Traffic Sign Classification

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Abstract— **Image classification is a Machine Learning method that recognizes an input image and predicts its category or class. There are several factors and challenges associated in building classification models such as image variations, image occlusion, scale variations and so on. The most common network model being used for an image classification problem is Convolutional Neural Network (CNN). Unlike the other network models, CNN uses just enough features of an image to understand and learn. In this project, CNN will be used to solve a Traffic Sign Classification problem.**

# INTRODUCTION

Road safety is one of the priorities in transport system in Canada. For several years now, applications dealing with driver assistance, traffic detection, traffic sign classification and smart cars have become an important topic that the Machine Learning researchers have been putting immensely work on. This research has led to the creation of these brilliant systems using deep learning.

Traffic sign classification is an algorithm that can recognize and identify the common traffic signs along the road. It uses an efficient classification model that is trained using various images from reliable sources. This can be used as “driver alert system” and can be placed inside cars to help the drivers anticipate approaching road signs. The main goal of this paper is to build a Traffic sign classification system using a Convolutional Neural Network model.

# METHOD

## Data Collection

For this project we will utilize either one of the following sources as train data.

1. German traffic sign dataset from Kaggle – This data consists of 50K images labeled with 40 classes and was used for training a CNN model.

Source Link: <https://www.kaggle.com/meowmeowmeowmeowmeow/gtsrb-german-traffic-sign>

1. Road Signs in Canada dataset from Kaggle – This data consists of 203 image files with 43 classes. This dataset is one of the widely used dataset for projects having similar objective.

Source Link: <https://www.kaggle.com/stavanjoshi/road-signs-in-canada>

For validation, test images will be extracted from public sources such as Google or ImageNet. These will be used against the trained model to generate prediction and validate the accuracy.

## Data Pre-processing

To prepare the images for training, the following steps will be performed:

1. Data Augmentation – this technique is useful in building any machine learning models that uses images. It does not only help in increasing the train dataset but also improves the performance of models’ prediction by forming new samples with noise.
2. Image formatting – this step includes setting the size, shape, color, and form of images.
3. Data organization and labeling – bad classification of training data will cause significant impact on the model prediction’s accuracy. Hence, this step must be taken into consideration prior modeling process.

## Convolutional Neural Network Model

CNN will be used to train the image classifier.

# INTENDED EXPERIMENT

The following tools and approaches are being considered in building the model.

1. TensorFlow Keras – using keras sequential API, model will be trained layer by layer sequentially.
2. PyTorch – as opposed to the first method, torch.nn.functional module will be used to train the model.

# Planning and Milestones:

## High-level milestone plan:

* Week 1: Proposal, Data collection, Solution Design
* Week 2 - 3: Data pre-processing, Building & Training the model
* Week 4: Final approach, Documentation

## Tasks and Assignee:

* Proposal, Solution design – Akshita, Angelica
* Data Collection – Jonatas
* Data pre-processing – Ajay, Kuldeep
* CNN Model building & training – All
* Documentations – All