**Project Outline**

**Project Overview:**

According to the CDC motor vehicle safety division, one in five car accidents is caused by a distracted driver. Sadly, this translates to 425,000 people injured and 3,000 people killed by distracted driving every year.

In this project, I have created and refined machine learning models to detect what the driver is doing in a car given driver images. This is done by predicting the likelihood of what the driver is doing in each picture.

**Problem Statement :**

Given a dataset of 2D dashboard camera images, an algorithm needs to be developed to classify each driver's behaviour and determine if they are driving attentively, wearing their seatbelt, or taking a selfie with their friends in the backseat etc..? This can then be used to automatically detect drivers engaging in distracted behaviours from dashboard cameras.

Following are needed tasks for the development of the algorithm:

Download and preprocess the driver images

Build and train the model to classify the driver images

Test the model and further improve the model using different techniques.

**Data Exploration:**

The provided data set has driver images, each taken in a car with a driver doing something in the car (texting, eating, talking on the phone, makeup, reaching behind, etc). This dataset is obtained from Kaggle(State Farm Distracted Driver Detection competition).

Following are the file descriptions and URL’s from which the data can be obtained :

imgs.zip - zipped folder of all (train/test) images

sample\_submission.csv - a sample submission file in the correct format

driver\_imgs\_list.csv - a list of training images, their subject (driver) id, and

class id

driver\_imgs\_list.csv.zip

sample\_submission.csv.zip

The 10 classes to predict are:

c0: safe driving

c1: texting - right

c2: talking on the phone - right

c3: texting - left

c4: talking on the phone - left

c5: operating the radio

c6: drinking

c7: reaching behind

c8: hair and makeup

c9: talking to passenger

There are 102150 total images. Of these 17939 are training images,4485 are validation images and 79726 are training images. All the training, validation images belong to the 10 categories shown above. The images are coloured and have 640 x 480 pixels each as shown below

**Data Preprocessing :**

Preprocessing of data is carried out before model is built and training process is executed. Following are the steps carried out during preprocessing.

Initially the images are divided into training and validation sets.

The images are resized to a square images i.e. 224 x 224 pixels.

All three channels were used during training process as these are color images.

The images are normalised by dividing every pixel in every image by 255.

To ensure the mean is zero a value of 0.5 is subtracted.

**Purpose :**

The purpose of this project is to develop an automated system using CNNs to detect distracted drivers. The project aims to address the limitations and challenges associated with this task by implementing effective approaches such as data augmentation, transfer learning, multi-task learning, attention mechanisms, and ensembling. By successfully implementing these approaches, the project intends to achieve the following goals:

1)Improve Road Safety: By accurately detecting distracted drivers, the project aims to contribute to enhancing road safety and reducing the risks associated with distracted driving.

2)Develop a Reliable System: The project seeks to develop a robust and reliable system that can effectively detect various forms of driver distraction, including phone usage, eating, drowsiness, and other visually observable distractions.

3)Overcome Data Limitations: The project aims to address the challenge of limited labeled data by applying data augmentation techniques and exploring transfer learning, enabling the development of a more accurate model.

4)Advance CNN Techniques: By implementing attention mechanisms, multi-task learning, and ensembling, the project aims to push the boundaries of CNN techniques in distracted driver detection, improving the overall accuracy and performance of the system.

Overall, the project's purpose is to contribute to the development of an effective and efficient system that can aid in preventing accidents caused by distracted driving, ultimately saving lives and making our roads safer.