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Real-time Drowsiness Detection

B. Tech. Deep Learning Project Report

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SCHOOL OF COMPUTER ENGINEERING AND TECHNOLOGY MIT ACADEMY OF ENGINEERING, ALANDI (D), PUNE-412105 MAHARASHTRA (INDIA)

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submitted in partial fulfilment of the requirements for the award of the degree

of

Bachelor of Technology

in

COMPUTER ENGINEERING BY

Ritesh Kulkarni, Rushikesh Jadhav, Uddhav Patil, Shruti Dhumne, Aditya Karpe

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CERTIFICATE

It is hereby certified that the work which is being presented in the B. Tech. Minor Project Report entitled **"*Real-time Drowsiness Detection*",** in partial fulfillment of the requirements for the award of the **Bachelor of Technology in Computer Engineering** and submitted to the **School of Computer Engineering and Technology of MIT Academy of Engineering, Alandi(D), Pune, Affiliated to Savitribai Phule Pune University (SPPU), Pune** is an authentic record of work carried out during an Academic Year 2020-2021, under the supervision of **Prof. Prajakta Ugale, School of Computer Engineering and Technology.**

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ABSTRACT

Technology has reached all aspects of our life. Right from the start of the morning to the end of the day we are embedded in technology. Technology has been used in all sectors of our life such as agriculture, banking, and communication, and even in socializing a human beings. Even technology in the education sector has helped a lot in the recent pandemic situation through online education mode and other online stuff. All sectors have implemented technology in their specific field except the police department. The Indian police Department has since its inception used the manual paper and pen method for carrying out the proceedings.

Many researchers have found out that many citizens hesitate to go physically to the police station due to fear of the officials and also due to lack of time. In India Virtualization is the need of the hour. Having an online way of reporting crime reduces the fear of the citizens. Also maintaining all the records has become very tedious. Having a digital solution for this will help in maintaining such records. Also, it helps in transparency and corruption- less system.

We aim to address such constraints in our application by giving the citizen a platform to complain and ask questions about the status of the complaint in the 'Comment' section. It also provides features to empower police to give the status of the complaint to the user and give various services to the user.

CONTENTS

1. INTRODUCTION

The driver drowsiness detection is based on an algorithm, which begins recording the driver's steering behavior the moment the trip begins. It then recognizes changes over the course of long trips, and thus also the driver's level of fatigue. Typical signs of waning concentration are phases during which the driver is barely steering, combined with slight, yet quick and abrupt steering movements to keep the car on track.

Based on the frequency of these movements and other parameters, among them the length of a trip, use of turn signals, and the time of day, the function calculates the driver's level of fatigue. If that level exceeds a certain value, an icon such as a coffee cup flashes on the instrument panel to warn drivers that they need a rest.

2. Motivations for the Project

Nowadays drowsiness of drivers is one of the main reasons behind road accidents. It is natural for the drivers who take long drives to doze off behind the steering wheel. In this article, we will build a drowsiness detection system that will alert the driver as soon as he fell asleep.

Drowsiness is identified by using vision-based techniques like eye detection, yawning, and nodding. When it comes to yawning and nodding some people can sleep without yawning and nodding.

One more method is by using physiological sensors like biosensors. Here the disadvantages are that the driver may hesitate to wear them or he may forget to wear them. Detecting drowsiness through eye detection is best compared to the remaining techniques.

3. Problem Statement

"To design and develop a deep learning-based model to report Driver Drowsiness."

4. Objectives

- The purpose of the drowsiness detection system is to aid in the prevention of accidents in passenger and commercial vehicles.
- The system will detect the early symptoms of drowsiness before the driver has fully lost all attentiveness and warn the driver that they are no longer capable of operating the vehicle safely.

- The system works in spite of the driver wearing spectacles and in various lighting conditions.
- To alert the driver on the detection of drowsiness by using a buzzer or alarm.

5. Scope

Future works may focus on the utilization of outer factors such as vehicle states, sleeping hours, weather conditions, mechanical data, etc, for fatigue measurement. Driver drowsiness poses a major threat to highway safety, and the problem is particularly severe for commercial motor vehicle operators. Twenty-four-hour operations, high annual mileage, exposure to challenging environmental conditions, and demanding work schedules all contribute to this serious safety issue.

