Udacity Machine Learning Engineer Nanodegree
Capstone Project By Patrick Harris

Domain Background:

Distracted driving spans several different domains and is a growing problem for public safety, insurance, automotive, technology, and medical industries. This particular Kaggle challenge is provided by State Farm Insurance. Kaggle - State Farm

The U.S. Department of Transportation classifies distracted driving as any activity that diverts attention from driving. This includes talking or texting on a phone, eating, drinking, talking to passengers, using the stereo, entertainment or navigation system. They also identify texting as the most alarming distraction due to the average time it takes to read a text message, 5 seconds. According to the CDC motor vehicle safety division, 1 in 5 accidents is the result of a distracted driver. This translates to 425,000 injured and 3,000 killed due to distracted drivers.

Due to these growing statistics, distracted driving is problem that needs to be solved and will likely require advances from multiple industries. The automotive industry has been working on self-driving vehicles, which will eliminate the driver from the equation. Technology companies have been enhancing their personal assistant capabilities to enable more hands-free capabilities on their handsets.

Insurance companies in particular want to solve this problem to decrease their exposure to high dollar claims involving distracted drivers. The approach of this challenge is to use a dashboard camera to identify when drivers are distracted.

This is an interesting domain to investigate due to the severity of the problem and wide range of impacts and potential solutions, both short-term and long-term.

Problem Statement:

Properly identify distracted drivers with dashboard cameras. In this challenge, there are 10 possible classifications, 9 are distractions and 1 is safe driving. The goal is to be able to identify the behavior of the driver within the provided classes, more specifically, to predict the likelihood of each class in an image.

Datasets:
Kaggle - State Farm - Data
mgs.zip – all images (train/test)

sample_submission.csv – sample submission file in correct format
driver_imgs_list.csv – list of training images, subject id and class

Solution Statement:

Developing a convolutional neural network using dataset augmentation will provide a solid foundation for predicting distracted drivers. All State does not communicate how they intend to use these predictions, but potential uses could be; to alert the driver via audio or vibration, record the number of distractions per trip to lower premiums for drivers with fewer distractions and increase premiums for highly distracted drivers.

Benchmark Model/ Evaluation Metrics:

A benchmark was not provided in this competition, however, the winning submission achieved a multiclass loss score of 0.08739. The top 100 has a score of approximately .3000.

Project Design:

1) Review the data to gain an understanding of the dataset
2) Rescale images, if needed
3) Split data into training and validation sets (test images separate file)
4) One-hot encode any labels, if needed
5) Create an augmented dataset
6) Construct CNN model architecture
7) Compile model
8) Train model
9) Load model with best weights
10) Score model
11) Repeat steps 6-10 until fine-tuned and experiment with combination of augmented dataset and without