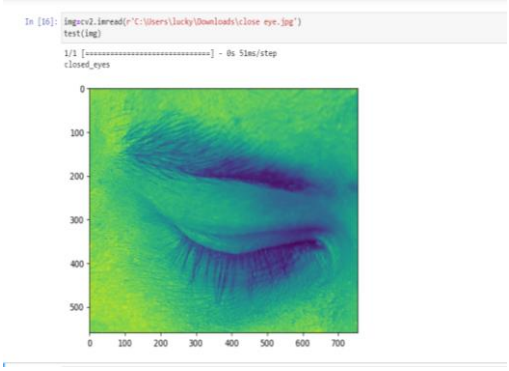

Fig 8: - The output image that came from model

3.1.3 MODEL RESULT ANALYSIS

The model results are taken via graphs where it displays the amount of accuracy and amount of loss.

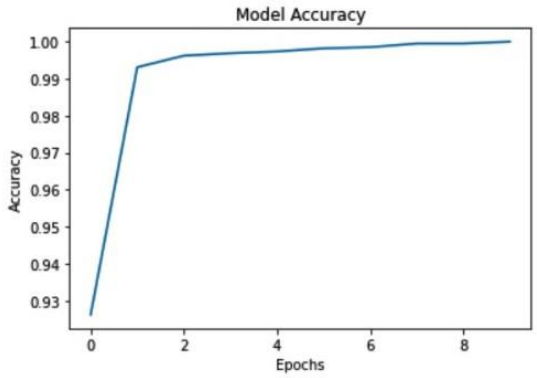

Fig 9: - The accuracy graph for the model.

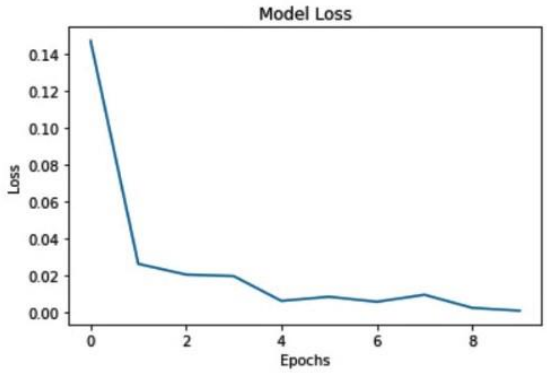

Fig 10: - The loss graph for the model.

3.2 DATASET

I. We have taken dataset from Kaggle. where the dataset contains the images of closed eyes and open eyes.
II. The dataset contains 4000 images where 2000 are open and 2000closed eyes.
III. The images from the dataset were taken under a variety of conditions, including diverse lighting conditions, distance, resolution, face angle and eye angle. So as to get accurate results.
IV. The link of the dataset is given below https://www.kaggle.com/datasets/prasadvpatil/mrl-dataset

3.3 METHODOLOGY

The main purpose of this paper is to produce a simple and easy-to-use system that will lead to a safe road trip

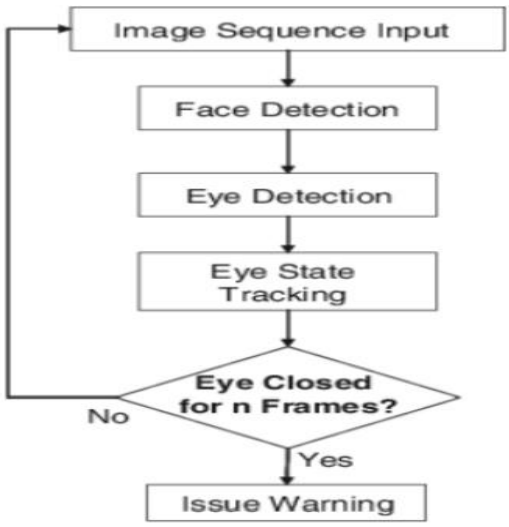

Fig 11: - Shows the methodology of proposed method

This methodology contains the five steps the helps us to find whether the driver is drowsy or not. The steps are:

I. Take image as input from a camera.
II. Detect the face in the image and create a region of interest (ROI).
III. Detect the eyes from ROI and feed it to the classifier.
IV. The classifier will categorize whether the eyes are open or closed.
V. Calculate score to check whether the person is drowsy.
VI. Send messages to driver family members that the driver is drowsy.

