More than 3,000 Americans are killed in car incidents each year due to distracted driving. Distracted driving occurs when a driver fails to focus on the road situation[3].

Distractions can be classified into three types:
1. Visual distraction: the driver’s eyes are off the road.
2. Manual Distraction: the driver’s hands are off the wheel.
3. Cognitive distraction: the driver’s mind is not engaged in driving.

A driver behaviour classification system aims to help drivers to enhance his/her driving style and prevent car accidents related to distracted driving.

References

Driver Behavioural Classification System

Hardware Components

The system uses a NVIDIA Jetson Nano Developer Kit to perform driver action classification.

A Pi NoIR night vision camera is employed to capture driver images.

CNN Models

Three Convolutional Neural Network models were developed in parallel:
Model 1: Binary Classification CNN Model
Model 2: Multi-class Classification CNN model
Model 3 : Multi-class Classification with ResNet CNN model
Model 2 was selected as the final model.

System Workflow

The system utilizes a software package called OpenCV to classify raw images that are obtained from the camera. If an unsafe behaviour is classified, the driver is alerted.

System Accuracy

Training Acc - 97.8%
Validation Acc - 96.6%

Precision - 0.98
Recall - 0.98

Conclusion

The multiclass classification CNN was capable of predicting the classes of validation data with over 96% accuracy, however on unseen test data, involving testing against a prerecorded video, the accuracy dropped to approximately 80%. Future work would involve making the training set more generalized to capture every angle of the driver’s view.

Presented By: Wenyun Liao, Divya Chawla & Elliot McSmythurs