

Traffic Sign Classification Project Report

Data Set Summary & Exploration

The data is being explored in cell number 3.

Number of training examples = 34799

Number of testing examples = 12630

Image data shape = (32, 32, 3)

Number of classes = 43

Function to visualize the dataset is defined in IPython netbook cell no:4. It is called in cell Number 8.



Describe how, and identify where in your code, you set up training, validation and testing data. How much data was in each set? Explain what techniques were used to split the data into these sets.

The provided training data is 34799 images. For every image we augment two more images with various transformations like rotation, translation, brightness augmentation etc. This makes the total training set as 104397 images.

Number of validation images(as provided): 4410

Number of test images(as provided): 12630

IPython notebook cell number 5,6,7 are used for augmenting training data.

Model Description:

I implemented LeNet-5 model with following layers:

Layer	Description
Convolution Layer 1	Input = 32x32x1. Output = 14x14x6
RELU	
Max Pooling	
Convolution Layer 2	Input = 14x14x6. Output = 5x5x16
RELU	
Max Pooling	
Fully Connected Layer 1	Input = 400. Output = 120
RELU	
Fully Connected Layer 2	Input = 120. Output = 84
RELU	
Fully Connected Layer 3	Input = 84. Output = 43

This is quite similar to model discussed in classroom. I used MaxPooling of filter 2X2 and stride of 2X2 to prevent overfitting. The model learning performance saturates around 200 epochs and no further improvement is seen after that.

Optimizer: AdamOptimizer

Batch Size: 256

Epochs: 200

Learning Rate: .001

I tried batchsize of 128 and 256 and finally used batch size of 256.

My model results were:

- Training set accuracy of : 99.8%
- validation set accuracy of :92%
- test set accuracy of 89.5%

I then removed the Fully connected layer 3 and modified my model as follows:

Layer	Description
Convolution Layer 1	Input = 32x32x1. Output = 14x14x6

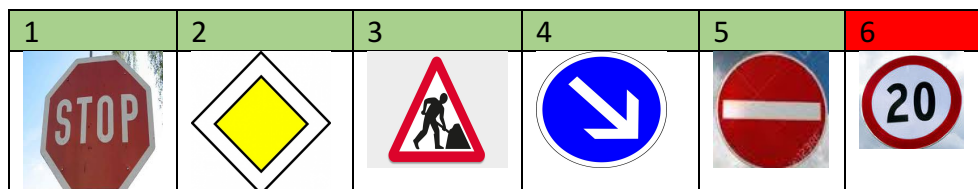
RELU	
Max Pooling	
Convolution Layer 2	Input = 14x14x6. Output = 5x5x16
RELU	
Max Pooling	
Fully Connected Layer 1	Input = 400. Output = 120
RELU	
Fully Connected Layer 2	Input = 120. Output = 43

In this model also, I used MaxPooling of filter 2X2 and stride of 2X2 to prevent overfitting. The model learning performance saturates around 200 epochs and no further improvement is seen after that.

My Final model results were:

- Training set accuracy of : 99.7%
- validation set accuracy of :93%
- test set accuracy of 91.0%

New Test Images from Web:



New Test Data Accuracy = 0.830

Image with green background is correctly predicted while red background is wrongly predicted.

The model is mostly certain and gives correct probability with top probability quite high as compared to rest 4. but it sometimes get confused with similar looking images like Speed limit20 and Speed limit30.