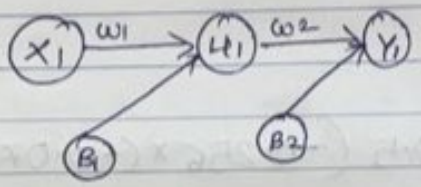
Network




Assumption

$X_1 = 1$ $\quad w_1 = 0.2$

$B_1 = 0.5$ $\quad w_2 = 0.4$

$B_2 = 0.8$ $\quad$ Actual output = 1

$\eta = 0.5$ $\quad$ Activation function = $\frac{1}{1+e^{-x}}$

forward pass

$H_1 = x_1 w_1 + B_1$

$= 0.2 + 0.5$

$= 0.7$

$H_1 out = \frac{1}{1+e^{-0.7}} = 0.6681$

$Y_1 = H_1 w_2 + B_2$

$= 0.6681 (0.4) + 0.8$

$= 1.06724$

$Out_{Y_1} = \frac{1}{1+e^{-1.06724}} = 0.744$

$Total error = \frac{1}{2} (Actual output - Out_{y_1})^2$

$= \frac{1}{2} (1 - 0.744)^2$

$= 0.03276$

Backward pass (updating weights)

$w_{2up} = w_2 - \eta \left( \frac{\partial total error}{\partial w_2} \right)$

$\frac{\partial total error}{\partial w_2} = \frac{\partial total error}{\partial out_{y_1}} \cdot \frac{\partial out_{y_1}}{\partial y} \cdot \frac{\partial y}{\partial w^2}$

$\frac{\partial total error}{\partial w_2} = -(1 - 0.744)$

$= -0.256$ — ①

$\frac{\partial out_{y_1}}{\partial y_1} = y(1 - y_1) = 1.067 (1 - 01.067)$

$= -0.0717$ — ②

$$\frac{\partial y}{\partial w_2} = 0.6881$$

$w_2$ update $= 0.4 - 0.5\left(-0.256 \times (-0.0717) \times 0.668\right)$

$= 0.3938$

$w_2$ update weight is $0.3938$

$w_1$ update $= w_1 - \eta\left(\frac{\partial \text{totalerror}}{\partial w_1}\right)$

$$= \frac{\partial \text{totalerror}}{\partial w_1} = \frac{\partial \text{totalerror}}{\partial \text{out}_{H_1}} \cdot \frac{\partial \text{out}_{H_1}}{\partial H_1} \cdot \frac{\partial H_1}{\partial w_1}$$

$$\frac{\partial \text{totalerror}}{\partial \text{out}_{H_1}} = \frac{\partial \text{totalerror}}{\partial \text{out}_{y_1}} \cdot \frac{\partial \text{out}_{y_1}}{\partial \text{out}_{H_1}} \cdot \frac{\partial y}{\partial \text{out}_{H_1}}$$

$= -0.0256 \times 0.6681$

$= -0.0171$

$$\frac{\partial \text{out}_{H_1}}{\partial H_1} = -(1 - 0.6681)$$

$= -0.3319$

$$\frac{\partial H_1}{\partial w_1} = 0.2$$

$w_1$ update $= (0.2) - 0.5\left((-0.0171) \times (-0.3319) \times 0.2\right)$

$= 0.1994$

$w_1$ update weight is 0.1994

$w_1 = 0.2$ $\quad w_1 up = 0.1994$

$w_2 = 0.4$ $\quad w_2 up = 0.3938$