

DTI 5126 - Fundamentals of Applied Data Science

Project Proposal: Driver Drowsiness Detection Using Artificial intelligence

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1 - INTRODUCTION

Can we prevent drivers from getting drowsy? Can we save more than one life? One of the most important factors that indicate how best countries are performing nowadays is the ability to increase road safety and reduce accidents. According to the World Health Organization (WHO) and the National Highway Traffic Safety Administration (NHTSA), around 1.35 million people die yearly in vehicle crashes globally. Driver fatigue has been identified as the most common cause of vehicle accidents. It can be caused by various factors, such as excessive driving time, poor road conditions, and unfavorable weather. Using the AI technique, we can detect the face, eyes and mouse to make sure the driver is in his normal state and is focused on the road.

2 - PROBLEM STATEMENT:

There are various reasons for road accidents. The major reasons for accidents on the road are drowsiness and fatigue of the driver. Previous approaches to detecting drowsiness mainly focused on the various behaviors associated with it, such as eye closure, blinking, and yawning or not. However, these methods are not enough to prevent these kinds of accidents. The accuracy ranged between 87.5 and 94 percent. We need to increase the accuracy also, we need to consider conditions like drivers who wear sunglasses or driving at night which will be confusing for the model to detect the eye because of the lighting.

3 - OBJECTIVES:

We use artificial intelligence represented by machine and deep learning to prevent car accidents and minimize casualties and financial loss. We can reduce the risks by minimizing the time of drowsiness detection and alerting the driver.

4 - BACKGROUND AND LITERATURE REVIEW:

With the general growth of the population, road safety has become a must for us. According to statistics, driver drowsiness is the reason for many automobile accident occurrences. In a study by the National Sleep Foundation, around 20 of drivers felt drowsy. Another survey by India's transport authority said that the third highest reason for road accidents is the fatigue of the driver. We can decrease the number of accidents like this by trying to monitor the state of the driver continuously. In recent years, there has been a great deal of research into predicting driver drowsiness. Many approaches were used to find the best way to detect the driver's drowsiness. Regarding the input methods, a camera was used to capture the photos or video, whether it was a webcam connected to the Raspberry Pi or a mobile phone camera. Machine learning models were popular in the past, and the most commonly used technique was the support vector machine (SVM). But now, deep learning techniques, especially convolutional neural networks, perform better on image processing applications. CNN Models architecture that are used to extract features from images such as AlexNet, VGG-FaceNet, FlowImageNet, and ResNet. The number of classes and taking the movement of the hand and mouse into consideration, in addition to the eye, are also important factors. Although there is a lot of work on driver drowsiness detection, a low number of frames from the camera is used in some of the methods, which affect the continuous monitoring of the driver. Some of the papers integrated more than two or three models, which made it more complex architecture to be processed and increased the training time. We intend to implement a model which will offer better accuracy in driver drowsiness detection. Also, to be cost-effective and low power consumption by changing the architecture of the model.

A Literature Survey of Different Methods for Driver Drowsiness Detection:

Sr. No.	Authors	Method	Result/Observations
1	Gwak et al. [1]	Features of drowsiness detection by cameras are divided into handcrafted features, or features learned automatically using CNNs	An accuracy of 65.2% was evaluated on pretended data
2	Kepesiova et al. [2]	A convolutional neural network (CNN), a convolutional control gate-based recurrent neural network (Conv GRNN), and a voting layer were used	Average accuracy of 84.41% was achieved
3	You et al. [3]	Deep cascaded convolutional neural network	Average accuracy of 94.80% was achieved
4	Mehta et al. [4]	Eye aspect ratio and eye closure ratio was used	A random forest classifier was used to get an accuracy of 84%
5	Sathasivam et al. [5]	Eye aspect ratio (EAR) and SVM classifier	Accuracy close to 94% was achieved

Figure 1. Literature Survey

5 - METHODOLOGY:

The proposed methodology treats Drowsiness detection as an object detection task. The general flow of our drowsiness detection algorithm:

1. First, a camera is setup that records a stream video for the driver.
2. Then take frames of images from the video every 2 seconds.
3. Use CNN as a feature extractor, if a face is found, facial landmark detection is applied to extract the eye regions and mouth.
4. The mouth region is used to detect if the driver is yawn or not, the eye regions are used to compute the eye aspect ratio to determine if the eyes are closed.
5. If the eye aspect ratio indicates that the eyes have been closed for a sufficiently period of time or yawn more than one time on short period, sound an alarm is used to wake up the driver and the indicators will be on to indicate the other drivers.

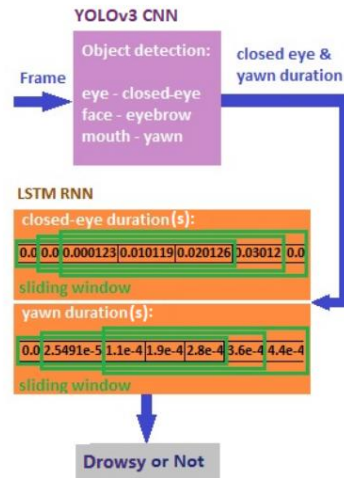


Figure 2. Methodology

6 - REFERENCES:

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