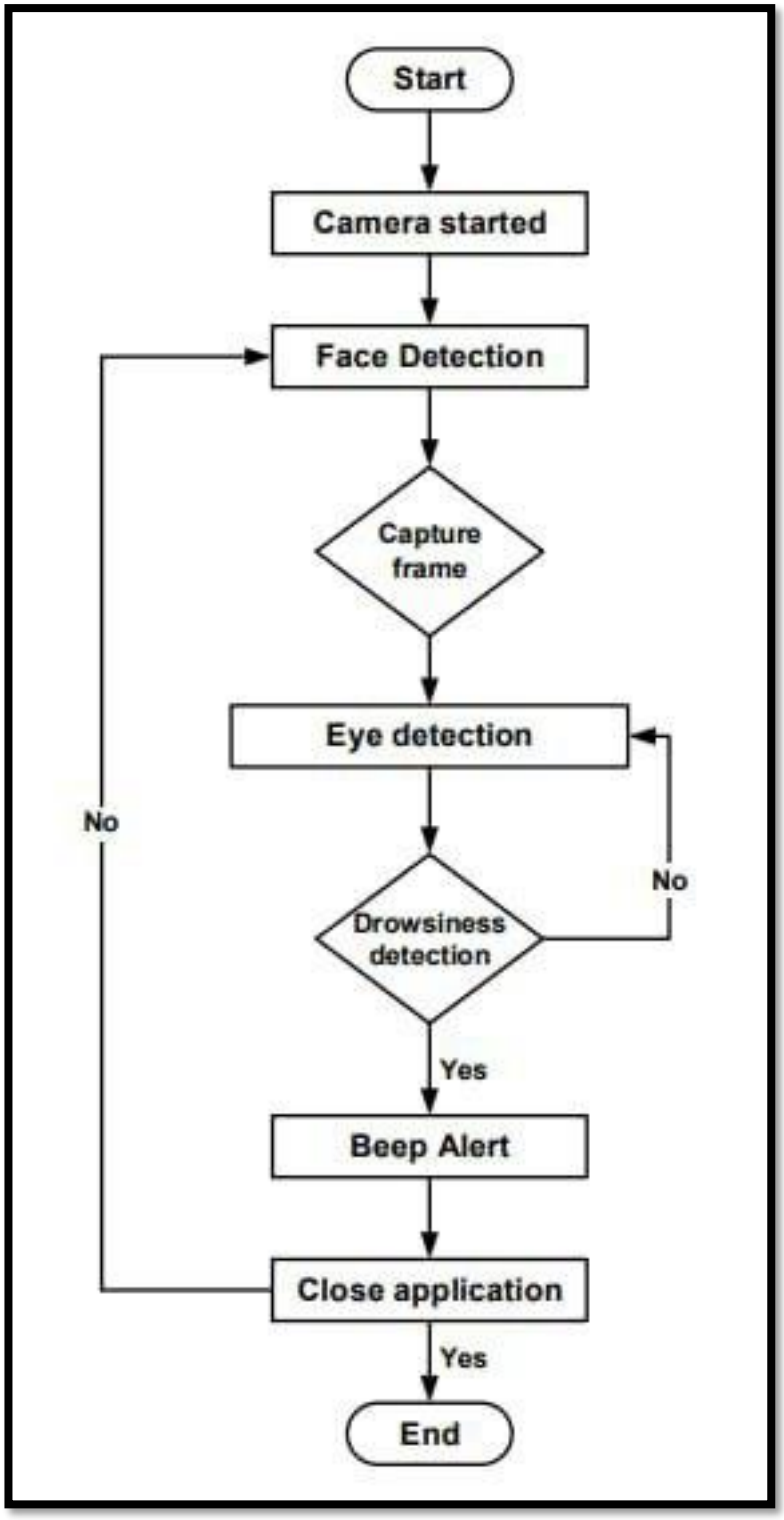
Monitoring the driver's state of drowsiness and vigilance and providing feedback on their condition so that they can take appropriate action is one crucial step in a series of preventive measures necessary to address this problem. Currently, there is no adjustment in the zoom or direction of the camera during operation. Future work may be to automatically zoom in on the eyes once they are localized.

