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DRIVER DROWSINESS DETECTION AND RECOGNITION WITH FACIAL BEHAVIOUR USING OPEN CV

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ABSTRACT

Drowsy driving is the leading cause of accidents worldwide. Due to lack of sleep and tiredness, many drivers are tired and drowsy, causing many car accidents. The best way to avoid traffic accidents caused by fatigue is to warn the driver early. There are many methods of detecting sleep. In this paper, we introduce a deep learning method to detect drowsy driving. We use a transfer learning method based on convolutional neural networks (MobileNet), which is a type of deep learning. We use an eye-region data set to predict sleep.

Keywords: Drowsiness detection, Convolutional neural network, transfer learning, deep learning

I.INTRODUCTION

Sleep-deprived driving (also known as tired driving, drowsy driving, or drowsy driving) refers to driving a car with impaired cognition due to lack of sleep. Lack of sleep is a major cause of car accidents and brain damage just like alcohol. According to a 1998 study, 23% of adults fell asleep while driving. According to the US Department of Transportation, male drivers are twice as likely as female drivers to fall asleep while driving. A national poll from the National Sleep Foundation showed that 54% of older drivers said they had driven drowsy in the past year, and 28% said they had fallen asleep while driving. he. According to the National Highway Traffic Safety Administration, drowsy driving causes more than 100,000 crashes in the United States, killing 6,550 people and injuring 80,000 each year. If a person does not get enough sleep, his ability to work will suffer. As discussed below, they may experience poor coordination, slow reaction times, cognitive impairment, and memory impairment. The number of vehicles on the road is increasing every day; Road accidents have become common in most countries and are a major cause of death. As we all know, those in charge are responsible for the road management system and road safety. In addition to being responsible for the passengers in the car, the driver is also responsible for himself. Sleep is a human condition that many people overlook when it comes to their safety. However, if not addressed and responded to, this situation can be dangerous for drivers and passengers, resulting in accidents and deaths. Drowsy driving is a complex problem that must be addressed to improve traffic safety. Driver drowsy detection is an important part of modern driver monitoring systems because many traffic accidents are caused by drowsy drivers around the world. Therefore, we implemented an application that can detect people's drowsiness and help in early detection so that fellow passengers or drivers can be alert and avoid accidents.

OBJECTIVE OF PROJECT

The goal of this project is to create an effective sleep system to improve road safety. By using deep learning techniques, especially the cross learning Neural Network based on MobileNet, we aim to accurately identify driver drowsiness. We focus on the face region in the dataset, aiming to create a robust and effective model that can provide timely warnings and reduce the risk of accidents due to fatigue and drowsy driver. **PROBLEM STATEMENT:**

Traffic accidents are increasing worldwide, due to lack of sleep and fatigue among drivers, highlighting the need for preventive measures. Current strategies fail to provide timely warning. This study addresses this important gap through a new deep learning approach. Using convolutional neural networks, especially MobileNet through cross-learning, we focus on sleep detection using a dataset focused on the eye region. The project aims to reduce the prevalence of accidents caused by drowsy driving and highlights the need for innovative and effective solutions.**MOTIVATION:**

In a world where road accidents due to driver drowsiness prevail, this project emerges as a crucial stride towards safety. Recognizing the dire consequences of fatigue-related mishaps, our innovative approach employs deep learning, specifically MobileNet-based transfer learning. By focusing on eye regions within our dataset, we aim to preemptively alert drivers, mitigating the risk of accidents. This project not only addresses a global safety concern but also showcases the power of cutting-edge technology in safeguarding lives on the road.

II.LITERATURE SURVEY

Gwak, J., Hirao, A., Shino, and M: The aim of this study was to investigate the effectiveness of classifying the driver's state of alertness (especially light sleep state) based on awareness and hybrid vehicle behavior. and consider implementing this feature in a search engine. First, we used a driving simulator and a driver monitoring system to measure driver drowsiness, driving performance, physiological symptoms (from EEG and ECG results) and behavioral symptoms. Next, a machine learning algorithm is used to identify the driver's mood and drowsiness, and a dataset is created based on the signals taken within 10 seconds. Finally, an ensemble algorithm is used for classification.

