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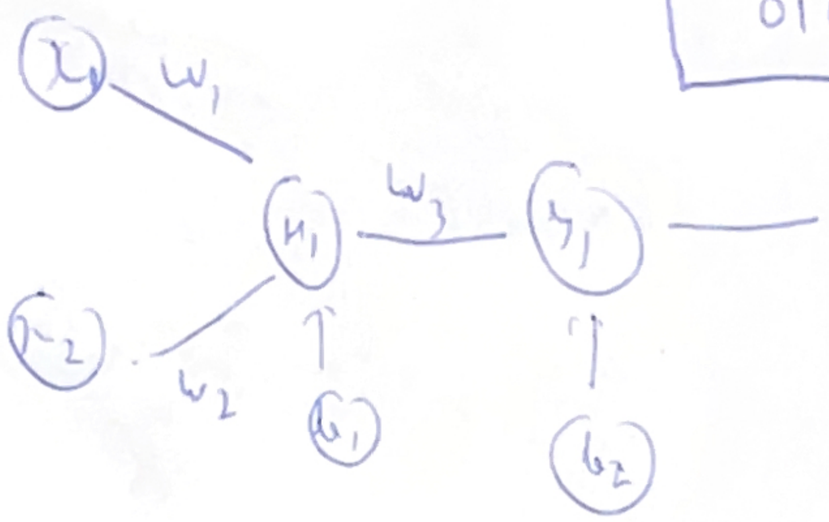

to calculate hidden layer:

$$h_1 = x_1 w_1 + x_2 w_2 + b_1$$

Activation function: Sigmoid: $\frac{1}{1+e^{-x}}$

$x_1 : 0.05 \quad b_1 : 0.40$

$x_2 : 0.10 \quad b_2 : 0.60$

Target $T_1 : 0.99$

Initial weights: $w_1 : 0.10, w_2 : 0.20, w_3 : 30$

Forward pass:

$h_1 : x_1 w_1 + x_2 w_2 + b_1$

$: 0.05 \times 0.10 + 0.10 \times 0.20 + 0.40$

$= 0.425$

Out $h_1 : \frac{1}{1+e^{-h_1}} = \frac{1}{1+e^{-0.425}} = 0.604$

$y_1 :$ Out $h_1 * w_3 + b_2 : 0.604 \times 0.30 + 0.60$

$y_1 : 0.781$

Out $y_1 : \frac{1}{1+e^{-y_1}} = \frac{1}{1+e^{-0.781}} = 0.685$

Calculating the total error

E total: $\frac{1}{2}(T - \text{Out } h_1)^2 = \frac{1}{2}(0.99 - 0.68)^2 = 0.048$

Backward Pass :

Error at w_3 : $\frac{\partial E_{total}}{\partial w_3} = -0.51 \times 0.217 \times 0.604$

$= 0.040$

$\frac{\partial E_{total}}{\partial w_3} = \frac{\partial E_{total}}{\partial out_{y_1}} \times \frac{\partial out_{y_1}}{\partial y_1} \times \frac{\partial y_1}{\partial w_3}$

$\frac{\partial E_{total}}{\partial out_{y_1}} = 2 \times \frac{1}{2} (T - out_{y_1}) \times -1$

$= -0.31$

$\frac{\partial out_{y_1}}{\partial y_1} = out_{y_1}(1 - out_{y_1}) * 1 = 0.217$

$\frac{\partial y_1}{\partial w_3} = out_{H_1} = 0.604$

Updating w_3.

$w_3 = w_3 - \{ \frac{\partial E_{total}}{\partial w_3} = 0.30 - 0.5(-0.040)$

$= 0.32$

Let, calculate error at w_2 & w_1 and update:

$\frac{\partial E_{total}}{\partial w_1} = \frac{\partial E_{total}}{\partial out_{H_1}} \times \frac{\partial out_{H_1}}{\partial H_1} \times \frac{\partial H_1}{\partial w_1}$

$\frac{\partial E_{total}}{\partial out_{H_1}} = \frac{\partial E_1}{\partial out_{y_1}} \times \frac{\partial out_{y_1}}{\partial y_1} \times \frac{\partial y_1}{\partial out_{H_1}}$

$= 0.31 + 0.217 \times 0.32$

$= -0.02$

$\frac{\partial out_{H_1}}{\partial H_1} = out_{H_1}(1 - out_{H_1}) = 0.24$

$\frac{\partial H_1}{\partial w_1} = H_1 = 0.05$

$$\frac{\partial E_{total}}{\partial w_1} = -0.02 \times 0.24 \times 0.01$$

$$= -0.00024$$

Updating $w_1 = w_1 - \eta \frac{\partial E_{total}}{\partial w_1}$ =

$$= 0.10 - 0.5(-0.0012)$$

$$w_1 = 0.1001$$

$$\frac{\partial E_{total}}{\partial w_2} = \frac{\partial E_{total}}{\partial out_{h_1}} + \frac{\partial out_{h_1}}{\partial h_1} + \frac{\partial h_1}{\partial w_2}$$

$$\frac{\partial E_{total}}{\partial out_{h_1}} = -0.02$$

$$\frac{\partial out_{h_1}}{\partial h_1} = 0.24$$

$$\frac{\partial h_1}{\partial w_2} = x_2 = 0.10$$

$$\frac{\partial E_{total}}{\partial w_2} = -0.02 \times 0.24 \times 0.10$$

$$= -0.00048$$

Updated weights = $w_1 = 0.10012$

$w_2 = -0.00048$

$w_3 = -0.00024$