UDACITY

< Back to Self-Driving Car Engineer

Traffic Sign Classification

REVIEW

CODE REVIEW

HISTORY

Meets Specifications

Hi there

Congratulations! You nailed on your first submission. You did a really good work on your submission and in your report. It was simple and clear. Easy to read and to follow.

Good luck!

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)**

Well done! All the submitted files are correct.

Dataset Exploration

The submission includes a basic summary of the data set.

You did a great job summarizing the dataset. All the retrieved values of the dataset are correct.

Please note that the actual image shape is 32x32x3 where 3 means that the image has 3 color channels.

The submission includes an exploratory visualization on the dataset.

Well done on explaining the data set distribution by providing an histogram. Something important that I encourage you to do is to print some images for **each label** and try to describe (or just pay attention) how the images look like. This is important because **you need to know the characteristics of the images that you are using for training your model**. Some properties that you may take a look on images are:

- The Brightness of the image.
- The Contrast of the image.
- The Angle of the traffic sign.
- Image might be jittered.
- Background Objects.
- Multiple Signs in one image.

Design and Test a Model Architecture

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

Normalization is a good choice for preprocessing datasets.

- Another technique that you may try out here is histogram equalization (CLAHE). This technique is used to improve contrast in images. For details, refer to this link.
- You can also use Keras.
- You may also want give a look to this link as a reference with other options available for preprocessing datasets.

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.

Awesome! Well done using an appropriate architecture.
Good job using dropout after the fully-connected layers to combat overfitting. For a detailed analysis of dropouts, you may also refer to this link

A few suggestions:

- A technique that has been proven to be useful here is batch normalization. This, basically carries out the preprocessing at each of the layers, thereby making the model more robust to the bad initializations. Check out this link
- You may also try experimenting with the ELU activation, as it is speed-optimized
- Another problem with the relu activation is the issue of "Dying ReLUs". To combat this, we use Leaky ReLUs
- For visualizing the model architecture, you may also use 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 work on picking up the hyperparameters. All the parameters used to train the model are reasonable 👍 If you want to learn more about Adam Optimizer, check this optional resource

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

Great job discussing your approach thoroughly and achieving a validation accuracy greater than 93%.
You may also want to check out the following blog post that explains how a similar problem was presented in a deep learning competition - https://medium.freecodecamp.org/recognizing-traffic-lights-with-deep-learning-23dae23287cc

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.

Great work, all the new images chosen are appropriate! You visualized the selected new images and produced predictions. You discussed several quality aspects of your images and how they could behave in your model.

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.

Well done! you model seems to perform really well with your images!

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.

Really good work on how you display the softmax probabilities by using the different tables. The result is really neat.

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