Driver Safety System using Internet Of Things
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Problem Statement

A lot of accidents are happening due to:

1. Driver is **tired** or **sleepy**.
2. Driver is **doing something else** while driving.
3. Driver is **drunk**

Making a *Driver Safety System* that alerts driver through **Audio message**

Background

From the different literatures, we inferred that Driver Drowsiness & Distracted Driver is accomplished through various deep learning techniques and computer vision techniques.
It can be done in 3 ways:
1. **Emotion** Analysis
2. **Facial Features** Analysis
3. **Car Movement** Analysis
Out of these, Facial feature-based detection is most effective.

Dataset and Features

We have used 2 different datasets:
1. Drowsiness: **Test**: 2012 images   **Train**: 751 images
2. Distraction: **Test**: 79726 images   **Train**: 17939 images
       8 different types of distraction classes.
Drunk Detection done by using Sensor in Raspberry Pi

Design Approach / Methods

Drowsiness Detection:
Using DLIB for 68 points face detection -> Identifying the eyes and mouth -> Model decides whether the eye is closed & person is yawning -> Define a threshold for eyes to remain closed -> Alert the driver using Voice message.

Distraction Detection:
Full body of driver is captured in a frame -> Ensemble Modelling (InceptionV3+VGG16) -> Compare the accuracies with other models -> Classify the frame into 1 of the 8 classes -> Alert the driver using Voice message.

Drunk Detection:
Using MQ3 sensor to measure ethanol concentration in air -> Alert the driver using Voice message.

## Desgin Constraints

Constraints are:
1. Not effective when driver is wearing sunglasses.
2. Model size should be less for Raspberry Pi to work properly.

Results and Discussions

Out of the methods used, the **InceptionV3 + VGG16** model worked the best with accuracy of 98%

Summary of Project Result

Driver drowsiness using eye blinks and frequency of yawning is working good. Driver distraction is giving an accuracy of 98%.Drunk detection using hardware MQ3 sensor measuring ethanol concentration in the air.
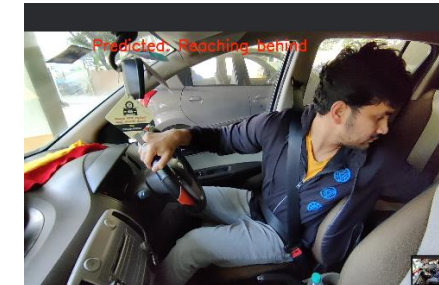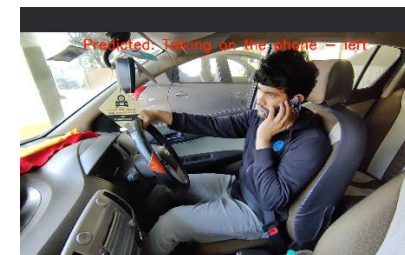
Conclusion and Future Work

A multi-modal application is created. Best ML and DL models are used for prediction. User friendly hardware implementation.
Future Scope:
1. Using night vision camera, for more clear detection of face at night. Can't use face brightening methods as raspberry pi won't be able to take that much load and will start lagging.
2. Check the speed of the car and if the speed is 0 or below 10. Then alarm should be turned off as it's not risky and it'll create a nuisance for the driver.
3. In distant future, this system can be used inside automated cars.

References

[1] "Detection of Driver Drowsiness by Calculating the Speed of Eye Blinking", Muhammad Fawwaz Yusri, Patrick Mangat and Oliver Wasenmiller, arxi.org, 21 October 2021. Firdaus Q., Sigit R., Harsono T. & Anwar A. (2020, September).

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