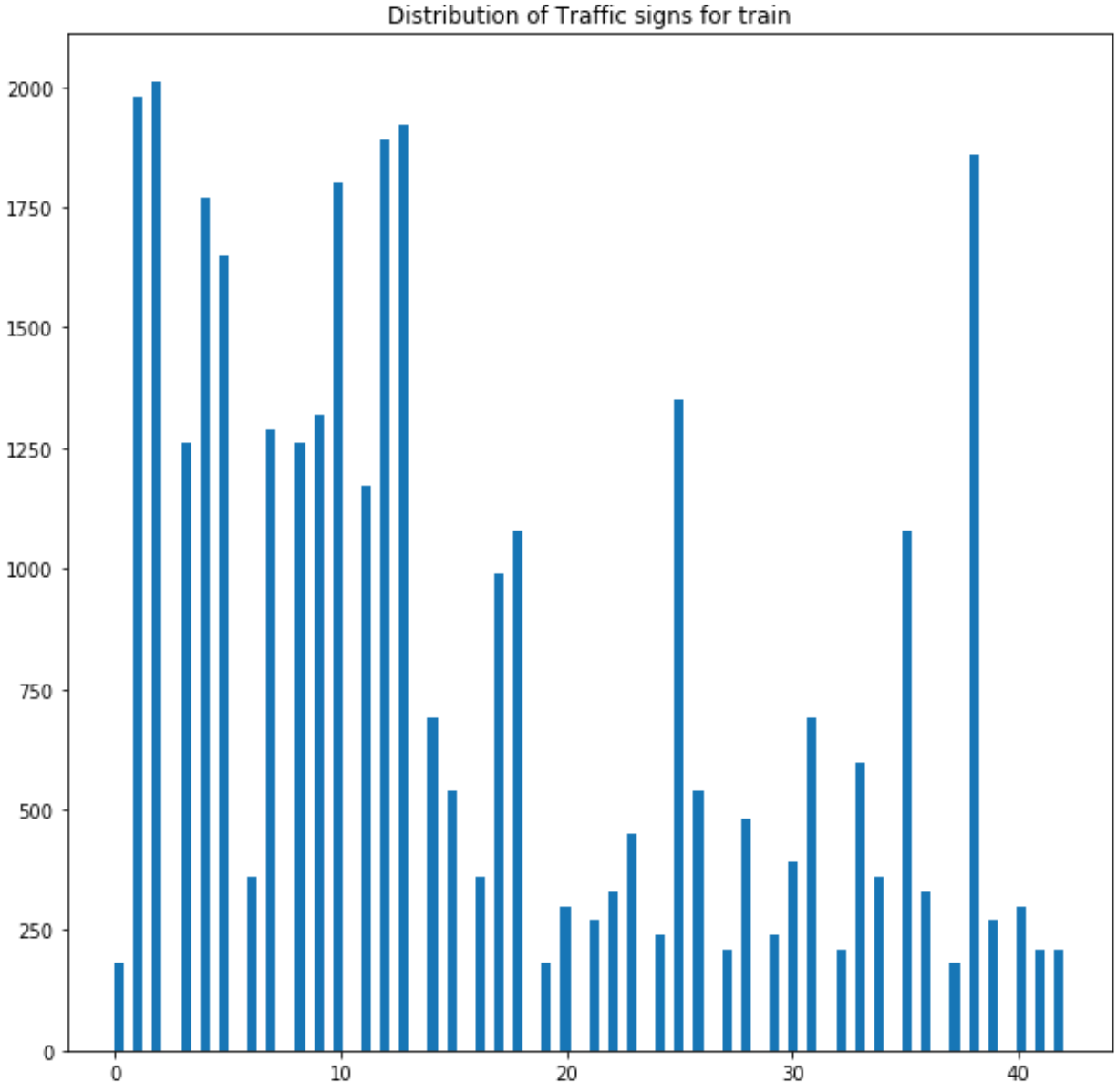
Project-2 Car ND-Traffic-Sign-Classifier

1. **Data Summary:**
   German Traffic sign dataset was used to train the model. The dataset is divided into train, valid and test sets. Each image is of 32*32 size with rgb components. There are **43** different image classes to be classified.
   Number of images for each of them are following:
   ```
   Training set: 34799
   Validation set: 4410
   Test set: 12630
   ```
2. **Data Exploration:**
   This chart is showing the distribution of training class labels.

