UDACITY

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

DISCUSS ON STUDENT HUB

Traffic Sign Classification

审阅

代码审阅

HISTORY

Meets Specifications

Excellent work, you nailed it!
👏👏👏

I can see you put a lot of effort in your project and advanced a lot, you should be really proud! You have shown a firm grasp of the concepts presented here and are good to go.

I must say this is one of the best submissions for this project I've reviewed, good job!

If you are curious check my take on this project here.

Keep going and good luck!
Paul

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)**

All required files are present.

Dataset Exploration

The submission includes a basic summary of the data set.

Good job completing the basic data summary.

This step is essential to build a general idea on the dataset.

The submission includes an exploratory visualization on the dataset.

Great visualization of the dataset.

This step is essential to get insights on what kind of data your model will be dealing with.

Suggestion

To further explore the dataset visually, you could plot a few examples from each class, i.e:

```
for c in set(y_train):  # Iterate all classes
  idx = np.where(y_train == c)  # Find index for class
  ten_images = x_train[np.random.choice(idx[0], 10)]  # Pick ten images to displa
y
  (...)
```

Remember to check the documentation for numpy.where.

Design and Test a Model Architecture

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

Nice implementation and reasoning for the chosen techniques.

Suggestion

Did you know you can use TensorFlow to convert RGB images to grayscale?

For increased robustness, you can use the image augmentation technique to further rebalance the number of examples for each class and to expose your model to a wider variety of image qualities.

Check out this article for a great explanation with examples.

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

Excellent work providing a diagram of the architecture.

Suggestion

Did you know you can visualize 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 reporting the training parameters.

Awesome

Excellent visualization of the training history.

Suggestion

Instead of a fixed number of **epochs**, one alternative is implementing early termination, as overtraining can lead to overfitting. This also frees you to experiment with other hyperparameters and architectures without having to worry about adjusting this.

You can do this easily by defining a max number of epochs, and on each epoch decide to continue or terminate based on the previous values for validation accuracy and/or loss. For instance, if there's no improvement for the last *n* epochs, stop training.

While at it, you could save your model whenever the validation score increases, to keep only the best model found during training.

Also, if you want to know more about optimizers, check this article for a nice description and comparison of different algorithms.

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

Nice reasoning for using *LeNet* and good work exceeding the required 93% accuracy on validation.

Suggestion

To learn more about convolutional networks I recommend this book.

Another shallow architecture with good results here is [this example]https://www.tensorflow.org/tutorials/estimators/cnn) for CIFAR-10, but if you want to go deep I example]https://www.tensorflow.org/tutorials/estimators/cnn) for CIFAR-10, but if you want to go deep I recommend trying your hand at a pretrained Inception v3.

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 evaluation of the new images.

Suggestion

Google Streetview is the perfect place to find more German traffic signs.

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.

Awesome

All your effort tweaking the model really paid off.

Great results!

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.

Awesome

Excellent visualization of the softmax probabilities and feature maps.

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