Machine Learning Laboratory

Session 3 – Neural Network and Backpropagation

Preparation

In this session you will, step by step, implement a simple neural network and the backpropagation algorithm on your own, without using any deep learning libraries. In order to prepare for the session you should:

1. Work through and understand the course notes from Stanford about neural networks and backpropagation
2. Work through and understand the following book chapter (including the optional sections): Michael Nielsen: "Neural Networks and Deep Learning", Chapter 2

After working through the materials and exercises you should understand:

- Four fundamental equations of backpropagation (BP1 - BP4 in [2])
- The structure of neural networks (forward and backward pass)
- How to measure the error of a neural network
- How to update a neural network based on gradient descent
- The idea of mini batches and stochastic gradient descent
- Different types of matrix multiplication, e.g., hadamard product

Further Reading

Optional: You can find the paper by Rumelhart, Hinton and Williams from 1986 about the initial idea of the backpropagation: Link. Furthermore, you can find the doc of how the gradients are automatically calculated in PyTorch with autograd.