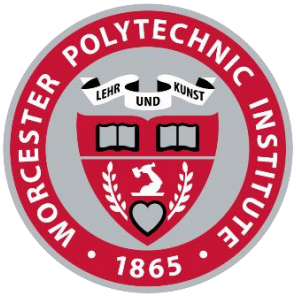

WPI

CS 539 Machine Learning

Project Proposal on

Distracted Driver Detection

By

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1. Introduction

Most people tend to follow safety guidelines while driving, yet there is a continuous increase in car accidents year after year that leads to loss of lives. One major factor that contributes towards it is minor distractions while driving. Current distracted driving statistics show that 80% of all car accidents are caused by the driver being distracted in some way. Thus, to reduce the number of car accidents, being able to identify a distracted driving is a major task.

2. Dataset and Pre-processing

Our dataset is from a 2016 Kaggle competition with a huge collection of 22,500 640x480 RGB images. We pre-process these images by resizing them to a lower size and extract each image's features by converting it to a column vector which will contain the RGB values stacked one after the other for a single example. We will then combine the vectors for each of the data instances and create a matrix as the input data to our models. Pre-processing of the data will be a challenge because we will have to figure an optimum value to resize the image.

3. Implementation Plan

Our project focuses on identifying driver activities while driving using various Machine Learning Algorithms and evaluate their accuracy. The input to the model is images of a driver in the car and we will build a model that is able to classify if a driver is driving safely or performing any activity which could be categorized as a distraction.

The goal of this project is to use various Machine Learning techniques to classify driver's activities and identify a model that yields the highest accuracy. The model is trained on image data that are the images of driver's actions in the car. This is a multi-class classification problem, with a total of 10 classes including a class of 'safe driving'. The image below gives the 10 classes:

Source: http://cs229.stanford.edu/proj2019spr/report/24.pdf

We plan to implement Non-Linear SVM and a Convolutional Neural Network for classification and measure their performance metrics. The accuracy derived by each model can be compared and the model with minimum test loss can be chosen as the best model for driver activity classification. We will make use of libraries like Sci-kit learn and Deep learning platforms (Keras or TensorFlow) for implementing the neural networks.

4. Applications

Our model is applicable to the following applications and many more

- If installed in a car, it can alarm/warn if the driver is distracted.
- In semi-autonomous vehicles, the vehicle can take control if the driver is distracted.
- Government can use to enforce laws on safe & distraction free driving.
- Auto Insurance companies can use these models in re-writing auto policies.

5. Existing work

Some existing models are built using decision trees, shallow neural networks, ensemble methods and convolutional neural networks. The methods we plan to implement should give us a good understanding of the underlying mechanics of various algorithms and help us better understand the suitability of an algorithm for a specific problem.

The project would be categorized as a research project. We will evaluate the performance of all algorithms and will able to understand the performance of the model by using it on test data to get a fair idea of its ability to generalize on real world data which is the most important part for any learning algorithm.

6. Resources

Since, it's a critical issue, various methods have been adopted in the past for solving this problem. Several research papers have implemented algorithms such as Linear SVM, SoftMax, Naive Bayes, decision trees and neural networks. In addition, Kaggle will also serve as a major resource for our project. We will use these public resources and try other algorithms like Gaussian Kernel based SVM along with CNN to obtain optimum results.

7. Evaluation

We plan to demonstrate the usefulness of our classification model by its ability to classify data accurately using metrics such as confusion matrix and classification accuracy. We will perform k-fold cross-validation by splitting the dataset into train/test data.