

# Blatt 3

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May 23, 2019

## 1 Lernregeln

$$E(w, b) = \frac{1}{2} \sum_{\mu=1}^M (T_{\mu} - f(wx_{\mu} + b))^2$$

1.

$$\nabla E(w, b) = \begin{pmatrix} \frac{\partial E}{\partial w} \\ \frac{\partial E}{\partial b} \end{pmatrix} = \begin{pmatrix} -\sum_{\mu=1}^M (T_{\mu} - f(wx_{\mu} + b)) \cdot \frac{\partial f(wx_{\mu} + b)}{\partial w} \cdot x_{\mu} \\ -\sum_{\mu=1}^M (T_{\mu} - f(wx_{\mu} + b)) \cdot \frac{\partial f(wx_{\mu} + b)}{\partial w} \end{pmatrix}$$

2. a) inkrementelle Version:

$$w(t+1) = w(t) - \mu(T_t - f(wx_t + b)) \cdot \frac{\partial f(wx_t + b)}{\partial w} \cdot x_t$$
$$b(t+1) = b(t) - \mu(T_t - f(wx_t + b)) \cdot \frac{\partial f(wx_t + b)}{\partial w}$$

b) Batch Version

$$w(t+1) = w(t) + \mu \sum_{\mu=1}^M (T_{\mu} - f(wx_{\mu} + b)) \cdot \frac{\partial f(wx_{\mu} + b)}{\partial w} \cdot x_{\mu}$$
$$b(t+1) = b(t) + \sum_{\mu=1}^M (T_{\mu} - f(wx_{\mu} + b)) \cdot \frac{\partial f(wx_{\mu} + b)}{\partial w}$$

mit  $\mu \approx 1/M$

3.