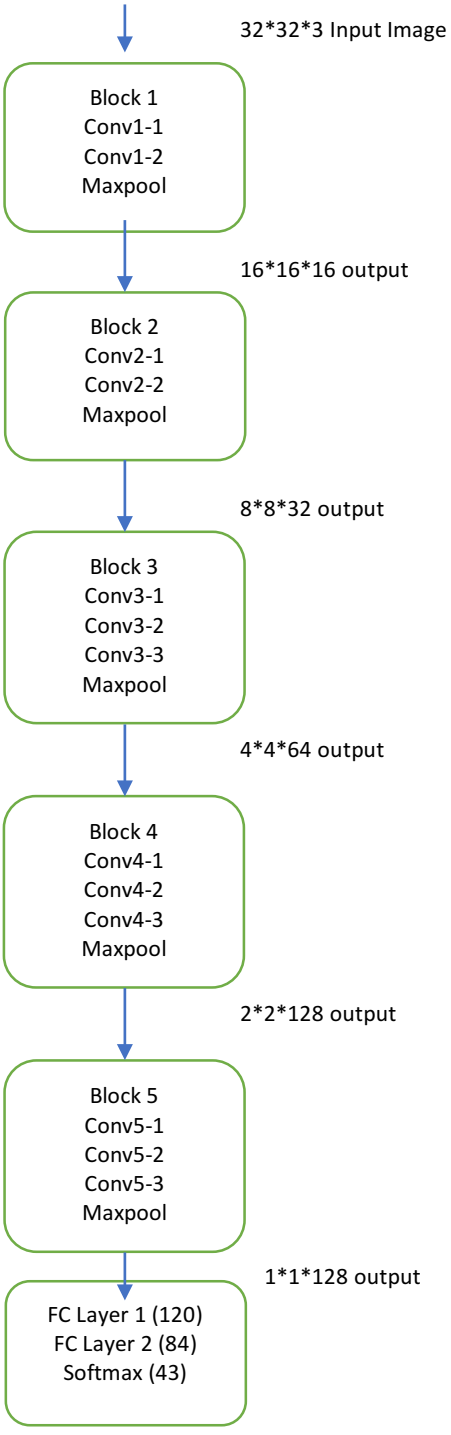


3. Design and Test a Model Architecture:

For pre-processing, all the images were normalized by scale of 1/255. All the 3 color components were used in the model.

Model Structure:

I used the VGG-16 model architecture. I have to change the number of filter sizes as opposed to the original VGG-16 structure.



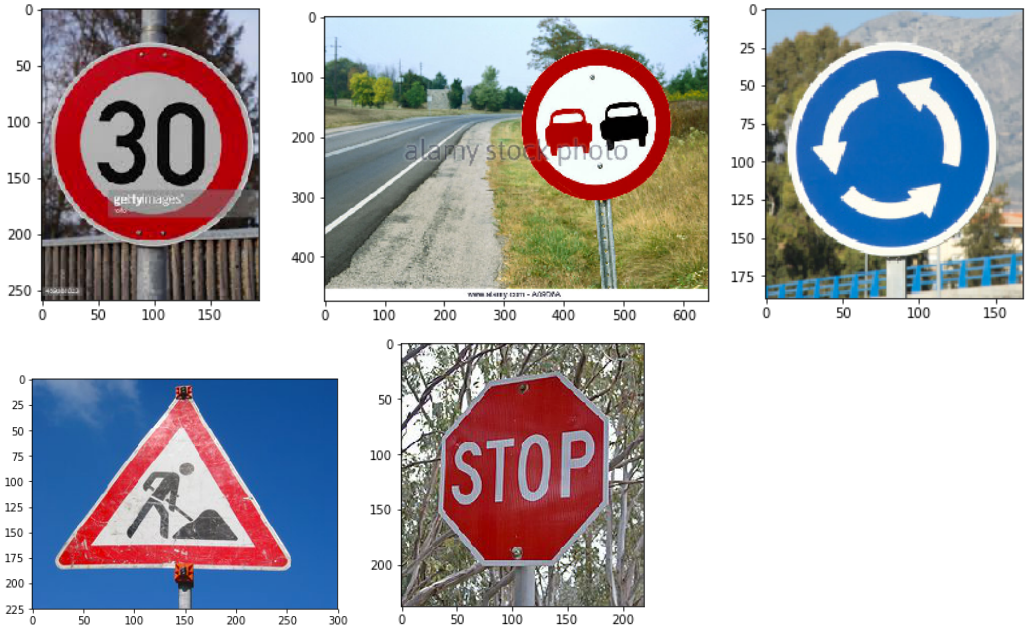
RELU activation was used in the model.
Batch Size: 256
Epochs: 200
Dropout Rate: 0.5
Stochastic Gradient Descent was used for optimization with decay rate of 0.001.

Model was trained on GPU k-80 titan. I have access to my grad school computing environment (NYU HPC computer). After the training, model weights were saved on to the file and then later restored on my personal machine.

Training Accuracy:99.54
Validation Accuracy:96.4
Test Accuracy: 94.7

Many hyper-parameters were tuned to get better accuracy.
Different batch sizes were tried from 32-256.
Decay rate was altered from 0.01-0.0001
Number of filters per convolutional layers were changed from the original VGG model. Model accuracy was very low with high number of filters. This is because of the smaller image size used for training.

###Test a Model on New Images



Model was able to predict 4 out of 5 images correctly i.e. 80% accuracy

Only the 2nd image (No passing) was miss-classified.

Prediction Probabilities for each image:
Image1:0.9
Image2: Incorrect (not able to predict it)
Image3: 0.8
Image4: 1.0
Image5: 0.9