6. Tools Used

- **IDE**
  - Jupyter Notebook
  - Anaconda

- **Libraries**
  - Tensorflow
  - OpenCV
  - Numpy
  - OS
  - Matplotlib

7. System Design

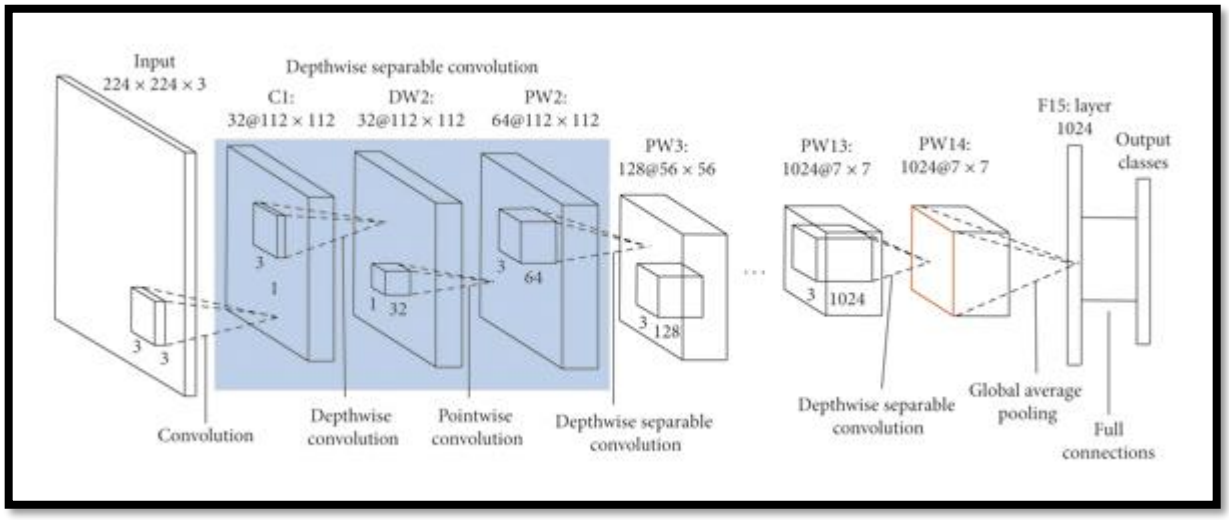


8. Methodology

We have used:

