Deep Learning - CSPE72

Project Report

Topic: Lane and traffic sign detection in a road scenario

Group No. 06

- K Shreyas (106119064)
- Rajneesh Pandey (106119100)
- Satyarth Pandey (106119112)

Problem Statement

The problem with Road Lane Detection and signal detection is finding the lane and traffic signs automatically for self-driving cars. It is all due to the advancement in computer vision and deep learning that it has become possible to detect road tracks from video frames and traffic signs during self-driving.

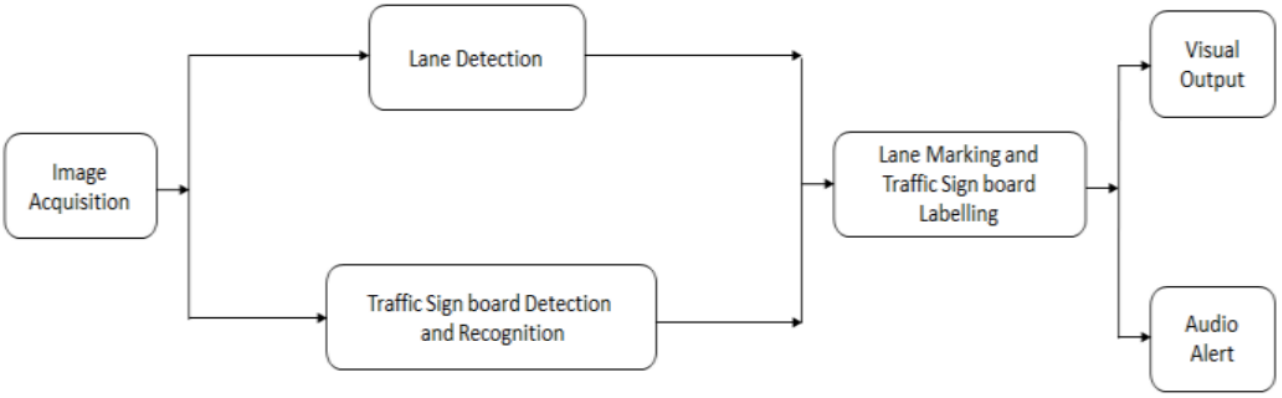


Fig 1: System Overview of Lane Detection and Traffic Sign Recognition system

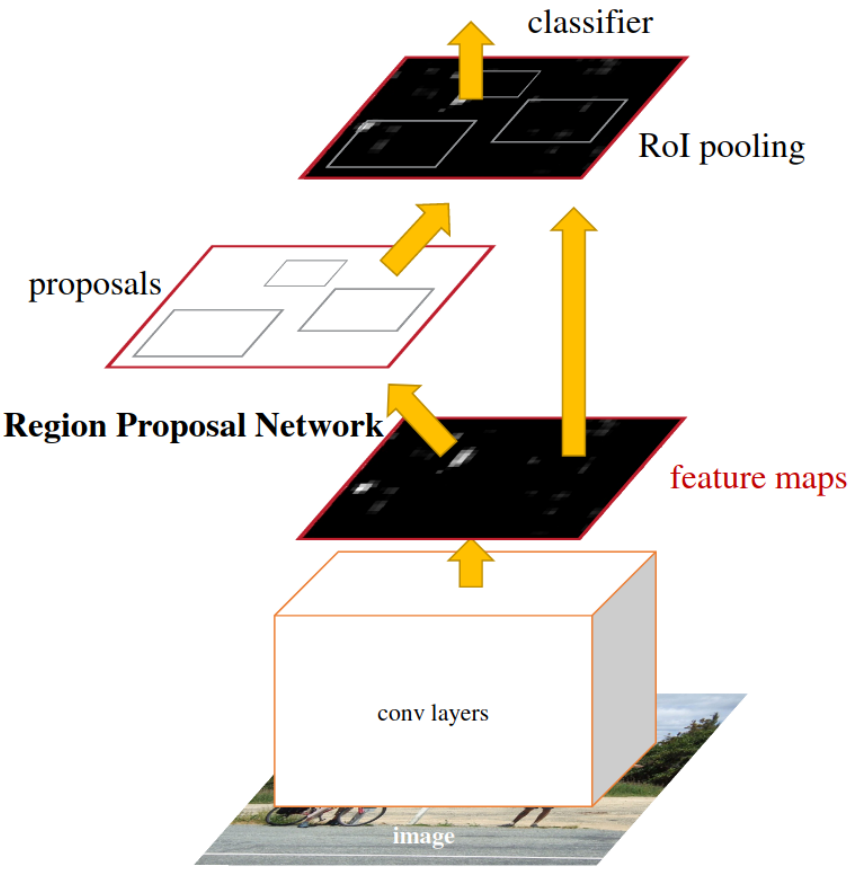
Tools and Libraries Used

Code Run on Kaggle and Google Colab.

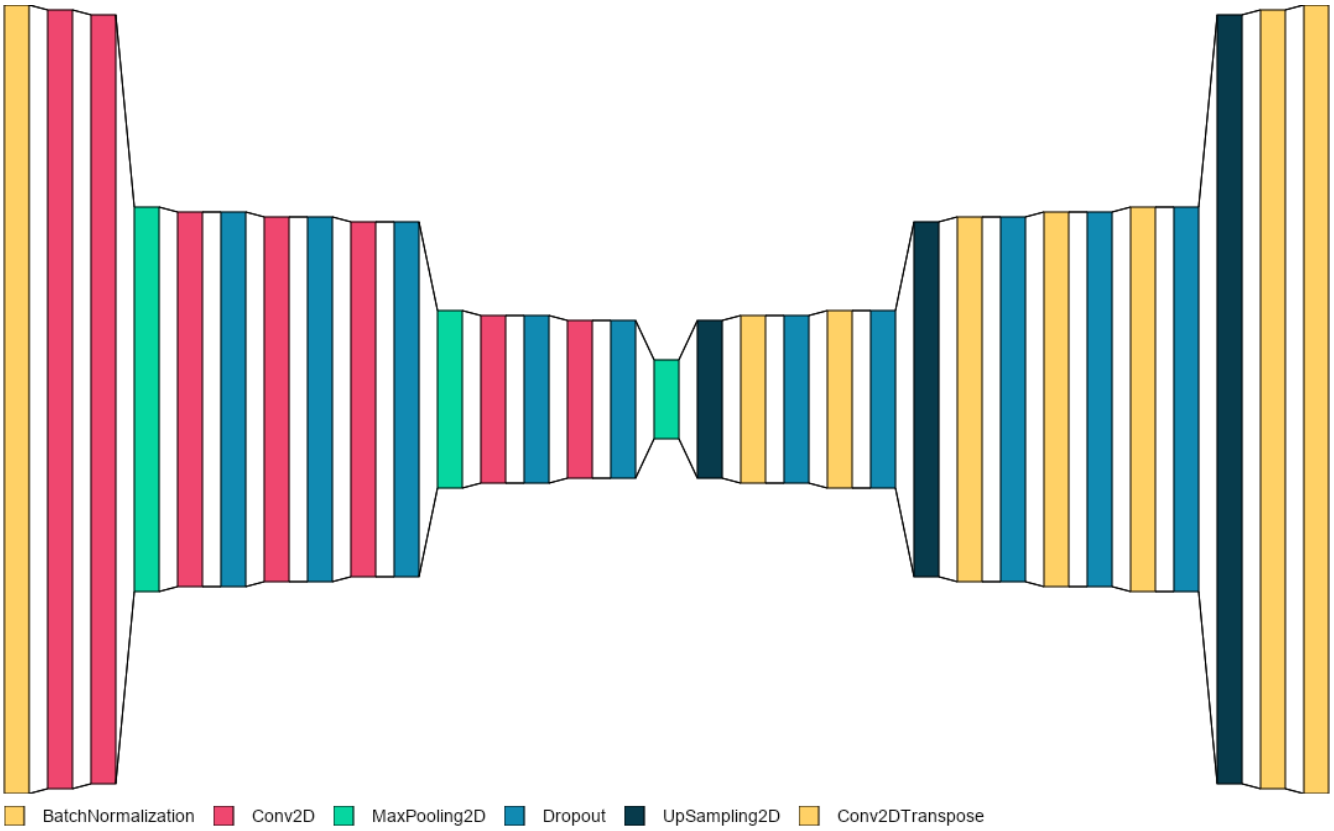
Major Libraries used PyTorch, NumPy, OpenCV, Matplotlib, Torchvision, pickle, etc.

