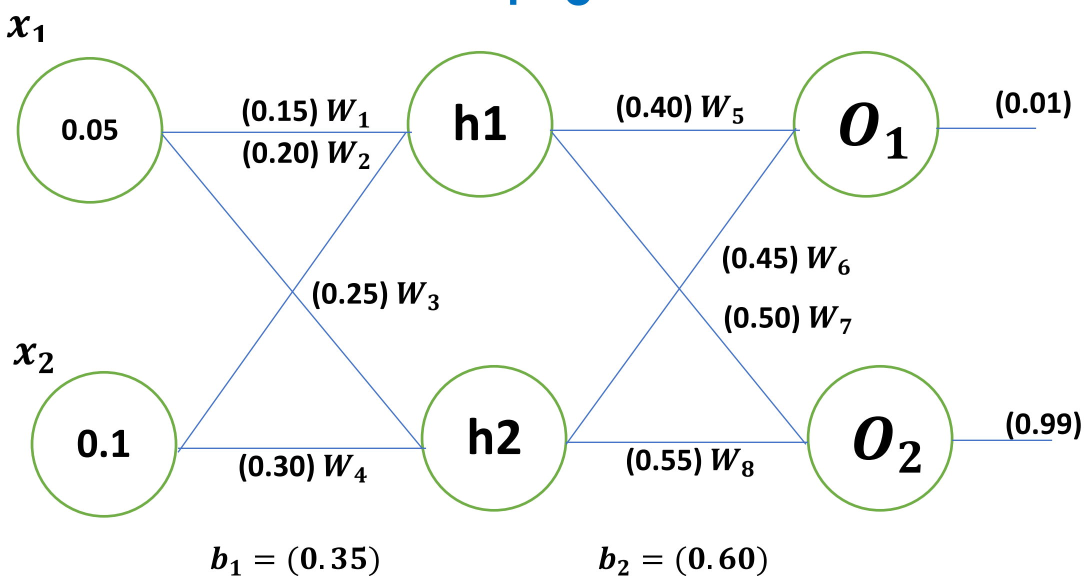
Back Propagation of Error



$For\ h_1$

$$h_1\,(in) = W_1\,x_1 + w_1\,x_2 + b_1$$
$$h_1\,(in) = (0.15 * 0.05 + 0.2 * 0.1 + 0.35)$$
$$h_1\,(in) = 0.377$$

$$h_1\,(out) = \frac{1}{1+e^{-h\,(in)}} \quad \therefore Activation\ Function\text{:}\ Sigmoid$$
$$h_1\,(out) = 0.5932$$

$Same\ relevant\ process\ for\ h_2\,(out) = 0.5968$

$For\ O_1$

$$O_1\,(in) = W_5\,h_1(out) + W_6\,h_2(out) + b_2$$
$$O_1\,(in) = (0.40 * 0.5935 + 0.45 * 0.5968 + 0.6)$$
$$O_1\,(in) = 1.105$$

$$O_1\,(out) = \frac{1}{1+e^{-O\,(in)}} \quad \therefore Activation\ Function\text{:}\ Sigmoid$$
$$O_1\,(out) = 0.7513$$

$Same\ relevant\ process\ for\ O_2\,(out) = 0.07729$

$$E_{O_1} = 0.274 \qquad E_{O_2} = 0.0235$$

$$E_{Total} = E_1 + E_2 = 0.2983$$

(Chain's Rule)

$$\frac{\partial E_{Total}}{\partial W_5} = \frac{\partial E_{Total}}{\partial Out_{01}} * \frac{\partial Out_{01}}{\partial Net_{01}} * \frac{\partial Net_{01}}{\partial W_5}$$

Now,

$$\frac{\partial E_{Total}}{\partial Out_{01}} = Out_{01} - Target_{01}$$

$$\frac{\partial E_{Total}}{\partial Out_{01}} = 0.751365 - 0.01$$

$$\frac{\partial E_{Total}}{\partial Out_{01}} = 0.741365$$

Then,

$$\frac{\partial Out_{01}}{\partial Net_{01}} = Out_{01}(1 - Out_{01})$$

$$\frac{\partial Out_{01}}{\partial Net_{01}} = 0.751365(1 - 0.751365)$$

$$\frac{\partial Out_{01}}{\partial Net_{01}} = 0.186815602$$

$$\frac{\partial Net_{01}}{\partial W_5} = Out_{h1} = 0.593269992$$

$$\frac{\partial E_{Total}}{\partial W_5} = 0.08216704$$

So, finally we got W5

$$W_5^* = W_5 - \frac{\partial E_{Total}}{\partial W_5}$$

$$W_5^* = 0.350699776$$

[Same process happens for entire layers]