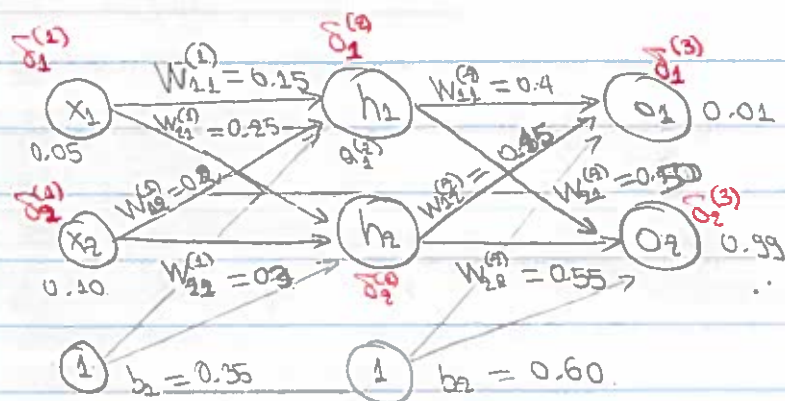


$$g(x) = \frac{1}{1+e^{-x}}, \quad g'(x) = g(x)[1-g(x)]$$



$$h_1 = g(W_{11}^{(1)} x_1 + W_{12}^{(1)} x_2 + b_1) = g(\underbrace{0.15 \times 0.05 + 0.2 \times 0.1 + 0.35}_{z_1^{(1)}}) = 0.59326939$$

$$h_2 = g(W_{21}^{(1)} x_1 + W_{22}^{(1)} x_2 + b_1) = g(\underbrace{0.25 \times 0.05 + 0.3 \times 0.1 + 0.35}_{z_2^{(1)}}) = 0.596884378$$

$$o_1 = g(W_{11}^{(2)} h_1 + W_{12}^{(2)} h_2 + b_2) = g(\underbrace{0.4 \times 0.5932 + 0.45 \times 0.5968 + 0.60}_{z_1^{(2)}}) = 0.75136507$$

$$o_2 = g(W_{21}^{(2)} h_1 + W_{22}^{(2)} h_2 + b_2) = g(\underbrace{0.5 \times 0.5932 + 0.55 \times 0.5968 + 0.60}_{z_2^{(2)}}) = 0.772928465$$

$$E_{o1} = \frac{1}{2} (0.01 - o_1)^2 = \frac{1}{2} (0.01 - 0.75136507)^2 = 0.244811083$$

$$E_{o2} = \frac{1}{2} (0.99 - o_2)^2 = \frac{1}{2} (0.99 - 0.772928465)^2 = 0.023560026$$

$$E_{total} = E_{o1} + E_{o2} = 0.258371109$$

$$\delta_2^{(3)} = (o_2 - y_2) g'(z_2^{(2)}) = (0.99 - 0.772928465) g'(0.5 \times 0.5932 + 0.55 \times 0.5968 + 0.60) = 0.217071535$$

$$\delta_1^{(3)} = (o_1 - y_1) g'(z_1^{(2)}) = (0.01 - 0.75136507) g'(0.4 \times 0.5932 + 0.45 \times 0.5968 + 0.60) = -0.1384985616$$

$$\frac{\partial J(W_{12})}{\partial W_{12}^{(2)}} = \delta_1^{(3)} \delta_2^{(2)} = 0.0821670405$$

$$\frac{\partial J(W_{12})}{\partial W_{12}^{(2)}} = \delta_1^{(3)} \delta_2^{(2)} = 0.0821670405$$

$$W_{12}^{(2)} = W_{12}^{(1)} - \alpha \frac{\partial J(W_{12})}{\partial W_{12}^{(2)}} = 0.4 - 0.5 \times 0.0821670405 = 0.358916475$$

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$$\frac{\partial J(W,b)}{\partial W_{21}^{(2)}} = a_1^{(2)} \delta_2^{(3)} = -0.0226025404$$

$$W_{21}^{(2)} = W_{21}^{(2)} - a \frac{\partial J(W,b)}{\partial W_{21}^{(2)}} = 0.511301270$$

$$\begin{aligned} \delta_1^{(2)} &= (W_{11}^{(2)} \delta_1^{(3)} + W_{21}^{(2)} \delta_2^{(3)}) g'(z_1^{(2)}) \\ &= [0.4 \times 0.138498 + 0.5 \times (-0.0380982865)] g'(0.15 \times 0.05 + 0.2 \times 0.1 + 0.35) \\ &= 0.00877135468 \end{aligned}$$

$$\frac{\partial J(W,b)}{\partial W_{11}^{(1)}} = x_1 \delta_1^{(2)} = 0.05 \delta_1^{(2)} = 0.0004385677$$

$$W_{11}^{(1)} = W_{11}^{(1)} - a \frac{\partial J(W,b)}{\partial W_{11}^{(1)}} = 0.149780716132$$

$$\delta_2^{(2)} = (W_{12}^{(2)} \delta_1^{(3)} + W_{22}^{(2)} \delta_2^{(3)}) g'(z_2^{(2)}) = 0.00995425$$

$$\frac{\partial J(W,b)}{\partial W_{21}^{(1)}} = x_2 \delta_2^{(2)} = 0.00049771273$$

$$W_{21}^{(1)} = W_{21}^{(1)} - a \frac{\partial J(W,b)}{\partial W_{21}^{(1)}} = 0.249751$$

$$\frac{\partial J(W,b)}{\partial W_{22}^{(2)}} = x_2 \delta_2^{(2)} = 0.0009954254$$

$$W_{22}^{(2)} = W_{22}^{(2)} - a \frac{\partial J(W,b)}{\partial W_{22}^{(2)}} = 0.29950229$$

$$\frac{\partial J(W,b)}{\partial W_{12}^{(2)}} = x_2 \delta_1^{(2)} = 0.000877113$$

$$W_{12}^{(2)} = W_{12}^{(2)} - a \frac{\partial J(W,b)}{\partial W_{12}^{(2)}} = 0.19956143$$