### **UE20CS302 – Machine Intelligence**



### **Mini Project**

# **Traffic Sign Classification**

Team No: 4

Project Guide: Dr. Alpha Vijayan

Project Team with SRNs:

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#### **Problem Statement**

- ❖ Traffic Sign classifier is very crucial in the current era of self-driving and autonomous cars. Due to high-speed movement of vehicles and criticality of the situation, recognition and classification accuracy is particularly important.
- This problem has two aspects, first is feature extraction i.e., extracting relevant features from the traffic sign images and second is image classification, which includes classification of an image to its corresponding class based on the extracted features.
- ❖ Identification of the traffic and taking appropriate action is crucial for an automated vehicle. This system will assist drivers by recognizing traffic signs which they did not recognize before passing and will save them from miss happenings.
- To solve this problem, we are using Deep Learning, specifically Convolutional Neural Network (CNN).

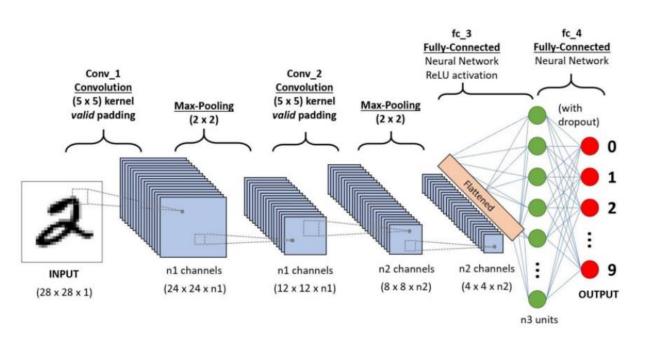


### Application and Uses

- Can be used in autonomous vehicles.
- ❖ Help the driver to recognise the traffic sign under abnormal conditions. For example if the driver is new to the place (let's say some foreign country) where he/she wants to drive, but is unaware of the traffic signs in that country.
- ❖ It can also be used under extreme weather conditions. For example, it's very hard to see the traffic signs on the road at the time of heavy rainfall. At those times traffic sign classifier plays a significant role.



### High level Architecture





# Literature Survey

Title of the paper	Year of Publication	Journal/Confere nce Name	Advantages	Limitations
In-vehicle camera traffic sign detection and recognition	2009	Nothing specified(we found this paper in Springer)	Cross- correlation template matching was performed, quadtree focus was used	In cluttered Urban areas misclassifications were detected.
Convolutional Neural Network based Traffic-Sign Classifier Optimized for Edge Inference	2020	2020 IEEE REGION 10 CONFERENCE (TENCON), 2020	Local histogram technique used to Grey scale images, 3X3 convolution layers used with "ReLU" as Activation function	50% pruning of weights didn't result in change in accuracy.
A Support Vector Machines network for traffic sign recognition	2011	The 2011 International Joint Conference on Neural Networks, 2011, pp. 2210- 2216	Image normalization performed,Miss classifications reduced to below 3.11%	NID SVM mis classified 11.37% of the data.



# Literature Survey

Title of the paper	Year of Publication	Journal/Conference Name	Advantages	Limitations
Lightweight deep network for traffic sign classification	2019	Institut Mines-Télécom and Springer Nature Switzerland	The proposed lightweight networks can achieve an accuracy loss of between 0.33 and 0.63% while parameters can be 1% of those employed by the compared algorithms.	Due to the large size of the neural networks involved, many models are difficult to deploy on mobile devices (which have limited power budgets) in traffic sign recognition systems.
An overview of traffic sign detection and classification methods	2017	International Journal of Multimedia Information Retrieval	The use of (ConvNets) to learn invariant features of traffic sign in a supervised way, they reached an accuracy of 98.97%, which is above then the human performance (98.81%).	The detection and classification methods achieved a high accuracy rate, but they are still far from a real-time ADAS application where the sign should be detected and classified in real time.
Traffic Sign Classification and Detection of Indian Traffic Signs using Deep Learning	2019	International Journal of Scientific Research in Computer Science Engineering and Information Technology	it has the advantage of being insensitive to brightness and shadows	The manual control of road signs becomes more difficult as vehicle speeds increase



# Literature Survey

Title of the paper	Year of Publicati on	Journal/Conference Name	Advantages	Limitations
Traffic Sign Recognition and Classification Using YOLOv2, Faster RCNN, and SSD	2019	10th International Conference on Computing, Communication and Networking Technologies (ICCCNT)	Helps in selecting appropriate model based on the project requirement.	The sting of each model wasn't regress enough.     Comparison could have included other models as well
Traffic Sign Classification Using Deep Neural Network	2020	IEEE Recent Advances in Intelligent Computational Systems (RAICS)	Data Augmentation was performed in order to prevent overfitting.      Achieved an accuracy of 98.44% with 50 epochs.	Haven't tried classification on different variants of CNN.     Accuracy can be improved even further.
Traffic Light Detection and Recognition for Self Driving Cars Using Deep Learning	2018	Fourth International Conference on Computing Communication Control and Automation (ICCUBEA)	Improves accuracy of existing and pre-trained model.     Reliable for real time.	Focused only on traffic light detection     Dataset wasn't generic and had less data instances. (i.e restricted to streets of Mumbai)



### **Proposed Approach**

- ❖ We have planned to develop a software with basic front end using Python GUI library-Tkinter.
- ❖ We have used many convolution layers with dense layers and dropdowns to get desired results (i.e. Accuracy of 95+%).
- ❖ The user uploads an image containing German traffic sign into the front end for the trained model to classify it amongst the predetermined classes only.
- ❖ The model is expected to classify the image 98 % of the time correctly as we have trained out model for 15 epochs to obtain the results.



