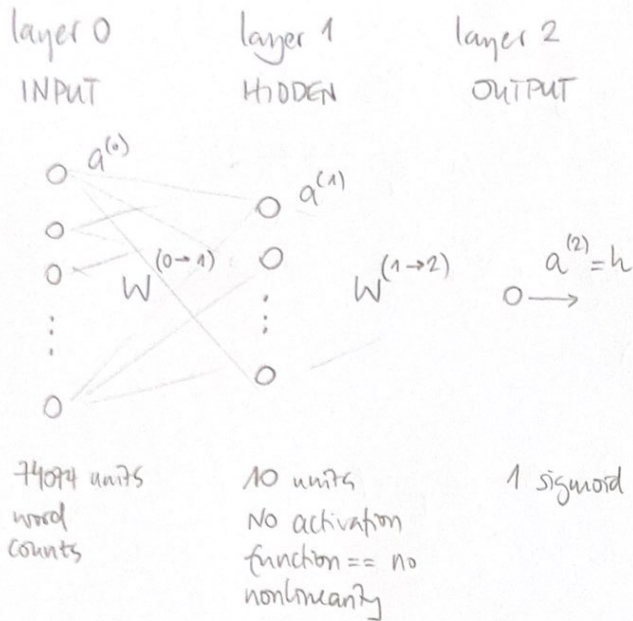


# SENTIMENT ANALYSIS NETWORK | UDACITY



(No bias)

Note: in Udacity, the  $W$  matrix is defined transposed; thus, the multiplication order must be changed

$\tilde{W}$ : (old units  $\times$  new units)

$$\tilde{Z} = \tilde{a} \cdot \tilde{W}$$

$$(\text{batch, old}) \times (\text{old, new}) = (\text{batch, new})$$

$$\tilde{Z} \leftarrow \tilde{Z} + \tilde{b}$$

$\tilde{b}$ : bias: (batch, new)

additionally, the bias is added afterwards, not inscribed in  $\tilde{W}$

## FORWARD

$$\tilde{a}^{(0)} = x \quad (74074, 1)$$

new units

$$\tilde{Z}^{(1)} = \tilde{W}^{(0)} \cdot \tilde{a}^{(0)} \quad \underbrace{(10, 74074)}_{\tilde{W}^{(0)}} \times \underbrace{(74074, 1)}_{\tilde{a}^{(0)}} = (10, 1)$$

old units

$$\tilde{a}^{(1)} = f(\tilde{Z}^{(1)}) = \tilde{Z}^{(1)} ; f: x \rightarrow x, f(x) = x : \text{no activation function}$$

$$\tilde{Z}^{(2)} = \tilde{W}^{(1)} \cdot \tilde{a}^{(1)} : \underbrace{(1, 10)}_{\tilde{W}^{(1)}} \times \underbrace{(10, 1)}_{\tilde{a}^{(1)}} = (1, 1)$$

$$a^{(2)} = \sigma(\tilde{Z}^{(2)}) : \text{sigmoid activation}$$

$$h = a^{(2)}$$

## BACKWARD

$$e^{(2)} = y - \hat{y} \quad (1, 1)$$

$$\delta^{(2)} = e^{(2)} \cdot \sigma'(\tilde{Z}^{(2)}) ; (1, 1) \quad \sigma' = \sigma(1-\sigma) \text{ sigmoid derivative}$$

$$e^{(1)} = (\tilde{W}^{(1)})^T \cdot \delta^{(2)} : \underbrace{(10, 1)}_{(\tilde{W}^{(1)})^T} \times \underbrace{(1, 1)}_{\delta^{(2)}} = (10, 1)$$

$$\delta^{(1)} = e^{(1)} \cdot * f'(\tilde{Z}^{(1)}) \quad (10, 1)$$

one epoch loop =  
for each  
example m:

$$\tilde{\Delta W}^{(l)} = \tilde{\Delta W}^{(l)} + \delta^{(l+1)} \cdot \tilde{a}^{(l)T}$$

1 (no activation function)

$\tilde{W}^{(0)} : (10, 1) \times (1, 74074)$   
 $\tilde{W}^{(1)} : (1, 1) \times (10, 10)$

m loop or after  
epoch

$$\tilde{W}^{(l)} = \tilde{W}^{(l)} + \frac{\alpha}{m} \cdot \tilde{\Delta W}^{(l)}$$