UDACITY

PROJECT

Traffic Sign Classification

A part of the Self Driving Car Engineer Nanodegree Program

PROJECT REVIEW

CODE REVIEW

NOTES

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Meets Specifications

Great Job!👏🏽

It is obvious that you have put some serious thought and hard work in to this project! Your model achieves a very high accuracy score, and the writeup covers every rubric requirement, making your project a pleasure to review!😃

Files Submitted

The project submission includes all required files.

Dataset Exploration

The submission includes a basic summary of the data set.

Great job here!👍🏽

Suggestion:

You could also use the `numpy.unique` function to get the number of classes in the dataset.

```
n_classes = len(np.unique(y_train))
```

The submission includes an exploratory visualization on the dataset.

Great job visualizing the distribution of classes in the training, validation and test datasets.

Design and Test a Model Architecture

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

Awesome job preprocessing the images with grayscale and normalization, and augmenting the data to even out the balance of the training data.

Suggestions:

- You can also try applying some other preprocessing techniques like histogram equalization to increase the contrast of the images.
- One more thing you could try is applying the normalization inside of the model using batch normalization layers. Here is an interesting resource about how batch normalization helps in CNNs.

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.

Excellent job clearly documenting the architecture of the final model that was used.

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

Excellent job documenting how the model was trained including choice of optimizer, learning rate, batch size and number of epochs.

Suggestion:

When deciding how many epochs to train the model for, you can try implementing an early stopping method which checks the validation loss after each epoch (or n number of epochs) and discontinues the training when validation loss is no longer improving. This way you do not have to guess at how many epochs will be optimal, and the training will stop automatically before overfitting occurs.

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

Great job achieving a validation accuracy greater than 93%!👏

Nice job documenting how you experimented with modifying the model architecture including different activation functions, and use of average/max pooling, and explaining how the greatest gains in accuracy were achieved as a result of augmenting the dataset.

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.

Nice job finding 5 german traffic signs from the web, and discussing that two of the images look very similar at low resolution, which might make them difficult 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.

The writeup documents the model performance on the additional images (100% accuracy).

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.

The top 5 softmax probabilities for each image are displayed in the notebook, and the certainty of the predictions is discussed in the writeup.

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