7. Problem sheet for **Statistical Data Analysis**

Exercise 1

Determine $\frac{\partial E}{\partial w_{ji}^O}$ and $\frac{\partial E}{\partial w_{ji}^H}$ of loss function

$$E(\mathbf{w}, \mathbf{b}) = \frac{1}{2} \sum_{k \in N_O} (\mathcal{O}_k - t_k)^2 \tag{1}$$

for a network with one input layer (with N_I neurons), output layer (with N_O neurons) and hidden layer (with N_H neurons). Note that every neuron is assumed to be connected to every neuron of the next layer, i.e., a Multi Layer Perceptron is considered. Further the sigmoid function is the considered action function for every neuron in the hidden and output layer.

Exercise 2

Let $X_1, ..., X_n$ be independent and identically $\mathcal{U}[0, \theta]-$distributed random variables. Show that

$$\left(\prod_{i=1}^{n} X_i \right)^{1/n} \tag{2}$$

is asymptotically unbiased and and consistent for $\gamma(\theta) = \theta e^{-1}$.