

Neural network - final report

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Solved problem

We solved recognition of handwritten digits. As dataset was used MNIST database of handwritten digits (<http://yann.lecun.com/exdb/mnist/>), stored in form of IDX file. For our purpose was training images stored into 2D array. First dimension for index of picture, second dimension are image pixels.

Labels are in different 2D array. First index for image index, second for value. Second dimension is binary value of length ten, each bit for one value (0 - 9).

We implemented multi-layer perceptron with backpropagation algorithm. Input layer has 784 neurons. One neuron for each pixel. Output layer has ten neurons, each for one value.

Results

Best result we had with these parameters:

- Network: [784, 50, 10]
- Learning rate: 2,8
- Number of train samples: 45 000
- Number of validation samples: 15 000
- Number of test samples: 10 000

Accuracy of this setting: 95.79%

We tried also other settings which gave worse results. All results are available in **results.xlsx** (also in results.pdf) file.

In this file:

- Sheet are named as types of network.
- On first sheet of each network are result for given learning rate, without given iteration.
- On other sheets are tested learning rates with set number of iteration (250-500).

Team contribution

Dominik Hanák – Main implementation of MLP

Matúš Hlaváčik – Testing

Pavel Fojtík – Data loading and parsing, presentations