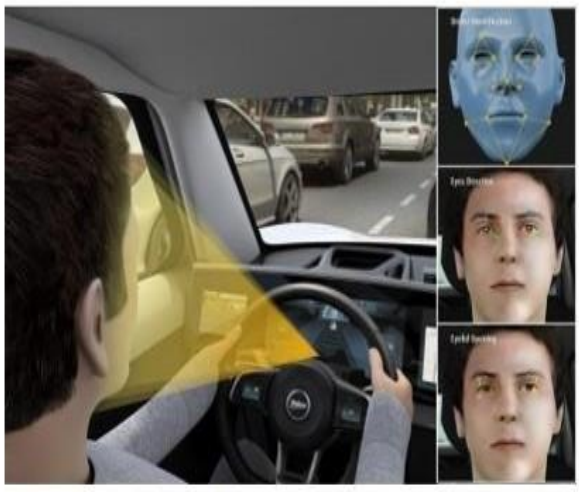

Fig 12: - Shows how it works in real life.

4. RESULTS

The results of the methodology shows that the driver is drowsy or active. The score is increasing if the driver is not active. The score remains zero if the driver is active. If the driver is drowsy then then alarm rings and the alert goes to the his close relatives then they will call him and alert him from his drowsiness. It helps to the driver to take some rest and start again. It helps to decrease some accidents in the real world. The final results are shown below.

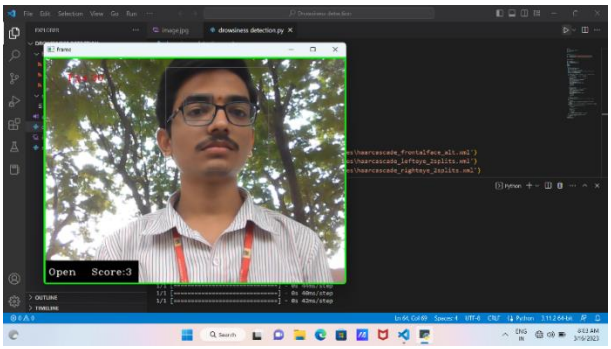

Fig 13: - Shows that the driver is not drowsy.

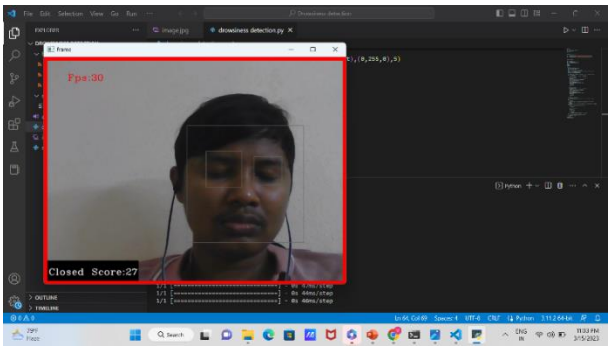

Fig 14: - Shows that the driver is drowsy.

5.CONCLUSION

The suggested CNN-based driver drowsiness detection system has demonstrated promising results in reliably identifying driver tiredness, in conclusion. Future studies could concentrate on enhancing the system's functionality by incorporating extra features and investigating different deep learning architectures to enhance the precision and efficacy of driver drowsiness detection. In the end, the proposed approach can considerably improve traffic safety by reducing accidents brought on by fatigued driving.

6. REFERENCES

[1]. Zhou, Z., Xu, Y., & Wang, Y. (2017). Driver drowsiness detection based on convolutional neural networks. IEEE Access, 5, 11840-11848.

[2]. Singh, S., & Gupta, S. (2019). Driver drowsiness detection using deep learning approach. Journal of Intelligent Transportation Systems, 23(3), 246-254.

[3]. Amin, M. G., & Karray, F. (2019). Driver drowsiness detection using convolutional neural networks. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition Workshops (pp. 0-0).

[4]. Yao, Y., Huang, X., & Wang, J. (2019). Real-time driver drowsiness detection using a convolutional neural network. IEEE Access, 7, 7994-8002.