Traffic Sign Classification Project Proposal - ECE 285

Stephen Kim
ECE
A15400652

Abstract

This project will be focused on classifying traffic signs from an image input. Several different techniques around image processing and models will be compared to evaluate their performance in classifying traffic signs. The goal of this project is to understand which approaches lead to better results. Having an extremely accurate model is essential in the realm of autonomous driving as failure to identify and follow instructions on the road, usually posted as signs, can lead to tragic events. In this proposal, I will be covering the problem behind identifying traffic signs, a general method I am going to take in approaching this problem, and how this plan will come to fruition.

1 Problem Definition

Understanding instructions on the road is important for your own safety as well as the safety of those around you and everyone else on the road. Drivers go through education and training to ensure that they understand the instructions on the road, given to drivers through a physical sign on the side so that certain measures can be taken to avoid hazards or to be careful with unusual road layouts. Autonomous cars should have the same training. If they are to be drivers, they need to understand the rules and precautions of the road. Autonomous driving is often a block box, so this project aims to interpret what helps achieve better results in traffic sign classification.

2 Tentative Method

There are already several models in the realm of image classification and recognition. I plan to use and compare several of these. Such models include VGG, Resnet, DeepFace, DenseNet, ... etc. I plan on researching these models through their respective research papers and implementing the models through libraries such as PyTorch and TensorFlow.

The reason why I decided to use these models for this problem is that these models are based on Convolutional Neural Networks (CNN) for classification. As shown in lecture, CNNs are proven to have the highest accuracy for image classification. Once I have implemented their models, I will fully train them from scratch and perform transfer learning for comparison.

3 Experiments

For this project, I will be using a traffic sign dataset from Kaggle. This dataset contains labeled images containing a single traffic sign. Each model requires the use of a specific pre-processing function, so after evaluating performance and tuning the models, I will analyze the pre-processing and models to understand what allows for the best performance.

References

Dataset: Traffic Sign Dataset (https://www.kaggle.com/datasets/ahemateja19bec1025/traffic-sign-dataset-classification)