Model Used and Detailed Architecture

(i) Traffic Sign Detection Model - Faster RCNN



(ii) Lane Detection Model - Custom Deep NN



Details of Parameters and Hyperparameters

We use Adam Optimizer and Stochastic Gradient Descent.

- ➢ Learning rate = 0.0005

  The learning rate defines how quickly a network updates its parameters.

- ➢ Momentum = 0.9

  Momentum helps to know the direction of the next step with the knowledge of the previous steps. It helps to prevent oscillations.

- ➢ Number of epochs = 10

  The number of epochs is the number of times the training data is shown to the network while training.

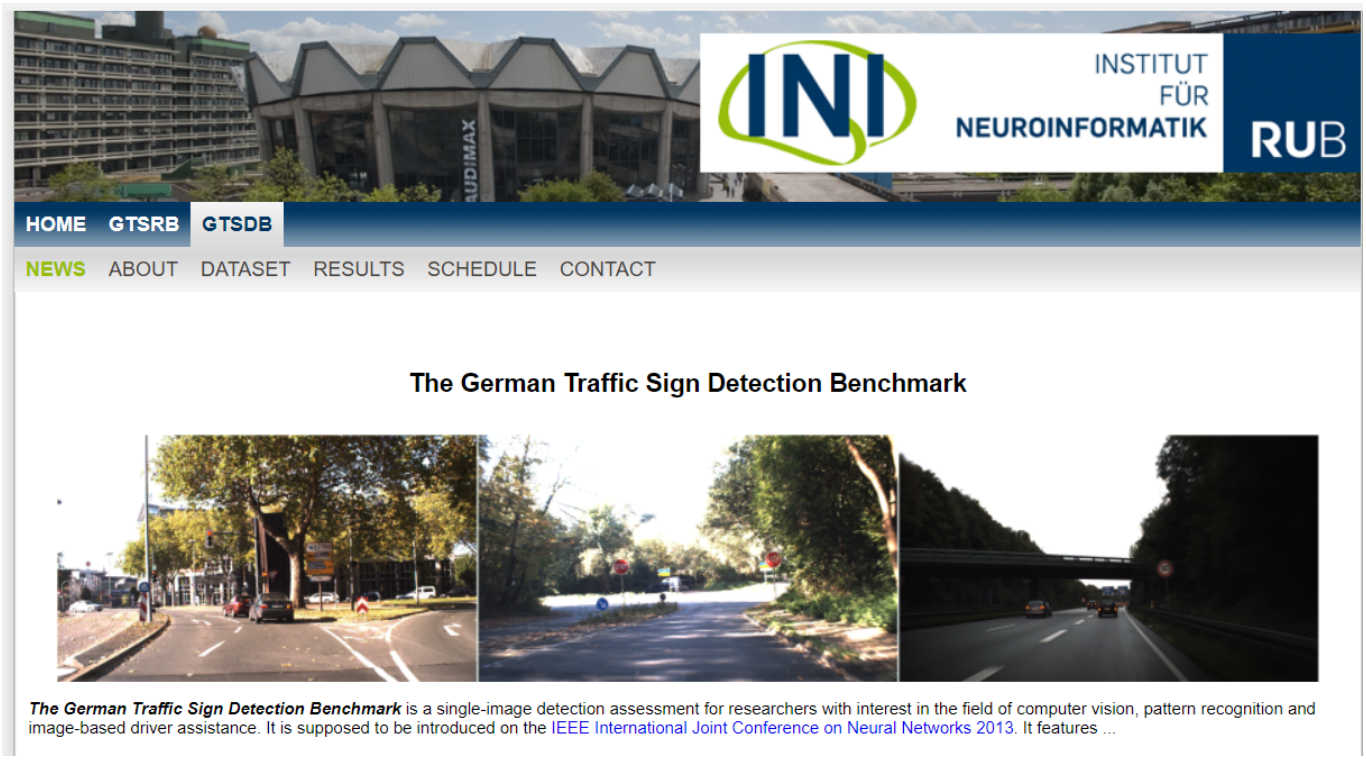
- ➢ Batch size = 128

  Mini batch size is the number of sub-samples given to the network after which parameter update happens.

