

1 Algorithmus

<p>Input: loss function E, learning rate η, dataset X, y und das Modell $F(\theta, x)$</p> <p>Output: Optimum θ which minimizes ϵ</p> <pre>1 while converge do 2 $\tilde{y} = F(\theta, x)$ 3 $\theta = \theta - \eta \cdot \frac{1}{N} \sum_{i=1}^N \frac{\delta \epsilon(y, \tilde{y})}{\delta \theta}$ 4 end</pre>
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Algorithm 1: Gradient descent

<p>Input: loss function E, learning rate η, dataset X, y und das Modell $F(\theta, x)$</p> <p>Output: Optimum θ which minimizes ϵ</p> <pre>1 while converge do 2 Shuffle X, y 3 for x_i, y_i in X, y do 4 $\tilde{y} = F(\theta, x_i)$ 5 $\theta = \theta - \eta \cdot \frac{1}{N} \sum_{i=1}^N \frac{\delta \epsilon(y_i, \tilde{y}_i)}{\delta \theta}$ 6 end 7 end</pre>

Algorithm 2: Stochastic Gradient descent(SGD)

Input: loss function E , learning rate η , dataset X, y und das Modell $F(\theta, x)$

Output: Optimum θ which minimizes E

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1 while converge do
2   Shuffle X, y
3   for each batch of  $x_i, y_i$  in  $X, y$  do
4      $\tilde{y} = F(\theta, x_i)$ 
5      $\theta = \theta - \eta \cdot \frac{1}{N} \sum_{i=1}^N \frac{\delta E(y_i, \tilde{y}_i)}{\delta E}$ 
6   end
7 end

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Algorithm 3: Mini-Batch Stochastic Gradient descent(MSGD)

Input: Netzwerk mit l layers, Aktivierungsfunktion σ_l , Output von der versteckten Schicht $h_l = \sigma_l(W_l^T h_{l-1} + b_l)$ und die Netzwerkausgabe $\tilde{y} = h_l$

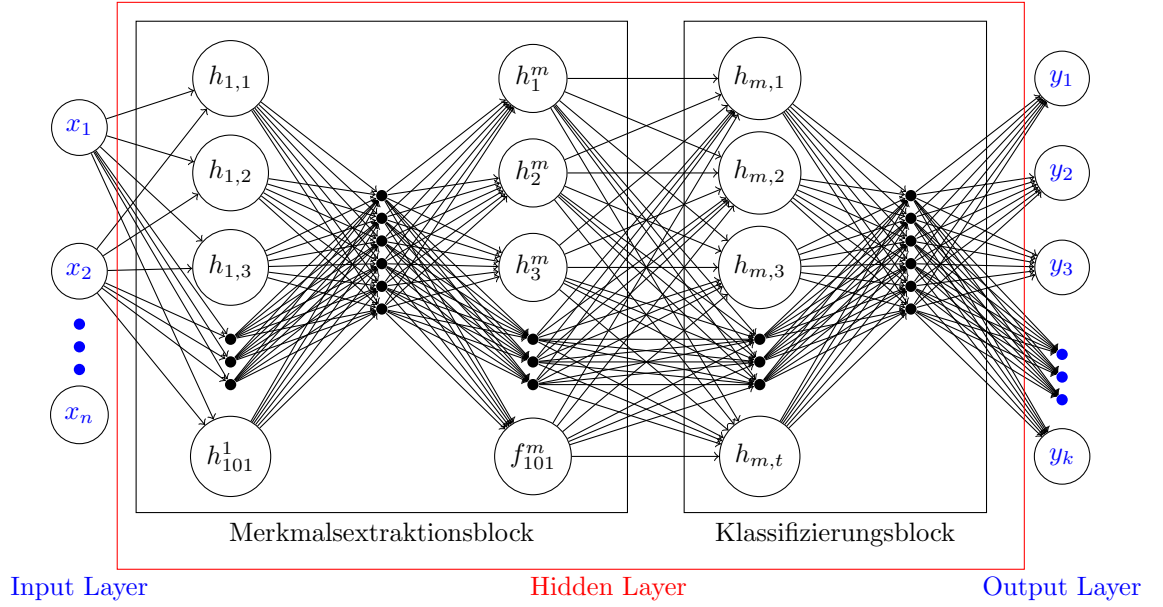
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1 Berechnen der Gradient:  $\delta \leftarrow \frac{\partial E(y, \tilde{y})}{\partial y}$ 
2 for  $i \leftarrow l$  bis 0 do
3   Berechnen der Gradient für die Aktuelle Schicht
4    $\frac{\partial E(y, \tilde{y})}{\partial W_i} = \frac{\partial E(y, \tilde{y})}{\partial h_i} \frac{\partial h_i}{\partial W_i} = \delta \frac{\partial h_i}{\partial W_i}$ 
5    $\frac{\partial E(y, \tilde{y})}{\partial b_i} = \frac{\partial E(y, \tilde{y})}{\partial h_i} \frac{\partial h_i}{\partial b_i} = \delta \frac{\partial h_i}{\partial b_i}$ 
6   Gradientabstiegverfahren mit  $\frac{\partial E(y, \tilde{y})}{\partial W_i}$  und  $\frac{\partial E(y, \tilde{y})}{\partial b_i}$ 
7   Propagiere den Gradienten zu den unteren Schichten.
8    $\delta \leftarrow \frac{\partial E(y, \tilde{y})}{\partial h_i} \frac{\partial h_i}{\partial h_{i-1}} = \delta \frac{\partial h_i}{\partial h_{i-1}}$ 
9 end

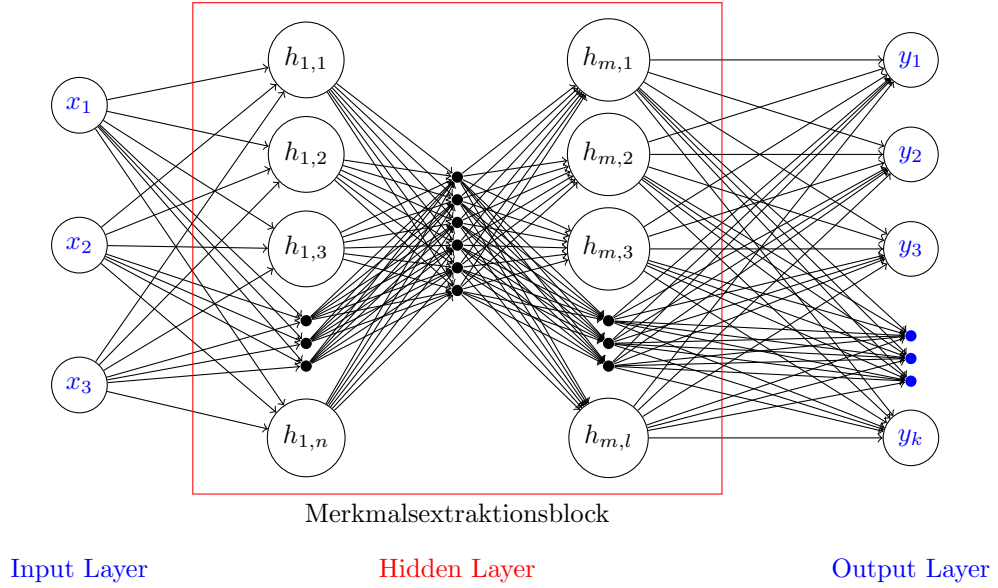
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Algorithm 4: Back-Propagation

2 Neuronale Netzwerk



(a) TemkiNet Architektur



(b) Allgemeine CNN-Architektur