You Fang, Li Xin, Gong Yu, Wang Hong, Li Hong: A sleep cycle for train driving that takes into account the differences of drivers was proposed. Building a deep convolutional neural network to detect eye locations avoids the problem of inaccuracy caused by manual extraction. Based on the Dlib toolkit, find the landmarks of the driver's front face in a given image. Based on the landmarks, a new parameter called face ratio is introduced to evaluate the driver's sleepiness in the current frame. Considering the differences in the size of the driver's eyes, the algorithm has two parts: offline training and online monitoring. In the first module, a weak image classifier is trained on support vector machine using face ratio as input. Then, in the second step, the trained class is used to monitor the online status of the driver. As driving fatigue increases, An index is included to calculate the number of sleepy frames per unit of time to evaluate driver drowsiness.

Mehta, S., Dadhich, S., Gumber, S., Bhatt, A.J: This paper develops a real-time driver sleep analysis system and uses it in an Android application. The system records the video and uses image processing technology to detect the driver's face in each frame. The system can detect facial landmarks and calculate Eye Aspect Ratio (EAR) and Close Close Ratio (ECR) to detect driver drowsiness based on adaptive thresholds. Machine learning algorithms have been used to test the effectiveness of the proposed method.

Song, F., Tan, X., Liu, , driving fatigue detection, etc. This method combines the advantages of multiple feature sets to represent a large amount of face spatial information (involving local/global shape and local texture) and to create face shape models. To improve the robustness of the model to shape noise and scale changes, we propose a new feature description called multi-scale histogram of fundamental gradients (MultiHPOG). Savas, B.K., Becerikli, Y: In this paper, a multi-functional convolutional neural network (ConNN™) model is proposed to detect driver drowsiness/fatigue. Facial and verbal features are used in driving behavior model. Changes in these characteristics are used to monitor the driver's fatigue level. Using CoNN's multitasking model, unlike studies in the literature, verbal and facial expressions are classified into a single model. Driver fatigue was assessed by calculating the duration of eye closure/percentage of eyes closed (PERCLOS) and the frequency of shouting/mouth opening (FOM). Abstract: Based on the above information, the authors implemented some hybrid algorithms [1], several machine learning algorithms [4] [6] using different data sets (including also EEG data [7]), and unique face ratios [8] are used to detect drowsiness. With the above methods, we can achieve justice, but these methods may not be good enough to get the right results. Therefore, we introduce a deep learning method made using a transfer learning method based on CNN (MobileNet) which does not provide good accuracy but can detect sleep well.

III.EXISTING METHOD

This model emphasizes an existing method that which was designed using the some of the algorithms of machine learning. Here the process does not performed accurately with the algorithms that were used and detection is not up to the expected levels accuracy.

DISADVANTAGES

- Less feature compatibility

- Improper detection

IV.PERFORMANCE ANALYSIS:

In our proposed method, we perform sleep detection. We use a CNN (MobileNet) transfer learning model to train the data. After training, we will use the OpenCV library. The process begins by capturing a live video stream from a camera, which is processed and sent to a model to predict sleep. Check each frame to see if the eyes are open or closed. If the eyes remain closed for longer than the time set in the system. If drowsiness is detected, the system will alert the driver and passengers with a buzzer.

ADVANTAGES:

- Accurate classification
- Less complexity
- High performance.

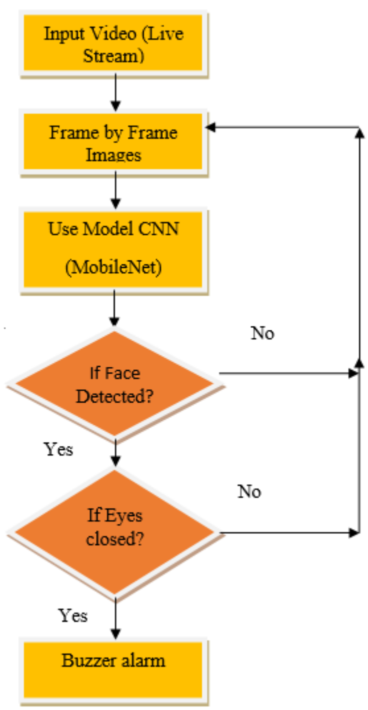

Fig 1:Block diagram

PROPOSED MODEL EVALUATION

This study uses four performance metrics to evaluate the model and its classification performance, namely accuracy, precision, recall, and F1 score. The number of correct predictions that a model makes across all types of predictions is called accuracy. Basically, the sum of the correct positive predictions between the positive classes is calculated, while the recall determines the sum of the correct positive predictions between all positive samples, the F1 score is the weighted average of the fair and just. Next, the equation shows the formula for each performance measure. True Accuracy (TP) is when the actual data and the predicted data agree. The True Thing (TN) is the time when the data value and the predicted data value are negative. A false positive (FP) is when the actual data is negative and the predicted data is positive. Negative probability (FN) is when the actual data is positive, but the predicted data value is negative.

