Traffic Sign Detection using CNN

Group 09:

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Introduction

Autonomous vehicles are the latest fad in the Artificial Intelligence sphere. Companies from Tesla to General Motors are investing in models that allow vehicles to automatically navigate on roads without human aid. Computer Vision for Autonomous Vehicles is a broad research and development topic. We aim to focus on a smaller but an essential aspect of this topic: traffic sign detection. Traffic signs are essential aids which communicate the traffic rules and guidelines to be followed by vehicles on the road. What makes it essential is that violation of traffic signs can lead to major accidents. The important research aspect in Traffic Sign detection to accurately detect various types of signs from “go slower” to “turn right”. Misclassification of labels can lead to major accidents hence our aim is to develop classification models to detect and classify traffic signs with minimum misclassifications.

Problem Statement

To develop models based on Convolutional Neural Networks (CNN) architecture to identify and classify Traffic Signs with minimum misclassification error on the German Traffic Sign Dataset.

Proposed Approach

Phase 1	**Phase 2**	**Phase 3**
1. Data Collection, Integration and normalization. 2. Augment data with adding noise, rotating and scaling the image.	1. Explore different CNN architectures. 2. Implementation Dimension Reduction Techniques.	1. Evaluate the model performance.

1. Collect, integrate and normalize data from different sources. Since there are multiple Traffic Sign Detection datasets, it gives us leeway to train our model such that it is able to generalize over multiple datasets.
2. Augment Data: Since a dataset of 50000 images is clearly not big enough. We plan to augment the images by adding noise, rotating and scaling images to improve our model accuracy on unseen data that necessarily does not follow the distribution of the training set.
3. Explore different CNN architectures such as ResNet, ImageNet and also design our own CNN architectures to build classification models.
4. Explore and implement dimension reduction techniques such as t-SNE and SVD to improve model performance.
5. Thorough evaluation of model performance on seen and unseen data, its ability to generalize and effect of various hyperparameters on model performance.

Dataset:

Dataset Link: https://www.kaggle.com/meowmeowmeowmeowmeow/gtsrb-german-traffic-sign

The dataset contains more than 50000 images with more than 40 classes making this a multiclass classification problem.

Content:

- Meta csv file: Path, ClassId, ShapeId, ColorId, SignId of the given image
- Training and Testing csv file: Width, Height, upper left and lower right x-y coordinates, ClassId, Path of the image

Work Distribution:

1. Pranshu Shrivastava: Data Collection/ Data Transformation/ Data Normalization

2. Yash Deshpande, Abhishek Ayachit: Model Implementation

3. Sudip Bala: Testing and evaluation