CNN Model Methodology: **(Highlights)**

Dataset chosen: German Traffic sign Recognition Benchmark

No. of Classes: 43 Different Traffic Signs

Divided into Test and Train Folders

Train Dataset Images: 39209; Test Dataset Images: 12630

Random images from size 15X15 to 250X250 pixels

Our Model for Comparision: (5 Class)

No. of Classes: 5 Different Traffic Signs

Turn Left Ahead, Turn Right Ahead, Stop, Speed Limit 20, Speed Limit 60
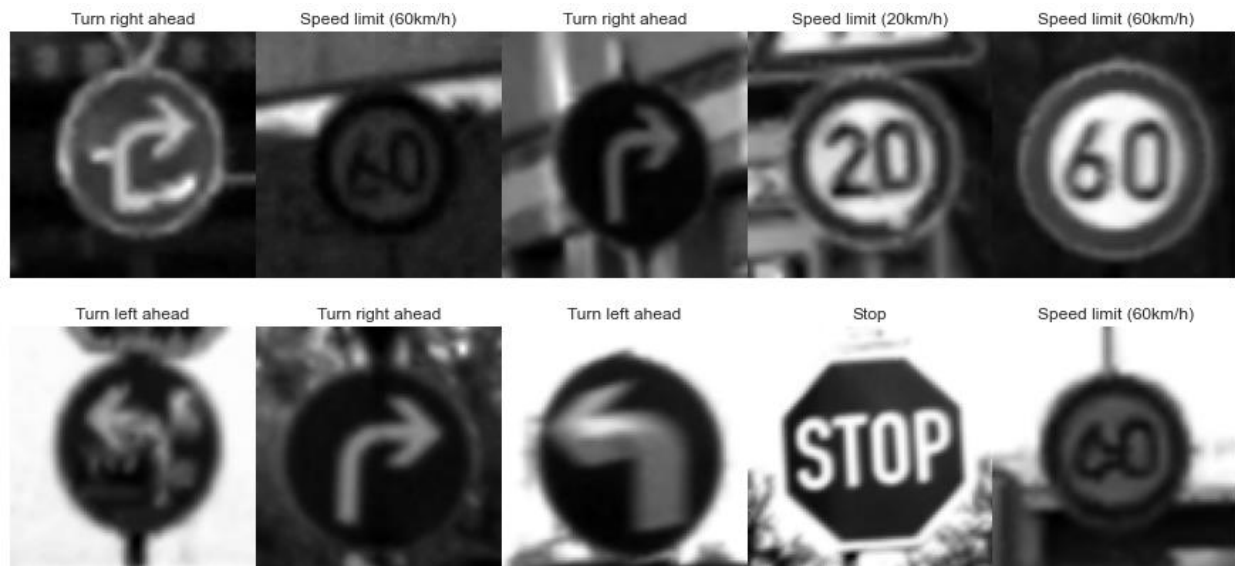
Image Preprocessing:

- Images resized: 80X80
- Converted to GrayScale
- Smoothing out

5 classes and 5 labels

The images for training are iterated and saved as a NumPy array.

Sample images from the training dataset along with labels:

Dataset split: 80% for training and 20 % for validation.

One hot Encoding method performed (Each image represented as binary vector of categorical class)

Building the CNN Model: Model Summary

```
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_16 (Conv2D)           (None, 76, 76, 32)        832

conv2d_17 (Conv2D)           (None, 72, 72, 32)        25632

max_pooling2d_8 (MaxPooling   (None, 36, 36, 32)        0
2D)

dropout_12 (Dropout)         (None, 36, 36, 32)        0

conv2d_18 (Conv2D)           (None, 34, 34, 64)        18496

conv2d_19 (Conv2D)           (None, 32, 32, 64)        36928

max_pooling2d_9 (MaxPooling   (None, 16, 16, 64)        0
2D)

dropout_13 (Dropout)         (None, 16, 16, 64)        0

flatten_4 (Flatten)          (None, 16384)             0

dense_8 (Dense)              (None, 256)               4194560

dropout_14 (Dropout)         (None, 256)               0

dense_9 (Dense)              (None, 5)                 1285

=================================================================
Total params: 4,277,733
Trainable params: 4,277,733
Non-trainable params: 0
```

Employs Adam optimizer and the categorical cross entropy loss function during training.

