# Report of Exercise 01

## Implementaion Approach

Following the lecture slides, and using the provided stub a simple multi-layer perceptron (MLP) was implemented.

## Results

Using stochastic gradient decent proved to be more efficient then using gradient decent. Therefore the following results were achieved using stochastic gradient decent. An error of about 2% (1-3% were required according to the notebook) on the validation set was achieved with the initial run. Therefore learning rate, batch size and layer structure were not changed from how they were initially chosen in the stub.

Results of a training session with 30 epochs can be seen in Figures 1 and 2 below. The achieved test error is 2,28%.
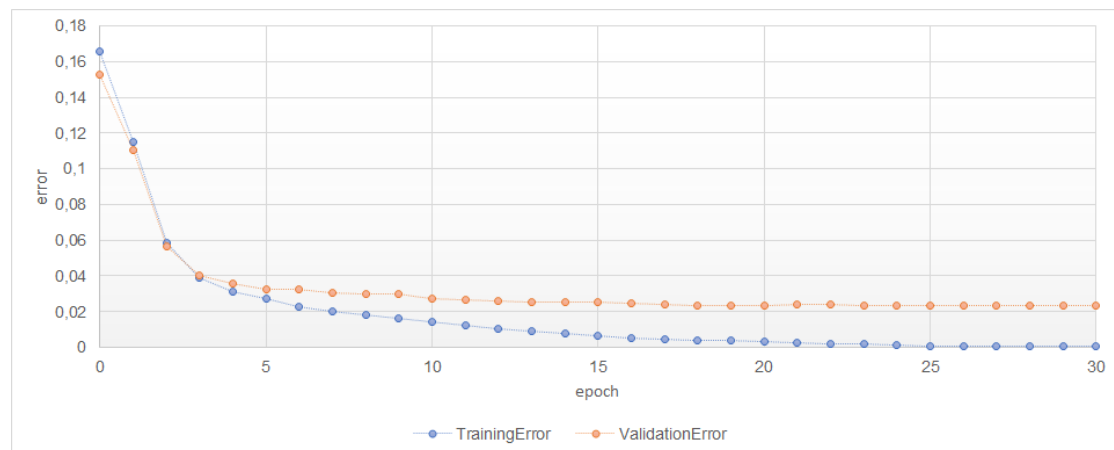


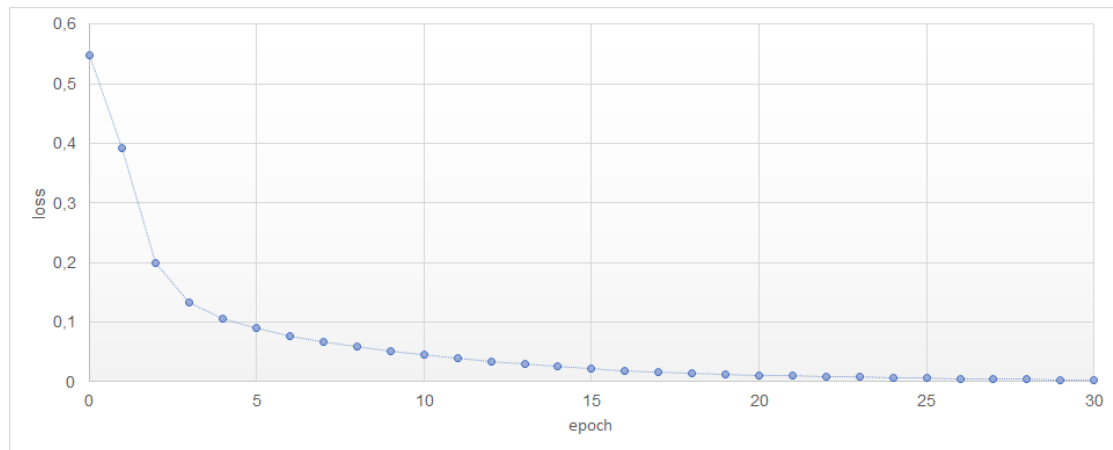Figure 1: Training Error / Validation Error

Figure 2: Loss

In the following Figures 3 and 4, a few examples concerning correctly and incorrectly classified samples are given.

In Figure 3 the left image shows the digit "2" and the right image shows the digit "7". Both digits are portrayed in a way that fits the general perception of how the corresponding digits should look like.
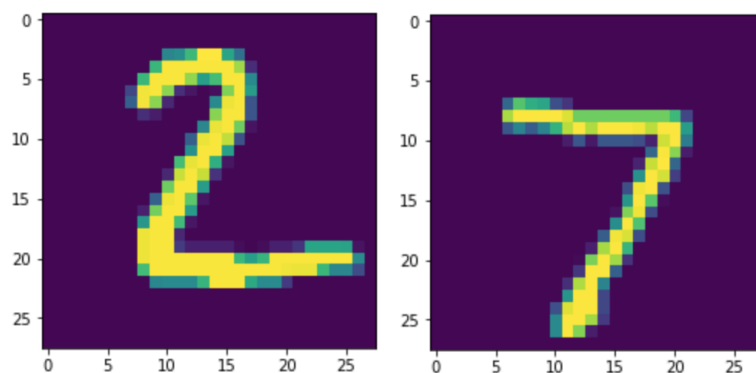


Figure 3: Correctly classified samples

In Figure 4 the left image shows the digit "4" but is classified as the digit "6", while the right image shows the digit "9" but is classified as the digit "8".
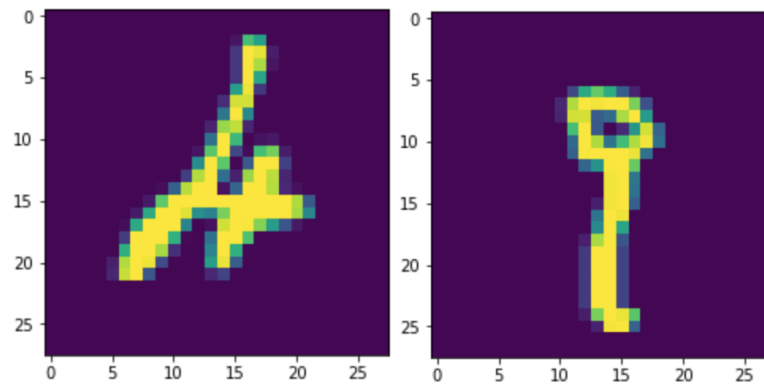The way the digits are portrayed is not as straight forward as the ones in Figure 3 but can still be recognised by the human eye even though they might look strange.



Figure 4: Incorrectly classified samples