Traffic Signs Classification Using CNN

MINI PROJECT REPORT

Submitted by

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UEC1605

MACHINE LEARNING

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EVEN SEM 2022-2023

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BONAFIDE CERTIFICATE

Certified that this mini project titled "**Traffic Signs Classification Using CNN**" is the bonafide work of "**Karthik Sriram Guntuka (203002046)** and **Nagavel Rajasekaran (203002063)**" of VI Semester Electronics and Communication Engineering Branch during Even Semester 2022 – 2023 for UEC1605 Machine Learning

Submitted for examination held on **09-05-2023**

INTERNAL EXAMINER

ABSTRACT

Over the last few years, different traffic sign recognition systems were proposed. Multiple papers presented approaches such as color-based (classified according to the color space), shape-based, and learning-based methods (including deep learning).

We apply Convolutional Networks (ConvNets) to the task of traffic sign recognition using the GTSRB dataset from the GTSRB challenge held at the International Joint Conference on Neural Networks (IJCNN), 2011. While many popular vision approaches use hand crafted features such as HOG or SIFT, ConvNets learn features at every level from data that are tuned to the task at hand.

Taking into note the previous works of the referred authors and the accuracies of their models, we concluded that ConvNets were the best approach for our use case of classifying traffic signs since ConvNets are generally well known for performing exceptionally at image classification tasks. The model performed as expected and classified the testing data with an accuracy of around 98%. Training the model with even more data or by running the training for more epochs could possibly improve the accuracy of the model.

INTRODUCTION:

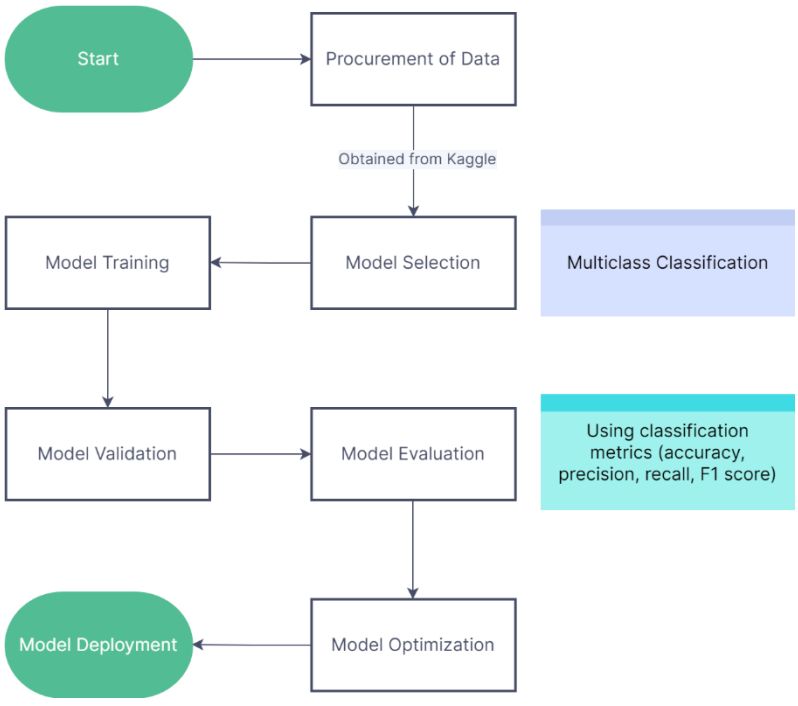
As autonomous vehicles become more prevalent, there is an increasing need to prioritize safety for both passengers and other road users. By accurately detecting and classifying traffic signs, autonomous vehicles can more effectively navigate roads, anticipate hazards, and adhere to speed limits, pedestrian crossings, and other traffic regulations. This helps prevent accidents and reduce traffic congestion and promotes more efficient and sustainable transportation systems.

OBJECTIVE:

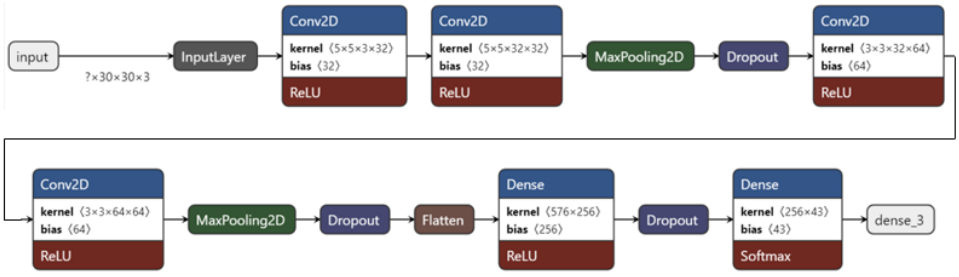
To accurately detect and classify traffic signs to ensure better road safety measures in autonomous vehicles

SYSTEM /MODEL DEVELOPED:

Block Diagram:



Process Flow Explanation:

