# 1 Neuronale Netze – Exercise 1 – Perceptron

## 1.1 Goals

- Be familiar with Python and its scientific frameworks (Numpy, Matplotlib, Scikit-learn..).
- Be familiar with the NN Praktikum framework design.
- Implement a simple Rosenblatt perceptron with *Heaviside step function* to recognize a handwritten digit whether it is a seven (7) or not.

## 1.2 Repository

- GitHub: `https://github.com/thanhleha-kit/NNPraktikum.git` (branch: master, sample code: Ex1).

## 1.3 Data

### 1.3.1 MNIST - handwritten digit recognition dataset

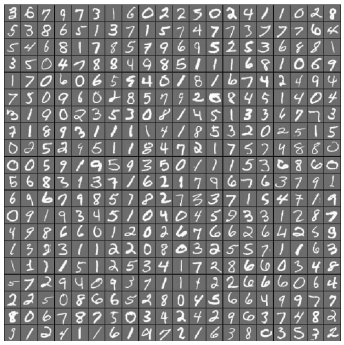

Figure 1: Example digits from MNIST dataset

- Grayscale images of handwritten digits (0–9), 28x28 pixels.
- 60000 images for training, 10000 for testing.

### 1.3.2 This MNIST subset

- 3000 images for training, 1000 for validation, 1000 for testing.
- In csv format, one row is one image (instance)
  - First field is the label of the digit (0–9)
  - Remaining fields (784 fields) are pixel values (0 means White, 255 means Black)

## 1.4 Description of the NN Praktikum coding framework

- Modular, OOP design: `data`, `model`, `util`, `report`.
- `data`: Wrapper for various datasets, divides the data into training, validation and test sets.
- `model`: The actual learning models with methods to train, test and evaluate.
- `util`: Contains various activation functions, error functions and other utilities.
- `report`: Evaluates and reports the performance of your learning algorithms.
- `Run.py`: Conducts the experiment pipeline (reads data, trains model, evaluates the test and displayes the performance).

## 1.5 Your coding tasks

- Install python and required scientific packages.
- Check out or download the data and framework.
- Complete the code for training, classifying and evaluating of the perceptron. See the stupid classifier as an example.
- Run your perceptron implementation in `Run.py`.
- Play around with the learning rate.

## 1.6 Help & Support

- Python, Numpy, Matplotlib tutorial: `http://cs231n.github.io/python-numpy-tutorial/`
- Numpy for Matlab users: `http://scipy.github.io/old-wiki/pages/NumPy_for_Matlab_Users.html`
- GitHub tutorial `http://product.hubspot.com/blog/git-and-github-tutorial-for-beginners`
- Email to: thanh-le.ha@kit.edu (in English)