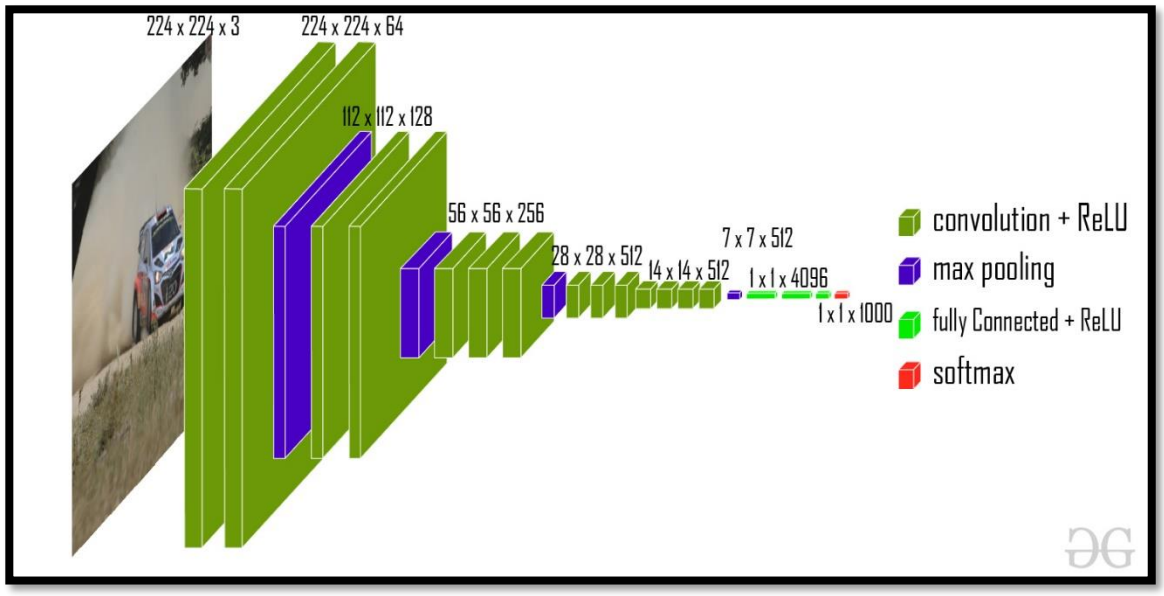
MobileNet

MobileNet is a streamlined architecture that uses depthwise separable convolutions to construct lightweight deep convolutional neural networks and provides an efficient model for mobile and embedded vision applications. The structure of MobileNet is based on depthwise separable filters, as shown below:



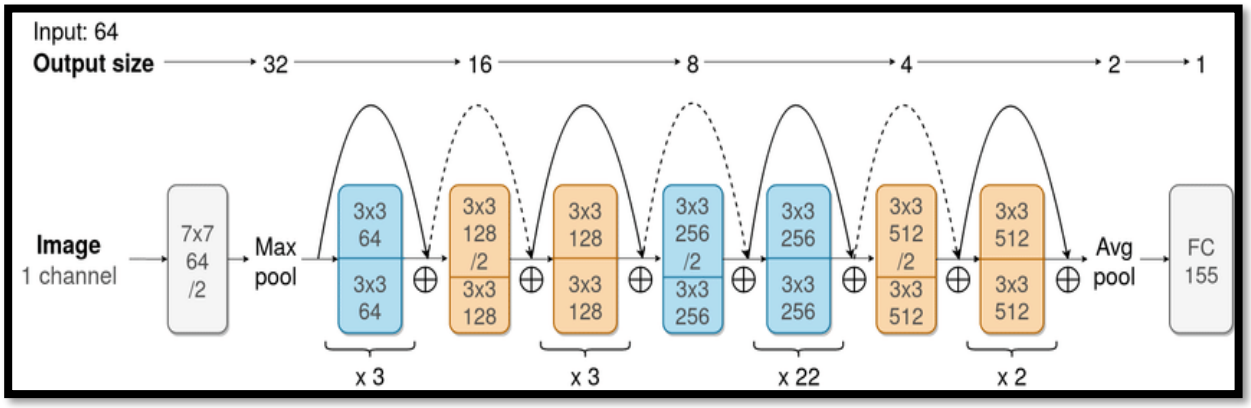
VGG-16

The input to the network is an image of dimensions (224, 224, 3). The first two layers have 64 channels of a 3*3 filter size and the same padding. Then after a max pool layer of stride (2, 2), two layers have convolution layers of 128 filter size and filter size (3, 3). This is followed by a max-pooling layer of stride (2, 2) which is the same as the previous layer. Then there are 2 convolution layers of filter size (3, 3) and 256 filters. After that, there are 2 sets of 3 convolution layers and a max pool layer. Each has 512 filters of (3, 3) size with the same padding. This image is then passed to the stack of two convolution layers. In these convolution and max-pooling layers, the filters we use are of the size 3*3 instead of 11*11 in AlexNet and 7*7 in ZF-Net. In some of the layers, it also uses 1*1 pixel which is used to manipulate the number of input channels. There is a padding of 1 pixel (same padding) done after each convolution layer to prevent the spatial feature of the image.



