Project Proposal

Topic: Traffic Sign Classification

Problem statement: Self-driving cars need traffic sign recognition in order to properly parse and understand the roadway. Recent advances in self-driving cars and computer vision have opened various prospects of traffic sign detection on the roads. Eventhough there are many advancements in the field of object detection and recognition it remains to be a crucial challenge even today. In order to classify the signs I will be using the LeNet architecture the task would be, given an image the model should be able to find the correct class it belongs to and to make the output have accurate results the dataset consists of 43 different classes of traffic signs along the road, speed limit signs, yield signs, merge signs, etc. For this project, I will be using GTSRB - German Traffic Sign Recognition Benchmark dataset. Being able to automatically recognize traffic signs will enable us to build "smarter cars".

Approach: The initial approach would be pre-processing the dataset into proper training, testing and validation sets but since all the data is already separated in the dataset it is very useful for the project. Then we make use of the LeNet5 architecture to build the CNN which is a classifier. Then we train our model with the images that are present in the training or making a new model of Conv nets by adding more layers for extracting features. The output of this CNN would be from one of the 43 different classes. The simple explanation for the architecture would be that we first apply convolution to the image that take a sub-sample than again apply convolution and take sub-sample of that and then pass them through the fully connected layers. Eventhough there are other ways to classify traffic signals like TrafficSigNet and others. I would be implementing LeNet5 and keep the others for future work. Below figure is visual representation of the approach:
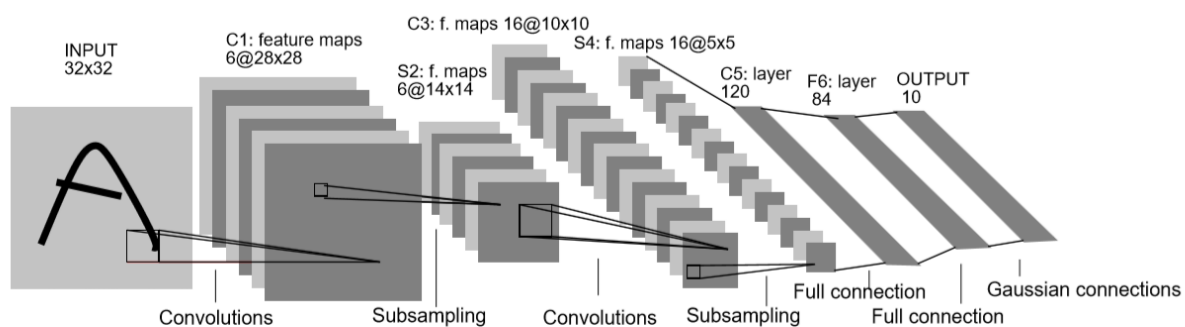

Fig. 2. Architecture of LeNet-5, a Convolutional Neural Network, here for digits recognition. Each plane is a feature map, i.e. a set of units whose weights are constrained to be identical.

Dataset: For this project I will be using GTSRB - German Traffic Sign Recognition Benchmark on Kaggle. It consists of more than 40 different classes of images of signs on the road and more than 50,000 images in total the labels present are related to the training images. The train data consists of the folders that are labelled with the classes that they belong to. It consists of images with traffic signs from various angles to train the model and also since they are arranged in the correct classes the training data is around 30,000 which makes it the suitable dataset for the project. One of the challenge presents is the images are low resolution so it's extremely challenging to recognize the sign. But we can use different variations to find the best parameters to make the model more accurate.(https://www.kaggle.com/meowmeowmeowmeowmeow/gtsrb-german-traffic-sign/?)

Evaluation metrics: The standard evaluation metrics used in object detection is mean Average precision (mAP). Apart from this a confusion matrix will be used that is used to describe the performance of a classification model and use precision and recall as well.

Team Planning: I will be working on the project individually.