Perceptron

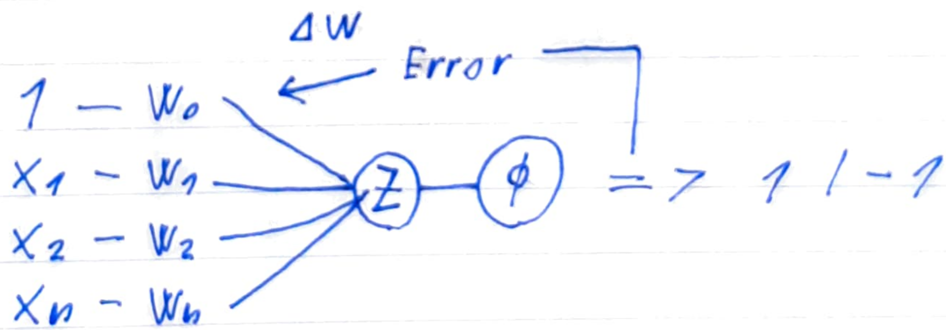
$$\phi(z) = \begin{cases} 1 \Leftarrow z \geq \theta \\ -1 \end{cases}$$

$$\phi(z) = 1 \Leftarrow z \geq 0 \mid -1$$

$$w_0 = -\theta$$
$$x_0 = 1$$

$$z = \sum_{0}^{n} x_j w_j = w^T x$$

$$\Delta w_j = \eta (y^i - \hat{y}^i) x_j^i$$
$$w_j := w_j + \Delta w_j$$



ADALINE

$$J = \frac{1}{2}\sum_i (y^i - \phi(z))^2$$

$$\boxed{\begin{array}{l} \mathcal{N}' = 0 \\ x^{2'} = 2x \\ (ax+b)' = a \end{array}}$$

$$\Delta W = -\nabla J(W) \cdot \eta$$

$$\nabla J = \frac{dJ}{dw_j}$$

$$= \frac{dJ}{dw_j} = \frac{d}{dw_j} \cdot \frac{1}{2}\sum_i (y^i - \phi(z^i))^2$$

$$= \frac{1}{2}\frac{d}{dw_j}\sum_i (y^i - \phi(z^i))^2$$

$$= \frac{1}{2}\sum_i 2(y^i - \phi(z^i))\frac{d}{dw_j}\left(y^i - \sum_i (w_j^i x_j^i)\right)$$

$$= \sum_i (y^i - \phi(z^i))(-x_j^i)$$

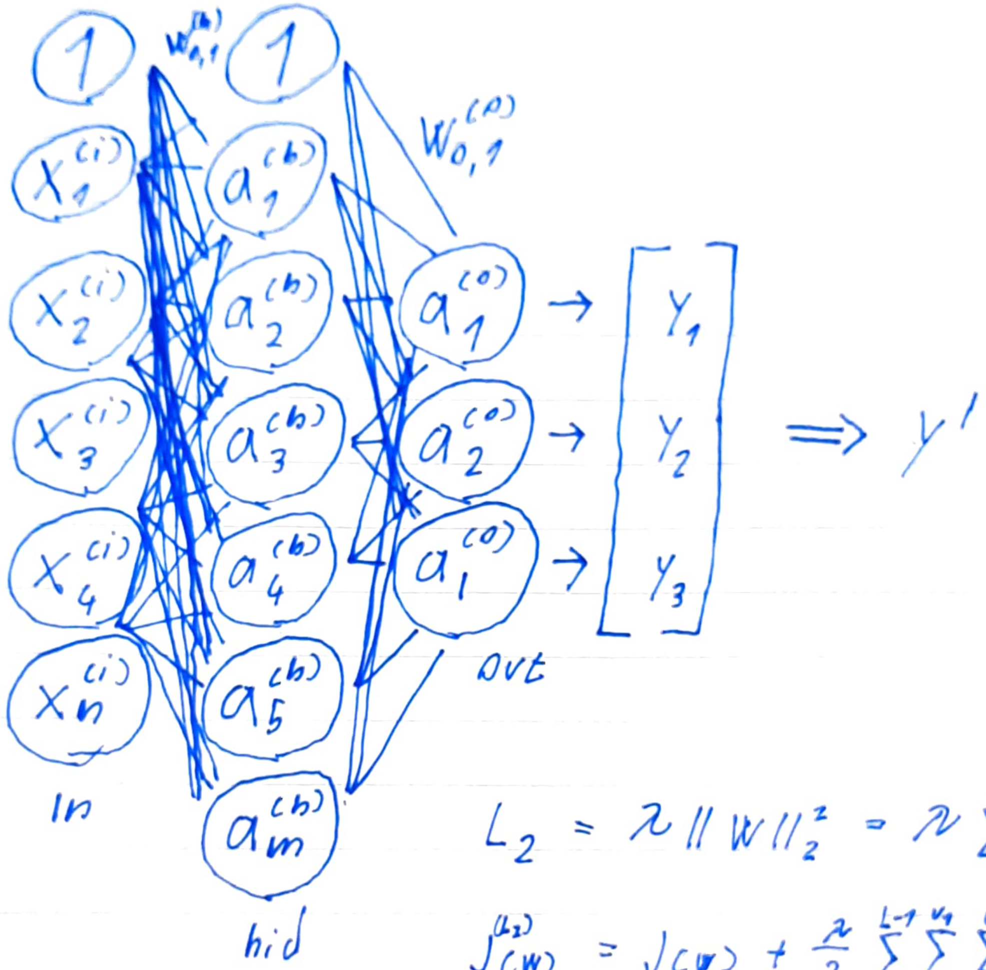
$$= -\sum_i (y^i - \phi(z^i))\, x_j^i$$

$$\Delta w_j = \eta \sum_i (y^i - \phi(z^i))\, x_j^i$$

$$W := W + \Delta W$$

$$SGD \Rightarrow \eta (y^i - \phi(z^i))\, x^i$$

MLP



$$L_2 = \lambda \| W \|_2^2 = \lambda \sum^{m} W_j^2$$

$$J^{(L_2)}_{(W)} = J(W) + \frac{\lambda}{2} \sum_{l}^{L-1} \sum_{i}^{v_l} \sum_{j}^{v_l+1} (w_{j,i}^{(l)})^2$$

$$a_n^{(i)} = x_n^{(i)}$$

$$\boxed{\Delta W = - \frac{\partial J(W)}{\partial w_{j,i}^{(l)}}}$$

$$a_m^{(h)} = \phi(X^T W_{n,m}^{(h)}) = \phi\left(\sum_{i1}^{n} X_n W_{n,m}^{(h)}\right)$$

$$a_1^{(o)} = \phi(X^T W_{m,1}^{(o)}) = \phi\left(\sum_{m1}^{m} A_m W_{m,1}^{(o)}\right)$$

$$\cancel{J(W) = - \sum_{n}^{i} \sum_{k}^{t} y_k^{(i)} \log (a_k^n}$$

$$J(W) = - \sum_{i}^{n} \sum_{j}^{t} y_j^{(i)} \log (a_j^{(i)}) + (1 - y_j^{(i)}) \log (1 - a_j^{(i)})$$