Matrizen in Neuronalen Netzwerken

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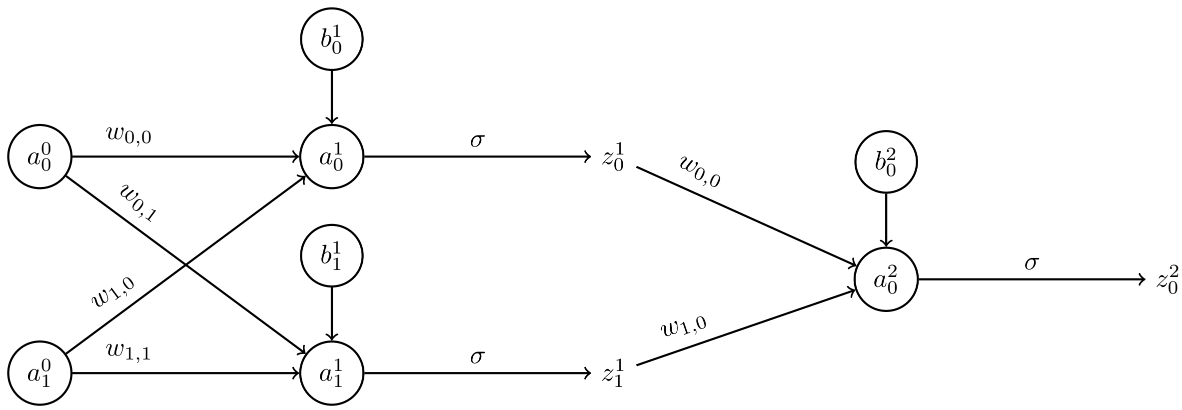
1 Grafik



2 Formeln

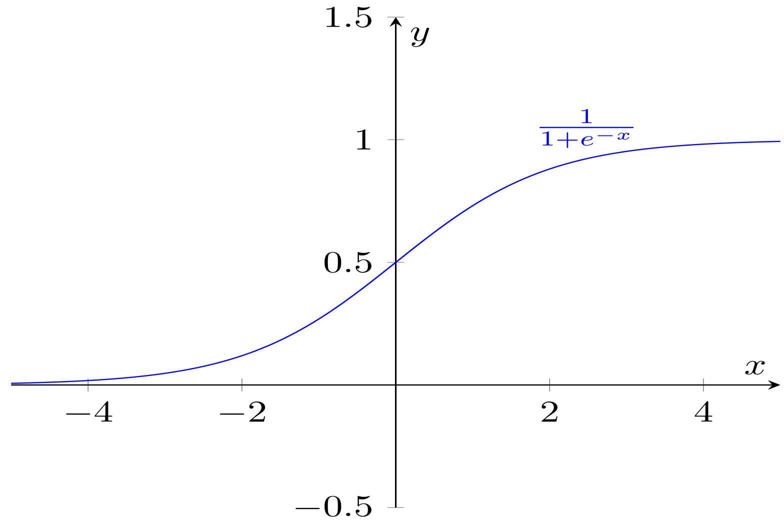
$$a_0^1 = a_0^0 \cdot w_{0,0} + a_1^0 \cdot w_{1,0} + b^1$$

allgemein:

$$a_0^1 = b^1 + \sum_{k=0}^{n} a_k^0 \cdot w_{k,0}$$

$$z_n^m = \sigma(a_n^m)$$

$$\sigma(x) = \frac{1}{1 + e^{-x}}$$



3 Matrizendarstellung

$$\vec{a}_m = \begin{pmatrix} a_0^m \\ a_1^m \\ ... \\ a_n^m \end{pmatrix} \qquad \vec{b}_m = \begin{pmatrix} b_0^m \\ b_1^m \\ ... \\ b_n^m \end{pmatrix} \qquad W = \begin{pmatrix} w_{0,0} & w_{1,0} & ... & w_{n,0} \\ w_{0,1} & w_{1,1} & ... & w_{n,1} \\ ... & ... & ... & ... \\ w_{0,j} & w_{1,j} & ... & w_{n,j} \end{pmatrix}$$

$$\vec{a}_m = \vec{a}_{m-1} \cdot W + \vec{b}_m$$

$$\begin{pmatrix} a_0^m \\ a_1^m \\ ... \\ a_n^m \end{pmatrix} = \begin{pmatrix} a_0^{m-1} \\ a_1^{m-1} \\ ... \\ a_n^{m-1} \end{pmatrix} \cdot \begin{pmatrix} w_{0,0} & w_{1,0} & ... & w_{n,0} \\ w_{0,1} & w_{1,1} & ... & w_{n,1} \\ ... & ... & ... & ... \\ w_{0,j} & w_{1,j} & ... & w_{n,j} \end{pmatrix} + \begin{pmatrix} b_0^m \\ b_1^m \\ ... \\ b_n^m \end{pmatrix}$$

$$\begin{pmatrix} a_0^m \\ a_1^m \\ ... \\ a_n^m \end{pmatrix} = \begin{pmatrix} w_{0,0} \cdot a_0^{m-1} + w_{1,0} \cdot a_1^{m-1} + ... + w_{n,0} \cdot a_n^{m-1} \\ w_{0,1} \cdot a_0^{m-1} + w_{1,1} \cdot a_1^{m-1} + ... + w_{n,1} \cdot a_n^{m-1} \\ ... \\ w_{0,j} \cdot a_0^{m-1} + w_{1,j} \cdot a_1^{m-1} + ... + w_{n,j} \cdot a_n^{m-1} \end{pmatrix} + \begin{pmatrix} b_0^m \\ b_1^m \\ ... \\ b_n^m \end{pmatrix}$$

$$a = b \qquad c = d$$