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

Nice job improving on the sections of your report that needed changes. Your project now meets all specifications defined by the project rubric for this project. Congratulations on passing the second project in the Self Driving Car Engineer Nanodegree and best of lucks in the ones ahead.
Cheers and Keep up the good work !!!

Files Submitted

✓

The project submission includes all required files.

Dataset Exploration

✓

The submission includes a basic summary of the data set.

✓

The submission includes an exploratory visualization on the dataset.

Design and Test a Model Architecture

✓

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

- Preprocessing steps taken have been discussed and justified

Suggestions & Comments

Here are some preprocessing techniques that have proven to work on this dataset (some of which you did think of so good job on that)

- Performing translations, scalings and rotations of the training set considerably improves generalization
- Values for translation, rotation and scaling can be drawn from a uniform distribution in a specified range, i.e. ±T % of the image size for translation, 1±S/100 for scaling and ±R○ for rotation.
- A normalization method that yields very impressive results is the Contrast-limited Adaptive Histogram Equalization (CLAHE)
- Normalization can help in case of High contrast variation among the images
- These resources (1 & 2 & 3) might provide some more intuition on the subject here.

✓

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

Sufficient details about the model's architecture is provided

Suggestions & Comments

- In order to further improve this work, it would be better to visualize the architecture that is adopted. And TensorBoard is a very good visualization tool.

✓

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

Suggestions & Comments

- Using StratifiedShuffleSplit over the traditional train-test-split, enables the use of the entire training data while keeping data for cross-validation: the distribution of the labels in both would be similar. Around 1% of the data can be used for the cross-validation set.
- Here's a nice discussion on how to choose the batch_size of Stochastic Gradient Decent
- And a Discussion on Adam Optimizer

✓

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

The approach taken is nicely discussed. I left some comments below.

Suggestions & Comments

Here are few questions to think about while designing the architecture:

- How would I choose the optimizer? What is its Pros & Cons and how would I evaluate it?
- How would I decide the number and type of layers?
- How would I tune the hyperparameter? How many values should I test and how to decide the values?
- How would I preprocess my data? Why do I need to apply a certain technique?
- How would I train the model?
- How would I evaluate the model? What is the metric? How do I set the benchmark?
- In case you're interested, here's an interesting Inception's example.

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 any particular qualities of the images or traffic signs in the images that may be of interest, such as whether they would be difficult for the model to classify.

- A very good discussion to pinpoint the qualities of images that lead to classification difficulties is made. Great!
- This paper might provide further intuitions on the subject here.

✓

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.

- A fair comparison has been made between the prediction accuracy of the model on the captured images and those on the testing set.

✓

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.

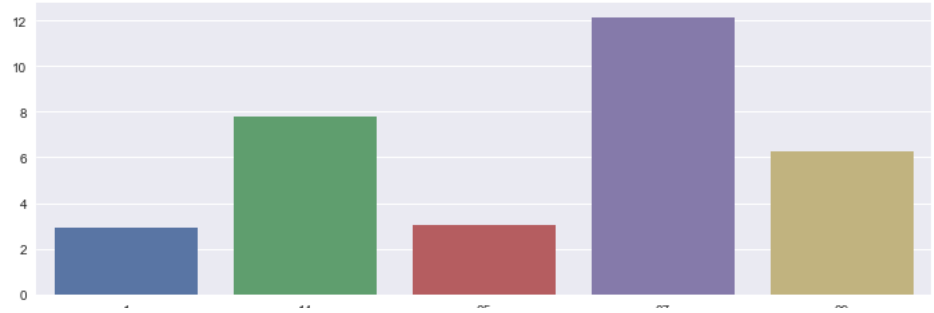
- Nice job visualizing the softmax probabilities here
- And discussing how certain/uncertain your model is of its predictions

Suggestions & Comments

- Here is an example code from a student for visualizing the softmax probabilities:

```
### Print out the top five softmax probabilities for the predictions on the German traffic sign ima
### Feel free to use as many code cells as needed.
for i in range(6):
    print(new_images[i])
    print("Predicted Class: {} | True Class: {}".format(preds[i], y_new[i]))
    fig = plt.figure(figsize=(12,4))
    sns.barplot(x=top_k[1][i], y=top_k[0][i])
    plt.show()
```

- And this is an example output from the code above:



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