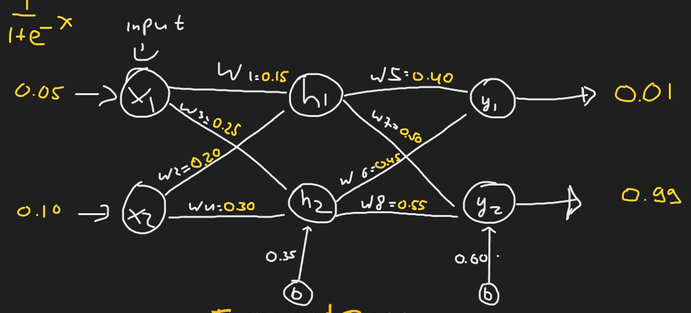
activation_function = sigmoid $\frac{1}{1+e^{-x}}$



Forward Pass

$h_1 = 0.05 * 0.15 + 0.10 * 0.20 + 0.35 = 0.3775 \rightarrow \frac{1}{1+e^{-0.3775}} = 0.59326$

$h_2 = 0.05 * 0.25 + 0.10 * 0.30 + 0.35 = 0.3925 \rightarrow \frac{1}{1+e^{-0.3925}} = 0.59688$

$y_1 = 0.59326 * 0.40 + 0.59688 * 0.45 + 0.60 \rightarrow 1.1059 \rightarrow 0.751$

$y_2 = 0.59326 * 0.50 + 0.59688 * 0.55 + 0.60 \rightarrow 1.2249 \rightarrow 0.77292$

Backpropagation

$E_{total} = \sum_{i=1}^{m} \frac{1}{2}(t-a)^2 \rightarrow \underbrace{\frac{1}{2}(0.01 - 0.751)^2}_{0.2745} + \underbrace{\frac{1}{2}(0.99 - 0.772)^2}_{0.0235} = 0.2983$

$\frac{dE_{total}}{dw_5} = \frac{dE_t}{doutput} * \frac{doutput}{dy_1} * \frac{dy_1}{dw_5}$

$\frac{dE_t}{doutput_{y_1}} = \frac{1}{2}(t - out_{y_1})^2 + \frac{1}{2}(t - out_{y_2})^2 \rightarrow 2 * \frac{1}{2}(t - out_{y_1})^{2-1} * -1 + 0$

$(0.01 - 0.751)^{-1} = 0.741$

$\frac{doutput}{dy_1} = \left(\frac{1}{1+e^{-y_1}}\right) = \frac{1}{1+e^{-y}}\left(1 - \frac{1}{1+e^{-y}}\right) = 0.18681$

$\frac{dy_1}{dw_5} = w_5 h_1 + w_6 h_2 + b \longrightarrow h_1 = 0.5968$

$\frac{dE_{total}}{dw_5} = \frac{dE_t}{doutput} * \frac{doutput}{dy_1} * \frac{dy_1}{dw_5} = 0.741 * 0.18681 * 0.5968 = 0.082$

$W_5 = \overset{0.40}{w_5} - (\underset{0.5}{learning\_rate} * 0.082) = 0.358$ new w5 weight after backprop