UDACITY

‹ Return to "Self-Driving Car Engineer" in the classroom

DISCUSS ON STUDENT HUB

Traffic Sign Classification

REVIEW

CODE REVIEW

HISTORY

Meets Specifications

Great job with the traffic sign classifier project. Your approach was clean and to-the-point. Congratulations on passing this project and best wishes for the ones ahead.

Here are the areas where you need some more work.

- You can challenge yourself with more challenging traffic images such as ones taken in poor lighting conditions.
- You can try completing the optional section (visualizing the state of the neural network), this will improve your intuition about neural networks.
  Hints for the optional Challange
- The inputs to the `outputFeatureMap` function are
  1. a stimuli image, one used during training or a new one you provided.
  2. tensorflow variable name that represents the layer's state during the training process.

A sample code snippet to do this is following.

```
image_input = X_train[14]

with tf.Session() as sess:
    saver.restore(sess, tf.train.latest_checkpoint('.'))
    image_input = image_input.reshape(1,32,32,3)
```

```
conv_layer_1_visual = sess.graph.get_tensor_by_name('conv1:0')
outputFeatureMap(image_input,conv_layer_1_visual)
print("Conv Layer 1 Activation: ")
```

Cheers, and Keep up the good work !!!

Files Submitted

The project submission includes all required files.

- **Ipython notebook with code**
- **HTML output of the code**
- **A writeup report (either pdf or markdown)**

Dataset Exploration

The submission includes a basic summary of the data set.

Good job printing and analyzing a basic summary statistics of the dataset.

The submission includes an exploratory visualization on the dataset.

Nice job with visualizing sample data and plotting the histogram of class distribution in the data.

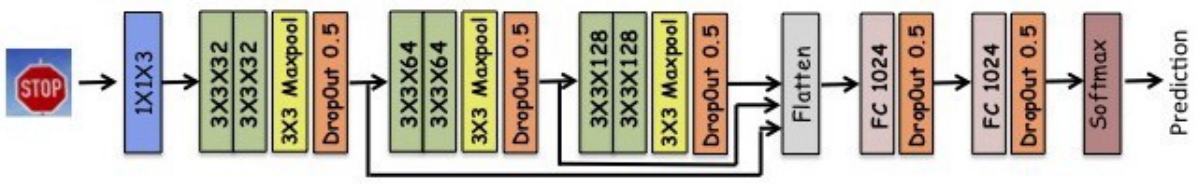
Design and Test a Model Architecture

The submission describes the preprocessing techniques used and why these techniques were chosen.

The submission provides details of the characteristics and qualities of the architecture, including the type of model used, the number of layers, and the size of each layer. Visualizations emphasizing particular qualities of the architecture are encouraged.

Great job in achieving a really impressive validation accuracy. If you are looking for improving your model further or want to explore best models on this dataset, you might find the following interesting.

- Model developed by Vivek Yadav (a student in the SDCND): Article



- In order to further improve this work, you can try visualizing the model architecture using TensorBoard

The submission describes how the model was trained by discussing what optimizer was used, batch size, number of epochs and values for hyperparameters.

Good job describing your hyperparameter choice.

You might find the following articles/discussions useful.

- Adam Optimizer: Link
- Choosing the batch_size of Stochastic Gradient Descent: Link

The submission describes the approach to finding a solution. Accuracy on the validation set is 0.93 or greater.

You have nicely described the approach taken for building and validating your model.

While designing the architecture, it is important to consider the following questions.

- How did I preprocess my data? How will that affect the model?
- How to choose the optimizer? Evaluate its pros and cons.
- Overfitting and Underfitting:
    - if overfitting, adding dropout or max pooling can help. You can report can describe how dropout or max pooling improved the model.
    - if underfitting, you can report how adding more convolution or fully connected layers helped.
- How to decide the number and type of layers?
- How to tune the hyperparameters? Sound knowledge of Linear Algebra, Probability & Statistics and Multivariate Calculus can help you a lot in narrowing down your choices.
- How to train and evaluate the model? What is the metric? How do I set the benchmark?

Test a Model on New Images

The submission includes five new German Traffic signs found on the web, and the images are visualized. Discussion is made as to particular qualities of the images or traffic signs in the images that are of interest, such as whether they would be difficult for the model to classify.

The submission documents the performance of the model when tested on the captured images. The performance on the new images is compared to the accuracy results of the test set.

Great job correctly classifying five out of five new images.

- You could try using more challenging scenarios such as traffic signs in poor lighting conditions
- This paper might provide further intuitions on this.

The top five softmax probabilities of the predictions on the captured images are outputted. The submission discusses how certain or uncertain the model is of its predictions.

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