

Exercise Sheet 10

Due: 05.02.2019, 16:00

Download the following files from ISIS:

- `mnist_small.csv` MNIST data set, 1000 examples
- `MNIST_contest.ipynb`

Install Keras (<https://keras.io>) on the basis of Theano or Tensorflow.

Exercise 10.1 (2 points + bonus points)

In this exercise, we conduct a classification contest. The goal is to find a neural network classifier on MNIST data which has the best generalization performance. The neural network model must be a Multi-Layer-Perceptron (MLP) with arbitrarily many hidden layers and neurons per layer. For building and training a model, we use Keras.

One challenge is that only a small dataset (`X_train, y_train`) with 1000 examples is given. This dataset is contained in the file `mnist_small.csv`. Using more data from other sources leads to disqualification (0 points).

Please submit an ipython notebook containing two parts.

1. The first part contains the experiments which you used for model selection
2. In the second part, you deploy your selected model

Part 1: Try to find a good MLP architecture and training algorithm for this problem. To find good a good model you can use any concepts presented in the lecture. Describe briefly in the notebook, how model selection was performed and provide your code for model selection.

Part 2: Deploy your selected model. For this, complete the method `train()` in the jupyter notebook. This method will take the visible training data (`X_train, y_train`) and should return a trained Keras model of class `keras.model.Sequential`.

To estimate the generalization performance, we will use a test dataset (`X_test, y_test`) which is not visible to you. The test will be conducted as follows:

```
for i = 1 to 10
    model = train(X_train, y_train)
    Acc[i] = evaluate model on (X_test, y_test)
endfor
Accuracy = mean(Acc)
Error = 1 - Accuracy
```

Scoring

- 1st place: 5 points
- 2nd place: 4 points
- 3rd place: 3 points
- All other participants: 2 points
- Non-participants: 0 points

Caution: Notice the due date! This is a hard submission deadline. I need some time for the tests.