Comparative Analysis

A benchmark is presented comparing the results of this study with other investigations that have used CNNs to detect drowsy driving. The accuracy of the proposed scheme can reach 97%. Although the results of the study [35] are similar, and the study [6,7] obtained results close to the results considered for accuracy, compared to this study, the project was considered good more accurate, Recall and F1 signal.

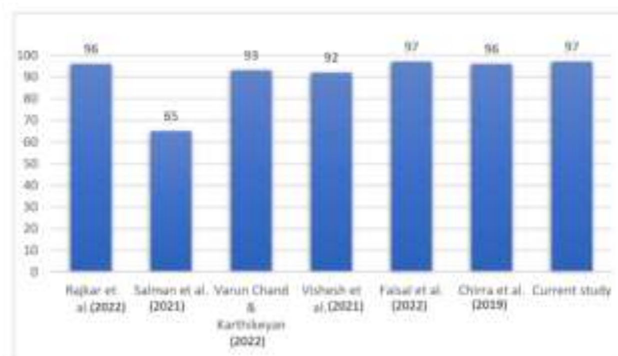

Fig 2. Comparative analysis

Statistical Analysis

In practice, the Welch t-test is used to test the hypothesis that two populations have equal means and different variances, also known as the standard deviation t-test [59]. In this study, this test is recommended because the classes are almost equal. Since this test is for a double population, four cases were added to the two cases, the open eyes and the part of the eye and 1449 cases with the eyes closed and the part of the flag and 1451 cases. After running the statistics [60], the calculated t value is 8.133821. Because the actual value of the test statistic of 5.132 is not greater than the resulting t value, the null hypothesis of the test cannot be rejected. Therefore, it is not enough. Statistical analysis In practice, the Welch t test is used to test the hypothesis that two populations have equal means and different variances, known as the t test of different variances [59]. In this study, this test is recommended because the classes are almost equal. Since this test is for a double population, four cases were added to the two cases, the open eyes and the part of the eye and 1449 cases with the eyes closed and the part of the flag and 1451 cases. After running the statistics [60], the calculated t value is 8.133821. Because the actual value of the test statistic of 5.132 is not greater than the resulting t value, the null hypothesis of the test cannot be rejected. Therefore, there is very little evidence that the two populations have significantly different cultures. This indicates that the study is valid.

V.IMPLEMENTATION:

Upload (Live):

Upload a video as a live feed using a webcam (or any camera attached in a farm).

View:

Video can be viewed live in a dialog box.

Preprocessing:

Data Preprocessing is a technique that is used to convert the raw data into a clean data set. Cleaning the data refers to removing the null values, filling the null values with meaningful value, removing duplicate values, removing outliers, removing unwanted attributes. If dataset contains any categorical records means convert those categorical variables to numerical values.

In this case, we are taking a live video feed in the form of images and resizing them to a standard size.

Identifying Features:

We use MobileNet SSD pretrained model which identifies features in any image using a Convolution Neural Network (CNN) model.

The model:

- SSD (Single Shot Detector) is a popular algorithm in object detection.
- It's generally faster than RCNN.
- SSD has two components: a backbone model and SSD head. Backbone model usually is a pre- trained image classification network as a feature extractor.
- Here, we will use MobileNet SSD model to detect the objects.
- Here, VGG Net is used as a backbone model to extract the features from the images.
- Convolution layers (CNN) are then used for object detection in the images using the feature map generated by VGG net layer.
- The model is able to detect multiple objects in any given image.
- For the purpose of classification, the model uses softmax in the last layer.
- Softmax takes in a vector of numbers and converts them to probabilities which are then used for image generating results.
- Softmax converts logits into probabilities by taking the exponents from every output and then normalize each of these numbers by the sum of such exponents, such that the entire output vector adds up to one.

Prediction:

A live video feed is taken in frame by frame as individual images. These images the then fed into the model after preprocessing to detect animals (if any exists).

User Interface:

A dialog box opens up while taking in the live video feed. The frames or images from the video are used to detect objects. The objects are then bounded in a bounding box along with a label, animal count and the probability of success in also displayed in there.

VI.CONCLUSION:

Here, we implement a drowsy detection application that can alleviate road accidents caused by drowsy drivers by detecting the driver's behavior using our proposed method. The technique we use here is the cross learning algorithm based on CNN, which is mainly used to train the proposed datasets after opencv training for testing purposes. Our thinking method can accurately predict a person's sleep or normal state.

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