



Deep Neural Networks

Assignment 9

Assignment due by: 15.01.2020, Discussions on: 22.01.2020

Question 1 Kaggle Challenge: Compete on an image classification task.

We created a Kaggle machine learning challenge, in which you have to predict the correct labels of images with deep convolutional neural networks. Since training a network on the provided dataset takes a lot of computation power, we recommend to use the TCML cluster to train your networks.

On ILIAS the training data and a baseline example code is provided. The provided code generates a file 'logpredictions.csv', which includes the category prediction of your network for each test set image. This file has to be submitted to the Kaggle challenge where your accuracy on the test set is calculated and ranked. To take part in the Kaggle challenge you need to access this link:

<https://tinyurl.com/dnn-challenge>.

- (a) Analyze the given dataset. Include one training image for each category to your sheet. Which are the categories you should classify? (3 points)
- (b) Get used to Tensorboard, which is a tool to visualize and analyze DNN structures and their training process. Extend the given code such that the average training loss, training accuracy, evaluation loss and evaluation accuracy per epoch get visualized in Tensorboard. Train the given example for 5 epochs and include screenshots of the plot of each metric. In addition visualize the computational graph and provide a screenshot. (3 points)
- (c) Take part in the Kaggle challenge. Your code should periodically print out the progress your network is making. The name of your kaggle group has to be **the concatenation of your last names**. You are not allowed to use any additional image sources and any pretrained weights. Your architecture can be related to commonly used architectures but you have to implement it yourself. Direct copies or copies with minor changes of existing architectures are prohibited. To achieve full points, you have to outperform the provided Kaggle baseline which reaches 56.2% accuracy. The top 10 teams will get (10/8/6/5/4/3/3/2/2/1) bonus points. Finally, submit the code of your best performing network to ILIAS. (9 points)
- (d) Document your results. Add a short explanation of your chosen architecture and a documentation of your training procedure. This should at least include a description of the architecture, the used hyperparameters, the used optimizer, any data augmentation and normalization techniques, plots of the training and evaluation accuracies over epochs, plots of the training and evaluation loss over epochs and the final test accuracy. (5 points)

Hints:

- You are allowed to change all parts of the code if it provides you some benefits.
- The example network provided does not use convolution or pooling layers, add some to increase the performance significantly.

- Some keywords for better performance are: Data Augmentation, Learning Rate Decay, DropOut, Batch normalization, Skip Connections, Data Normalization, Assembles.
- In Ilias an example .sbatch file is provided to run your code on the TCML-Cluster. Note that you have to increase the time tag and that you have to set the partition tag to 'day' for longer trainings.
- Try to mount your cluster directory with sshfs, since using scp to copy your files is cumbersome. In addition, if you use sshfs you can use Tensorboard on your local machine to visualize and analyze your training process.