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Driver Drowsiness Detection

ECE 4032 – Neural Networks and Deep Learning

Team members

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Abstract

- Driver drowsiness has become one of the main reasons for large number of road accidents.
- The main aim of this project is to overcome the problem of road accidents which are related to drivers experiencing fatigue leads to a need arises to design a system that keeps the driver focused on the road.
- With the evolution and improvement in Computer Vision technologies, smart/intelligent cameras are developed to predict drowsiness in drivers, thereby alerting drivers which in turn reduce accidents when they are feeling drowsy.
- In this work, a new approach is taken using deep learning to detect driver drowsiness based on Eye state while driving the vehicle.
- To detect the face and extract the eye region from the face images, OpenCV algorithms and haar cascade classifier are used

Problem statement (Motivation)

- Sleep disorders increase the risk of road accidents by 300%, finds a World Bank study.
- Many of these truck drivers or bus drivers who drive vehicles on highways suffer from Obstructive Sleep Apnea (OSA), a disorder that majorly goes undetected because of lack of testing.
- 0% of all road accident victims are found suffering from sleep disorders and OSA and more than 23% of truck drivers have sleep deprivation. Clearly, these drowsy drivers can cause fatal accidents on roads.

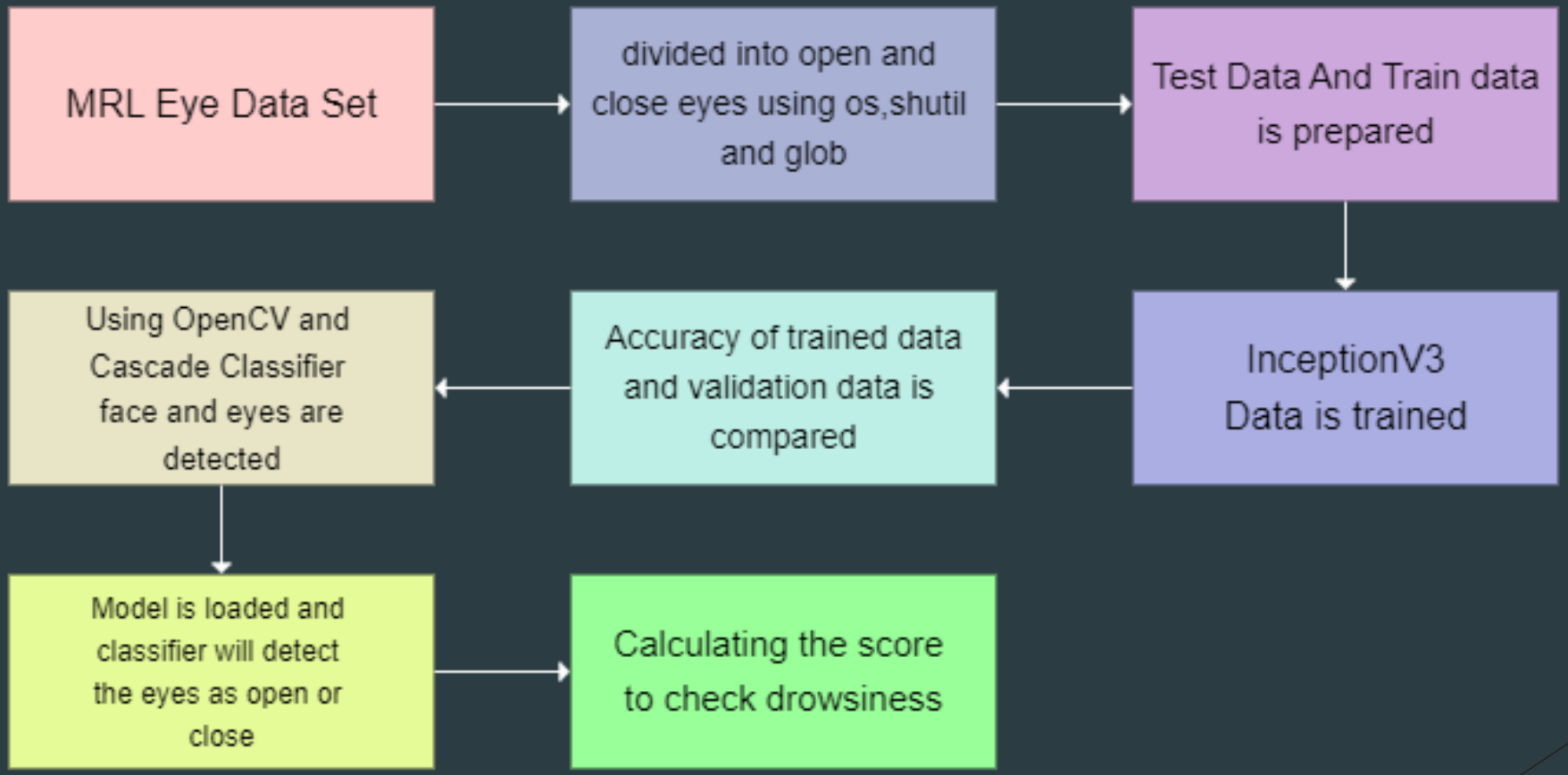
Proposed Idea (Novelty)