Dataset Used

The German Traffic Sign Detection Benchmark

https://benchmark.ini.rub.de/gtsdb_news.html



Code Link and Instructions for Execution

- Lane Detection:

  Lane Detection Colab Notebook
- Traffic Sign Detection:

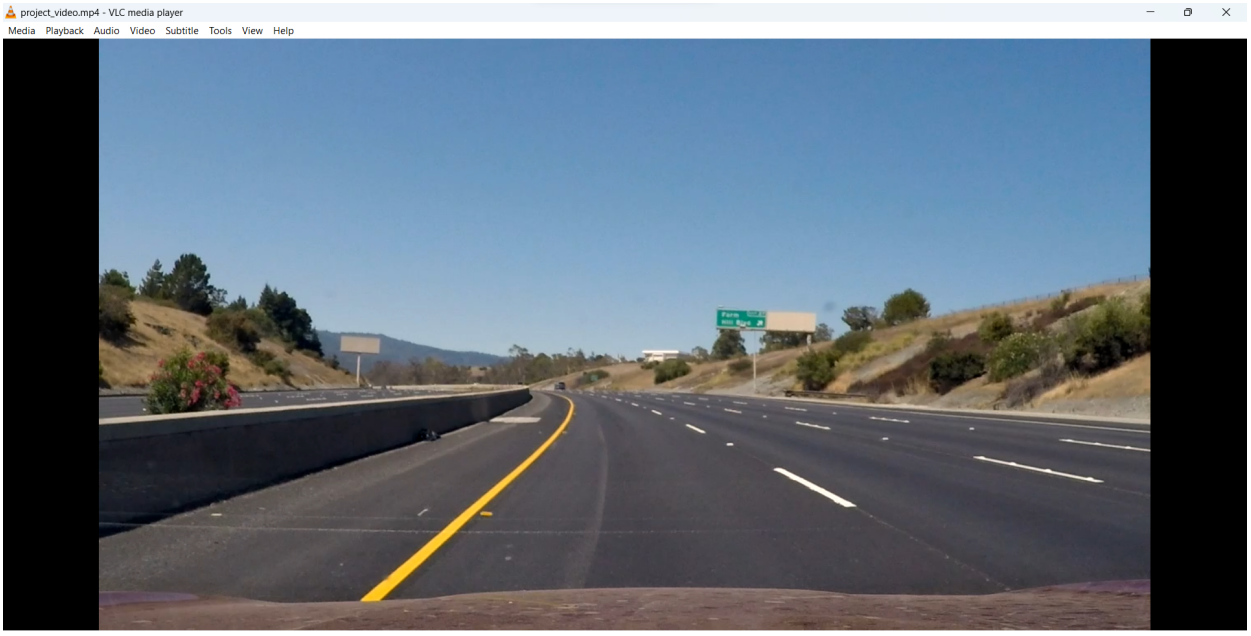
  Traffic Sign Detection Kaggle Notebook with Dataset

Sample Test case

Input Image:

Output Image (detecting traffic signs and also their class - speed limit):

Input Video:



Output Video (showing driver's lane):

Difference from existing approach (Novelty)

- The Faster RCNN network has been fine-tuned to the GTSDB dataset.
- We have created a deep neural net without any pre-trained models for lane detection
- A pipeline can be set up from a video feed, where each frame will be processed by the lane detector, then the traffic sign detector, and the annotated video can be obtained.

Contribution of each team member

K Shreyas (106119064) -

Worked on the Traffic Sign detection with pre-trained models and tried different models for the same. Helped with Lane Detection Neural Network.

Rajneesh Pandey (106119100) -

Tried Traffic Sign detection on video dataset using Convolution neural network, which gave low accuracy, and Lane Detection model on image dataset using a different model.

Satyarth Pandey (106119112) -

Worked on Lane Detection using custom designed Neural Network which works for live video. Worked on integrating Traffic Sign Detection with Lane Detection, but didn’t give good accuracy.