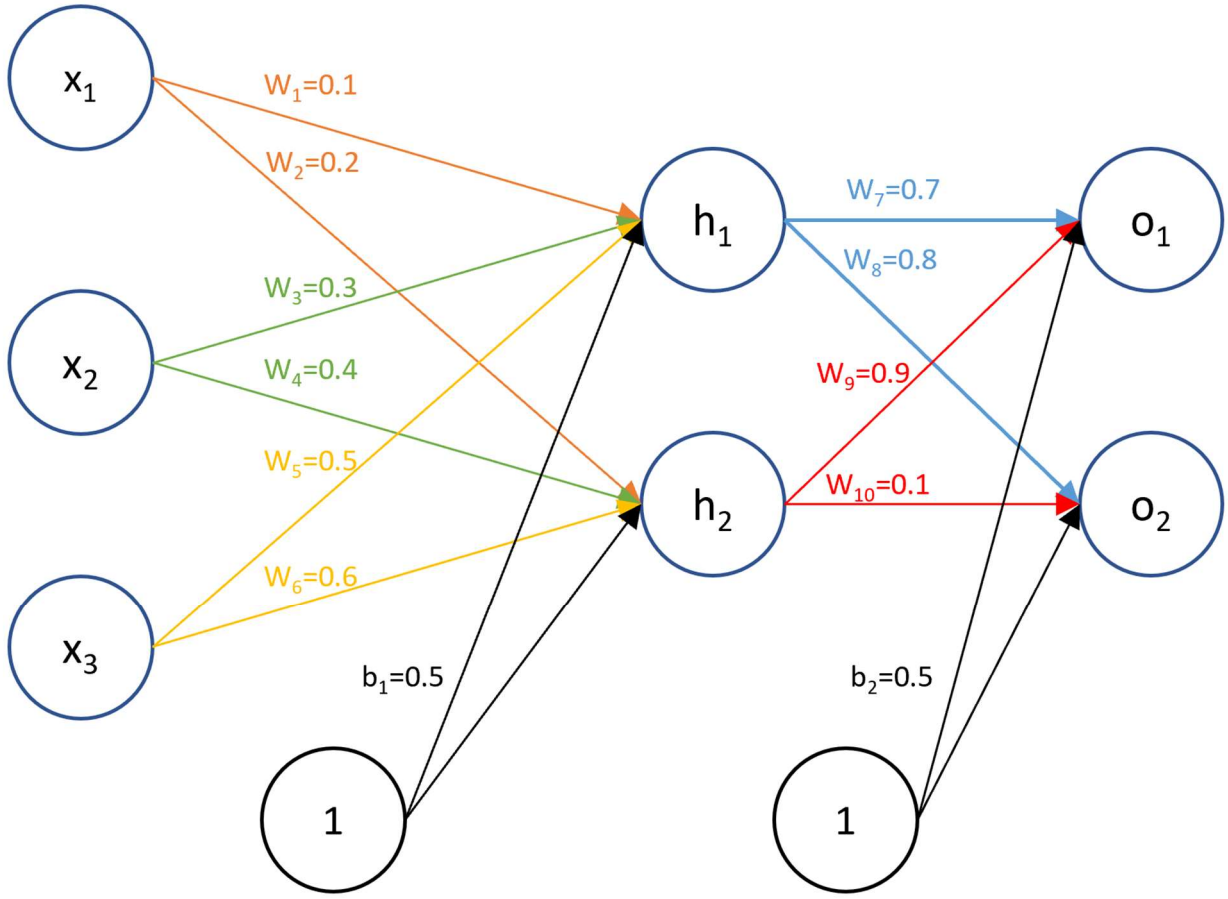
$x_1 = 1, x_2 = 4, x_3 = 5, t_1 = 0.1, t_2 = 0.05$



Входной слой -> скрытый слой:

$$w_1 x_1 + w_3 x_2 + w_5 x_3 + b_1 = z_{h_1}$$

$$w_2 x_2 + w_4 x_2 + w_6 x_3 + b_1 = z_{h_2}$$

$$h_1 = \sigma(z_{h_1})$$

$$h_2 = \sigma(z_{h_2})$$

Скрытый слой –> выходной слой:

$$w_7 h_1 + w_9 h_2 + b_2 = z_{o_1}$$

$$w_8 h_1 + w_{10} h_2 + b_2 = z_{o_2}$$

$$o_1 = \sigma(z_{o_1})$$

$$o_2 = \sigma(z_{o_2})$$

Суммарная ошибка:

$$E = \frac{1}{2}[(o_1 - t_1)^2 + (o_2 - t_2)^2]$$

$$o_1 - t_1 = \frac{dE}{do_1}$$

$$o_2 - t_2 = \frac{dE}{do_2}$$

Производная сигмоиды:

