

Traffic Sign Recognition

Build a Traffic Sign Recognition Project

Data set:

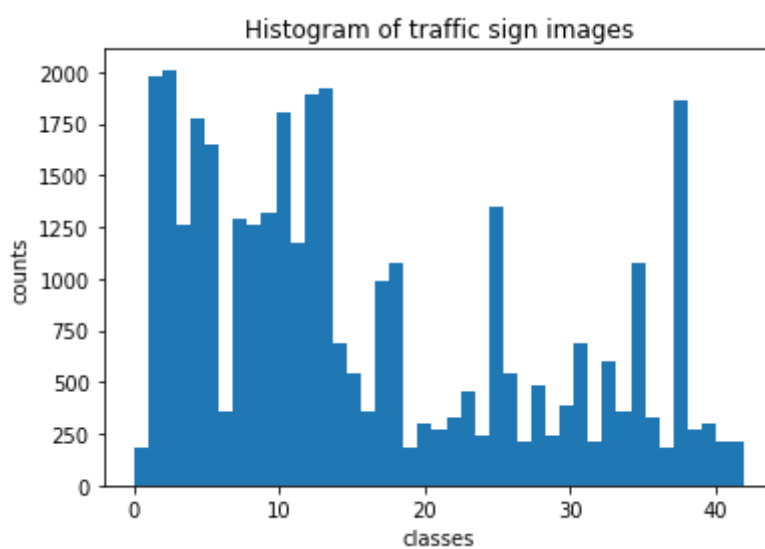
Number of training examples = 34799

Number of testing examples = 12630

Image data shape = (32, 32, 3)

Number of classes == 43

Visualization of dataset:



Preprocessing:

I tried to use

`cv2.cvtColor(data[i], cv2.COLOR_RGB2GRAY)` to convert rgb to gray

And normalize by the formula:

`X_train_gray.astype(float) - 128) / 128`

Model Architecture:

Most of the part is from LeNet

```
layer1_shape (?, 28, 28, 6)
after maxpool layer1_shape (?, 14, 14, 6)
layer2_shape (?, 10, 10, 16)
after maxpool layer2_shape (?, 5, 5, 16)
flatten_layer_shape (?, 400)
layer_3 shape (?, 400)
layer_4 shape (?, 400)
logits shape (?, 43)
```

But with connect two 400*400 fully connected layers to get a deeper network, and to avoid overfitting problem, I added a dropout after the fully connected layers, with keep_prob=0.5 when training:

```
layer_4 = tf.nn.dropout(layer_4, keep_prob)
```

Model Training:

Use:

```
EPOCHS = 30
BATCH_SIZE = 100
rate = 0.001
```

Solution Approach:

I got:

```
Validation Accuracy = 0.930
Test Accuracy = 0.930
Training Accuracy = 0.999
```

Acquiring New Images:

I searched 5 pictures from google, saved in download directories:

Normalized pictures are:



Performance on New Images

Test Accuracy = 0.600

Only got 3 of them are right

Model Certainty - Softmax Probabilities:

```
indices=array([
    [12, 14, 10, 40, 5],
    [28, 3, 29, 1, 34],
    [17, 34, 9, 8, 32],
    [ 1, 2, 5, 7, 3],
    [13, 25, 10, 5, 38]],
```

The original label should be

```
[12, 22, 17, 5, 13]
```

So we can see the second and fourth of pictures are predicted incorrectly.

I found the speed limit sign is very easy to get wrong, since I tried different speed of signs, they all failed. I can see the number on the speed limit sign is hard to interpret by my model. Maybe I can improved by adding more data, or classify as speed limit sign first and train another model to predict its number, that should be more accurate.