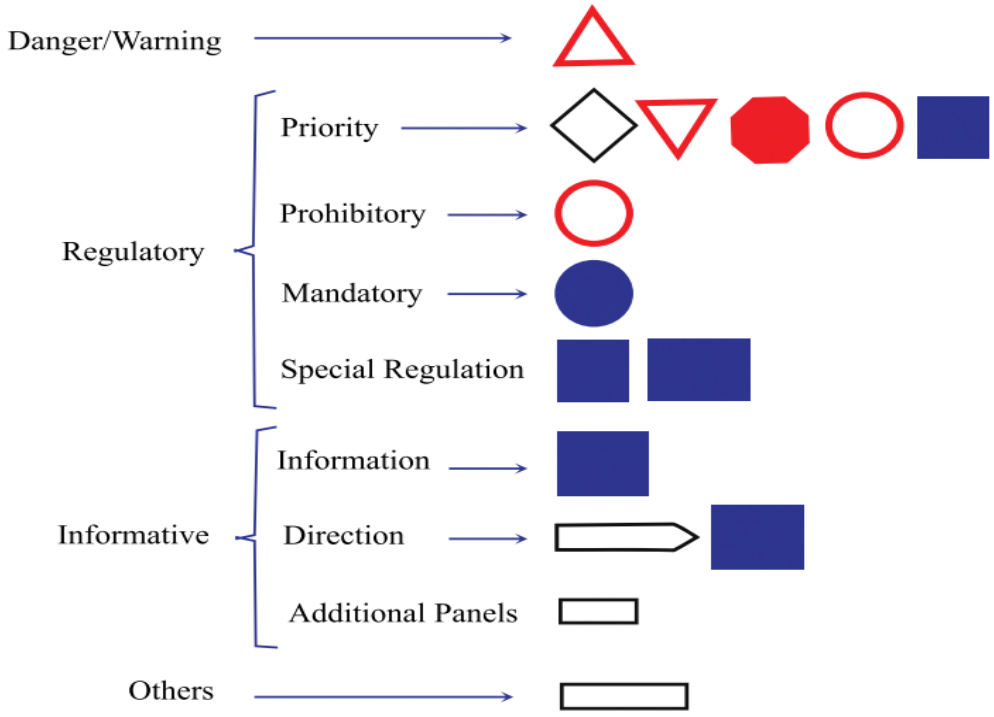


1. The model is trained on the GTSRB dataset which contains 39208 images of various traffic signs across the German nation.
2. 80% of the data is used for Training and the rest 20% is used for testing and validation.
3. The images are resized to a dimension of 30x30 to match the input layer of the ConvNet.
4. We proceed with training the model with a batch size of 32 and run it for 15 epochs.
5. The obtained results are plotted and the model is saved for manual testing.

Dataset Details:

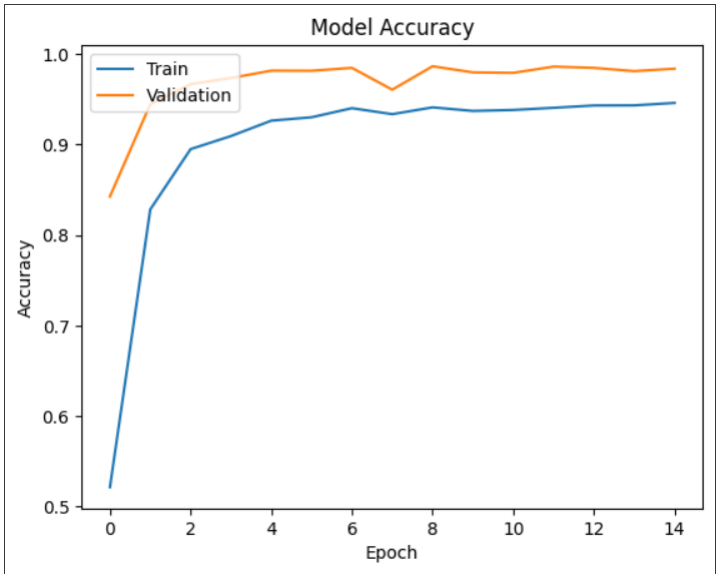
The dataset used is the German Traffic Sign Recognition Benchmark (GTSRB) which contains 43 classes of traffic sign images and a total of around 40000 images. The images are in various dimensions and the image quality is varied intentionally for better training. Intraclass variations in the form of blurring, varied lighting, varying weather conditions, etc,.

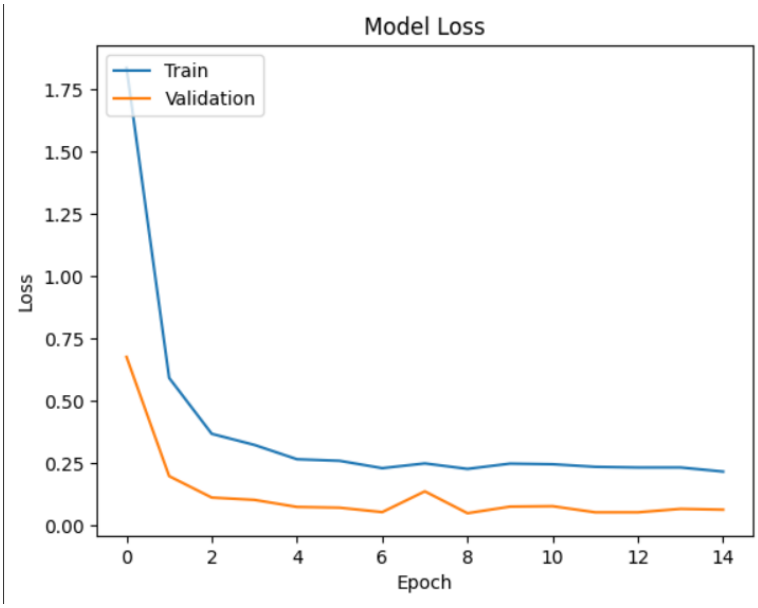
The dataset makes sure to cover a variety of traffic signs and include most of the different categories according to the German Traffic Regulations.



RESULTS & DISCUSSION

Being a multiclass classification problem, we use loss and accuracy as the performance metrics for the model.





- The accuracy of the model can be improved by training it with more data.
- Running it for more epochs is also an option although the accuracy improvement obtained through this method would not be very noticeable

CONCLUSION

Using Convolutional Neural Networks proved to perform well on the chosen dataset. Further exploration can be done for improving the speed of recognition to enhance the safety of high-speed autonomous travel. The above model can also be trained on datasets obtained for Indian roads to further promote autonomous driving in India.

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