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

$$\frac{d\sigma}{dx} = \frac{e^{-x}}{(1 + e^{-x})^2} = \sigma(x)(1 - \sigma(x))$$

Производные суммы:

$$\frac{dz_{o_1}}{dw_7} = h_1, \frac{dz_{o_2}}{dw_8} = h_1, \frac{dz_{o_1}}{dw_9} = h_2, \frac{dz_{o_2}}{dw_{10}} = h_2, \frac{dz_{o_1}}{db_2} = 1, \frac{dz_{o_2}}{db_2} = 1$$

Для корректировки весов необходимо вычислить:

$$\frac{dE}{dw_7}, \frac{dE}{dw_8}, \frac{dE}{dw_9}, \frac{dE}{dw_{10}}$$

$$\frac{dE}{dw_7} = \frac{dE}{do_1}\frac{do_1}{dz_{o_1}}\frac{dz_{o_1}}{dw_7} = (o_1 - t_1)(o_1(1 - o_1))h_1$$

$$\frac{dE}{dw_7} = (0.8896 - 0.1)\big(0.8896(1 - 0.8896)\big)(0.9866) = 0.0765$$

$$\frac{dE}{dw_8} = 0.1183, \frac{dE}{dw_9} = 0.0772, \frac{dE}{dw_{10}} = 0.1193$$

$$\frac{dE}{db_2} = \frac{dE}{do_1}\frac{do_1}{dz_{o_1}}\frac{dz_{o_1}}{db_2} + \frac{dE}{do_2}\frac{do_2}{dz_{o_2}}\frac{dz_{o_2}}{db_2}$$

$$\frac{dE}{db_2} = (0.7896)(0.0983)(1) + (0.7504)(0.1598)(1) = 0.1975$$

Далее вычисляем:

$$\frac{dE}{dw_1}, \frac{dE}{dw_2}, \frac{dE}{dw_3}, \frac{dE}{dw_4}, \frac{dE}{dw_5}, \frac{dE}{dw_6}, \frac{dE}{db_1}$$

$$\frac{dE}{dw_1} = \frac{dE}{dh_1}\frac{dh_1}{dz_{h_1}}\frac{dz_{h_1}}{dw_1}$$

$$\frac{dE}{dh_1} = \frac{dE}{do_1}\frac{do_1}{dz_{o_1}}\frac{dz_{o_1}}{dh_1} + \frac{dE}{do_2}\frac{do_2}{dz_{o_2}}\frac{dz_{o_2}}{dh_1}$$

$$\frac{dE}{dh_1} = (0.7896)(0.0983)(0.7) + (0.7504)(0.1598)(0.8) = 0.1502$$

$$\frac{dE}{dw_1} = (0.1502)(0.0132)(1) = 0.0020$$

$$\frac{dE}{dw_3} = 0.0079, \frac{dE}{dw_5} = 0.0099$$

$$\frac{dE}{dh_2} = \frac{dE}{do_1}\frac{do_1}{dz_{o_1}}\frac{dz_{o_1}}{dh_2} + \frac{dE}{do_2}\frac{do_2}{dz_{o_2}}\frac{dz_{o_2}}{dh_2} =$$

$$= (0.7896)(0.0983)(0.9) + (0.7504)(0.1598)(0.1) = 0.0818$$

$$\frac{dE}{dw_2} = 0.0004, \frac{dE}{dw_4} = 0.0016, \frac{dE}{dw_6} = 0.0020$$

$$\frac{dE}{db_1} = \frac{dE}{do_1}\frac{do_1}{dz_{o_1}}\frac{dz_{o_1}}{dh_1}\frac{dh_1}{dz_{h_1}}\frac{dz_{h_1}}{db_1} + \frac{dE}{do_2}\frac{do_2}{dz_{o_2}}\frac{dz_{o_2}}{dh_2}\frac{dh_2}{dz_{h_2}}\frac{dz_{h_2}}{db_1} =$$

$$= (0.7896)(0.0983)(0.7)(0.0132)(1) + (0.7504)(0.1598)(0.1)(0.0049)(1) =$$
$$= 0.0008$$

Скорость обучения $\alpha = 0.001$

$$w_1 \coloneqq w_1 - \alpha\frac{dE}{dw_1} = 0.1 - (0.01)(0.0020) = 0.1$$