No. of batches: 64

No. of Epochs: 20

Loss and Accuracy graphs:
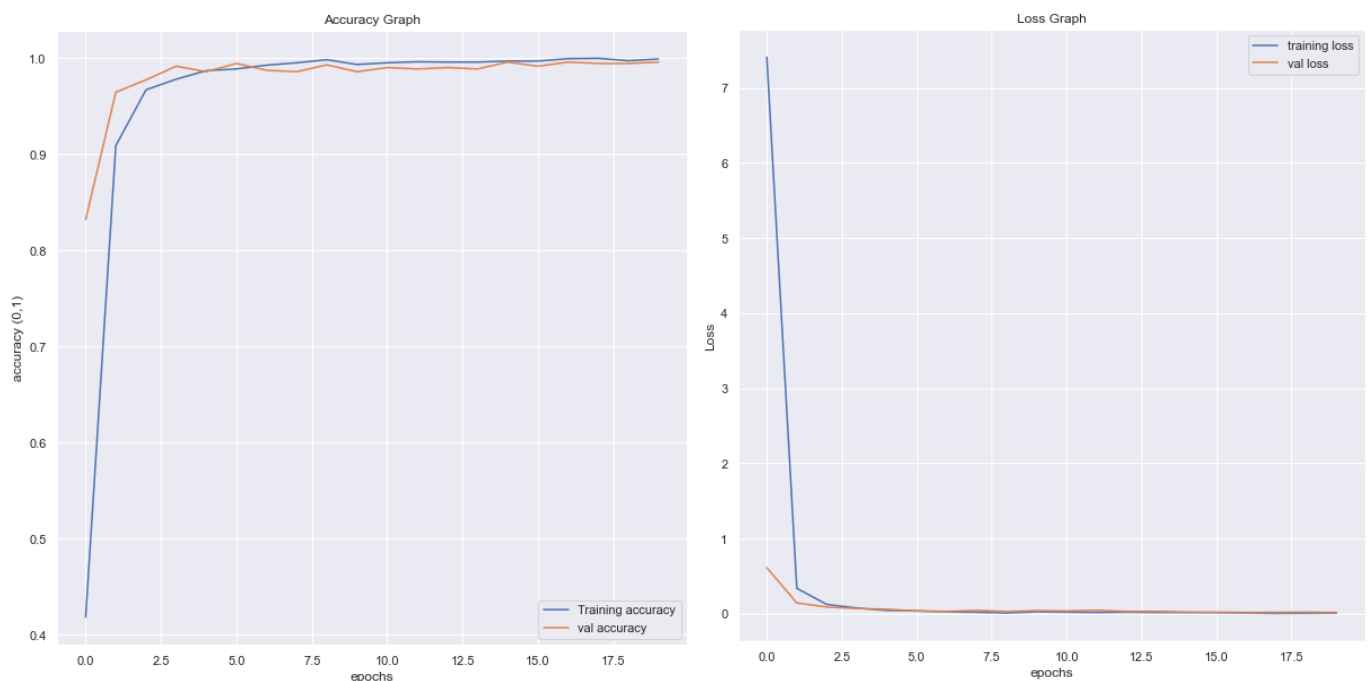
Model_Accuracy: 99.89%

Validation_set_Accuracy: 99.57%

Testing the model with Test Images:

No. Test images: 1110

Test_accuracy: 98.28%

Test-Precison : 97.79%

Test_Recall: 97.99%

Test_F1-Score: 97.94%

Metrics according to Classes:

Class Labels	Precision	Recall	F1-score	No. of Test_Images
Turn Left Ahead (0)	0.96	0.99	0.98	120
Turn Right Ahead (1)	1.00	0.99	0.99	210
Stop (2)	1.00	0.96	0.98	270
Speed Limit 20 (3)	0.97	0.97	0.97	60
Speed Limit 60 (4)	0.98	1.00	0.99	450
				1110