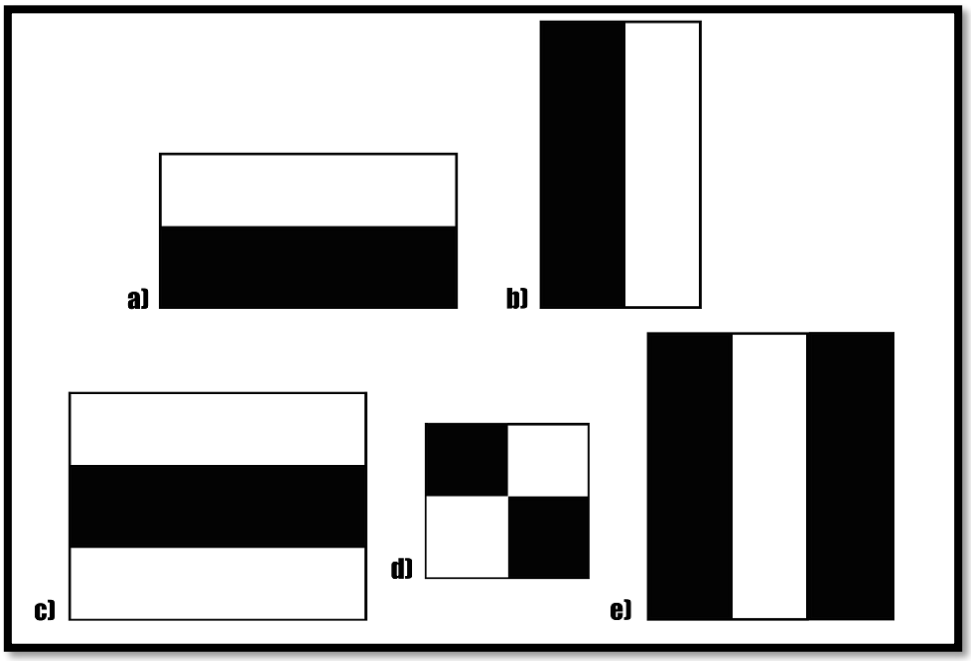
ResNet101

A residual neural network (ResNet) is an artificial neural network (ANN). It is a gateless or open-gated variant of the HighwayNet, the first working very deep feedforward neural network with hundreds of layers, much deeper than previous neural networks.



9. (I) Algorithm Used

- Haar-Cascade Algorithm
  - Identifying a custom object in an image is known as object detection. This task can be done using several techniques, but we will use the haar cascade, the simplest method to perform object detection
  - Haar cascade is an algorithm that can detect objects in images, irrespective of their scale in image and location.
  - This algorithm is not so complex and can run in real time. We can train a haar-cascade detector to detect various objects like cars, bikes, buildings, fruits, etc.
  - Haar cascade uses the cascading window, and it tries to compute features in every window and classify whether it could be an object.



(II) Result

Training & Saving The Models

```
In [25]: mobile_net_model.compile(loss = "binary_crossentropy", optimizer = "adam", metrics = ["accuracy"])
         mobile_net_model.fit(X,Y, epochs = 1, validation_split = 0.2)
         mobile_net_model.save('mobile_net_model.h5')## training

         50/50 [==============================] - 452s 9s/step - loss: 1.8051 - accuracy: 0.8756 - val_loss: 8.4734 - val_accuracy: 0.44
         84

In [46]: resnet_model.compile(loss = "binary_crossentropy", optimizer = "adam", metrics = ["accuracy"])
         resnet_model.fit(X,Y, epochs = 1, validation_split = 0.2)
         resnet_model.save('resnet_model.h5') ## training

         50/50 [==============================] - 1850s 36s/step - loss: 7.7704 - accuracy: 0.4956 - val_loss: 7.4988 - val_accuracy: 0.
         5139

In [47]: vgg_model.compile(loss = "binary_crossentropy", optimizer = "adam", metrics = ["accuracy"])
         vgg_model.fit(X,Y, epochs = 1, validation_split = 0.2)
         vgg_model.save('vgg_model.h5')## training

         50/50 [==============================] - 1777s 35s/step - loss: 7.7416 - accuracy: 0.4981 - val_loss: 7.4988 - val_accuracy: 0.
         5139
```

10. Conclusion

The drowsiness detection and correction system developed is capable of detecting drowsiness in a rapid manner. The system can differentiate normal eye blink and drowsiness which can prevent the driver from entering a state of sleepiness while driving. The system works well even in the case of drivers wearing spectacles and under low-light conditions also. During the monitoring, the system is able to decide if the eyes are opened or closed. When the eyes have been closed for about two seconds, the alarm beeps to alert the driver.

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