- The drowsiness detection based on eye state has been done accurately based on the varying features and factors, and also with the help of experts knowledge.
- Predicting the facial landmarks and detecting the eye-state and displaying the driver status on the screen and producing alert sound if the driver is drowsy for drowsiness detection.
- Generally, the driving person feels drowsy due to continues driving for long hours or Physical illness or might be drunken and this leads to major road accidents.
- Our aim is to detect the drowsiness, make them alert to prevent accidents and generate an alarm sound.

Beneficiaries of the proposed solution(Societal Impact)

- with this Python project, we will be making a drowsiness detection system. A countless number of people drive on the highway day and night. Taxi drivers, bus drivers, truck drivers, and people traveling long-distance suffer from lack of sleep. Due to this, it becomes very dangerous to drive when feeling sleepy.
- The majority of accidents happen due to the drowsiness of the driver. So, to prevent these accidents we will build a system using Python, OpenCV, and Keras which will alert the driver when he feels sleepy.

Block Diagram



Hardware and Software details

- a webcam through which we will capture images
- opencv-python (face and eye detection)
- tensorflow (keras uses TensorFlow as backend).
- keras (to build our classification model).
- Pygame (to play alarm sound).
- Data Set To build and train our model

Project Description

- Data preparation MRL eye dataset is used in this project. It is large-scale dataset of human eye images. This dataset contains infrared images in low and high resolution, all captured in various lightning conditions and by different devices. The dataset is suitable for testing several features or trainable classifiers. In order to simplify the comparison of algorithms, the images are divided into several categories, which also makes them suitable for training and testing classifiers.
- The OS module in Python provides functions for interacting with the operating system. OS comes under Python's standard utility modules. This module provides a portable way of using operating system-dependent functionality. The shutil in Python is a module that offers several functions to deal with operations on files and their collections. It provides the ability to copy and removal of files. Glob is used to find the files and folders whose names follow a specific pattern. The searching rules are similar to the Unix Shell path expansion rules. tqdm is a Python library that allows you to output a smart progress bar by wrapping around any iterable. A tqdm progress bar not only shows you how much time has elapsed, but also shows the estimated time remaining for the iterable. Open eyes and closed eye data was separated and moved 90 percent of the images was moved to train dataset and remaining to test dataset manually

