National University of Sciences and Technology (NUST)
School of Electrical Engineering and Computer Science

Department of Computing

CS370: Artificial Intelligence

Semester Project Proposal

Traffic Sign Recognition

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Description

The field of artificial intelligence has been undergoing major advancements, especially so in the past decade. One of the key areas being focused on is that of Computer Vision, a sub-field of AI which aims to develop the capacity of computers to derive meaning from digital images, videos, and other visual inputs. Our project's aim is to work on the same principles by building a neural network which will be used detect and differentiate traffic signs by using an image of each sign as input.

Scope

A neural network will be built using TensorFlow, and a dataset would be used which includes images of various traffic signs to be interpreted. The program would then be able to distinguish between each of the various road signs, paving the way for computer programs to understand the meaning behind each.

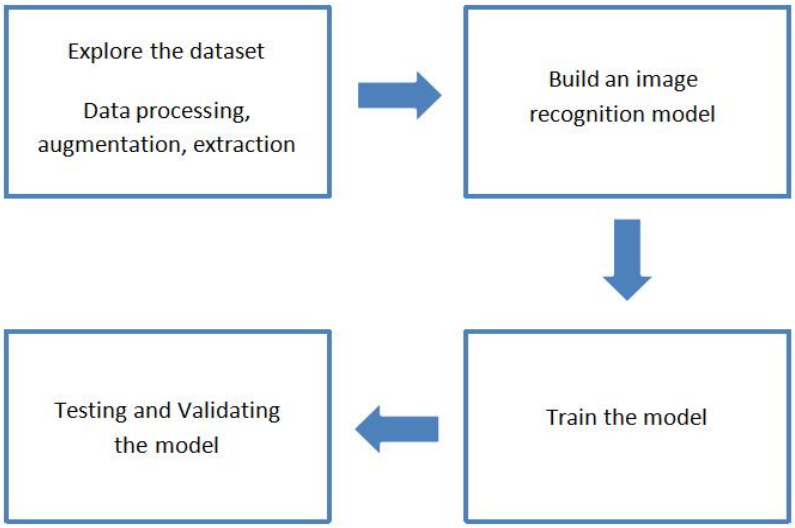
Assumptions

The dataset being used for the project would be a labeled dataset, and include a group of images which are already categorized through the road sign present in each of them.

Applications

Self-driving cars are a major beneficiary of the development of the subject area our project focuses on, i.e. Computer Vision and specifically distinguishing road traffic signs and the individual interpretations of each of them, as it is imperative for the AI used in these cars to be able to understand these traffic signs so that they can operate in a manner which ensures the safety of the passenger as well as other drivers on the road.

Flow Diagram



Data required and Dataset and Progress

We need multiple images of different kinds of traffic signs to train the model.

We are using the German Traffic Sign Recognition Benchmark (GTSRB) dataset which is a multi-class, single-image classification problem. We chose this dataset as it contains more than 40 classes and 50,000 images in total, which is a good amount of data to train the model.

ML Algorithms

We can use quite a few Machine Learning Algorithms to develop a Traffic Sign Recognition System. Among them, the two most commonly used are

Support Vector Machine (SVM)

SVM is a linear model that is used for classification and regression. This ML algorithm generates a line or a hyperplane that separates the data into different classes. In traffic sign recognition, SVM can perform pattern recognition tasks by building decision boundaries that separates data into classes.

Convolutional Neural Networks (CNN)

CNN is a deep learning algorithm that enables face and image recognition. It is used to classify images into different categories. It does this by taking an input image, assigning importance to different aspects of the image and then differentiating them from one another. This image recognition CNN model will then be used to recognize different traffic signs on the road.

References

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