#### **Results and Discussion**

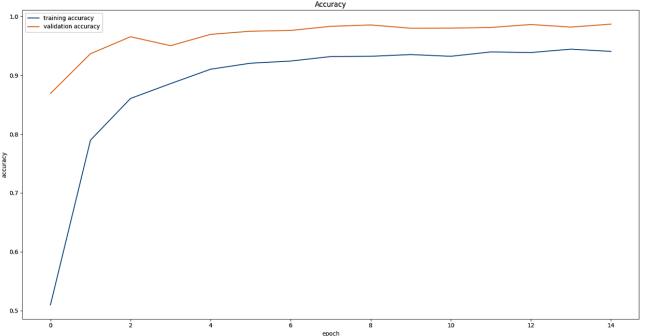
### CMD output while training model

```
G:\Download\MI_trial_code\Road-Traffic-Sign-Detector-master>python traffic_signs.py
2022-11-13 12:25:16.433964: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cudart64_110.dll'; dlerror: cudart64_110.dll not found
2022-11-13 12:25:16.434274: I tensorflow/stream_executor/cuda/cudart_stub.cc:29] Ignore above cudart dlerror if you do not have a GPU set up on your machine.
2022-11-13 12:29:35.117212: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cudart64_110.dll'; dlerror: cudart64_110.dll not found
2022-11-13 12:29:35.118704: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cublas64_11.dll'; dlerror: cublas64_11.dll not found
2022-11-13 12:29:35.120166: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cublasLt64_11.dll'; dlerror: cublasLt64_11.dll not found
2022-11-13 12:29:35.121351: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cufft64_10.dll'; dlerror: cufft64_10.dll not found
2022-11-13 12:29:35.122462: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'curand64_10.dll'; dlerror: curand64_10.dll not found
2022-11-13 12:29:35.123622: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cusolver64_11.dll': dlerror: cusolver64_11.dll not found
2022-11-13 12:29:35.124755: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cusparse64_11.dll'; dlerror: cusparse64_11.dll not found
2022-11-13 12:29:35.125941: W tensorflow/stream executor/platform/default/dso loader.cc:641 Could not load dynamic library 'cudnn64 8.dll': dlerror: cudnn64 8.dll not found
2022-11-13 12:29:35.126059: W tensorflow/core/common_runtime/gpu/gpu_device.cc:1850] Cannot dlopen some GPU libraries. Please make sure the missing libraries mentioned above are installed properly if you would
like to use GPU. Follow the guide at https://www.tensorflow.org/install/gpu for how to download and setup the required libraries for your platform.
Skipping registering GPU devices...
2022-11-13 12:29:35.126622: I tensorflow/core/platform/cpu_feature_guard.cc:193] This Tensorflow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following CPU instructions in pe
rformance-critical operations: AVX AVX2
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
981/981 [===========] - 87s 87ms/step - loss: 1.9570 - accuracy: 0.5098 - val_loss: 0.5184 - val_accuracy: 0.8692
Epoch 2/15
Epoch 4/15
Epoch 5/15
Epoch 6/15
Epoch 9/15
Fnoch 18/15
Epoch 12/15
Epoch 14/15
```



#### **Results and Discussion**

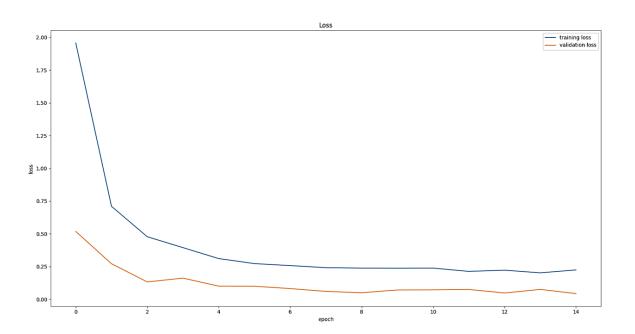
# Plotted while testing the model:(Accuracy Vs Epoch)





#### **Results and Discussion**

## Plotted while testing the model:(Loss Vs Epoch)





#### Conclusion

- We have successfully implemented and demonstrated our project and it capabilities.
- The project has been completed with good will and we are very thankful to our Professor and PES University for continuous guidance and support throughout the project.
- ❖ We have tested our model thoroughly and concluded that it can predict 98% of the time correctly provided the traffic sign belongs to german data set. If not the model still classifies but not with the abovementioned accuracy.
- ❖ The future scope is to implement the same using openCV library that would enable it to give live predictions with more accuracy.



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# Thank You