Project Description

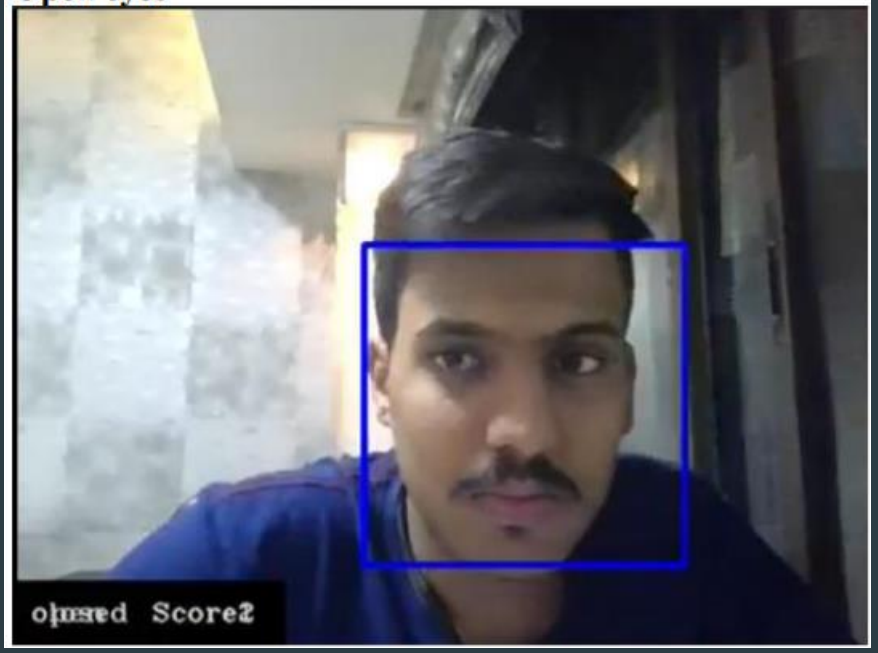
- Model Training InceptionV3 CNN Architecture Trained on ImageNet Data Set. Inception-v3 is a convolutional neural network that is 48 layers deep. You can load a pretrained version of the network trained on more than a million images from the ImageNet database. The pretrained network can classify images into 1000 object categories, such as keyboard, mouse, pencil, and many animals. As a result, the network has learned rich feature representations for a wide range of images. The network has an image input size of 299-by-299. Transfer learning, used in machine learning, is the reuse of a pre-trained model on a new problem. In transfer learning, a machine exploits the knowledge gained from a previous task to improve generalization about another. For example, in training a classifier to predict whether an image contains food, you could use the knowledge it gained during training to recognize drinks.

Project Description

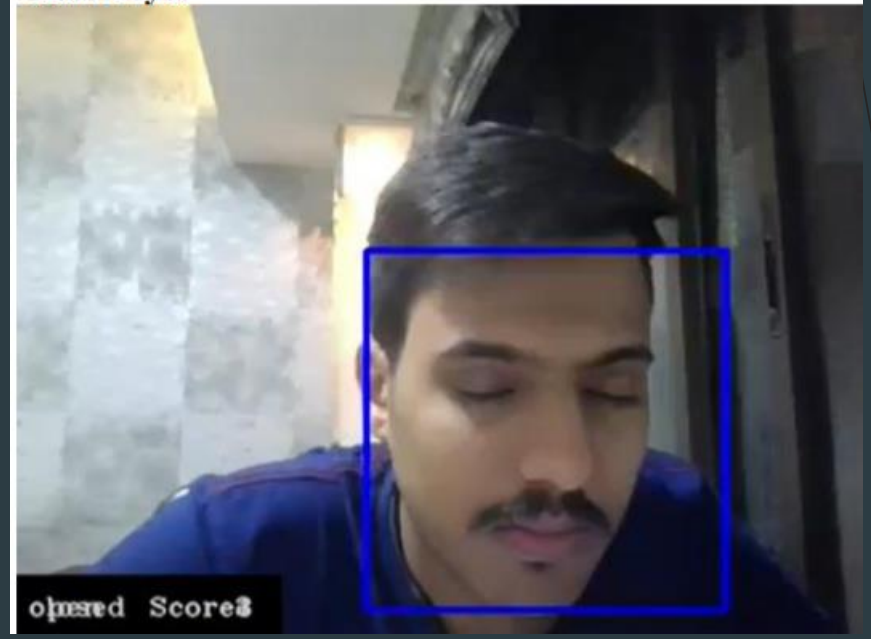
- OpenCV By using it, one can process images and videos to identify objects, faces, or even handwriting of a human.
- Detect Face in the Image and Create a Region of Interest (ROI)
- Detect the eyes from ROI and feed it to the classifier
- Classifier will Categorize whether Eyes are Open or Closed
- Calculate Score to Check whether Person is Drowsy

Results

Open eyes



Closed eyes



Working Model Link

- Output Video Link
- Github

Conclusion

- In this proposed work a new method is proposed for driver drowsiness detection based on eye state. This determines the state of the eye that is drowsy or non- drowsy and alert with an alarm when state of the eye is drowsy. Face and eye region are detected using Predict and Detection algorithm. Stacked deep convolution neural network is developed to extract features and used for learning phase. An EAR equation is used to classify the driver as sleep or non-sleep. Proposed system achieved (92%>) accuracy. Proposed system effectively identifies the state of driver and alert with an alarm, when the model predicts drowsy output state continuously. We have used transfer learning to improve the performance of the system. By doing this many accidents will be reduced and provide safe life to driver and vehicle safety. A system for car safety and driver safety is presented only in the luxurious cars. Using drowsiness detection system, driver safety can be implemented in normal cars also.