

19101020

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Given,

$$x = [1, 0] \quad y = [0, 1]$$

$$\theta_3 = \theta_4 = \theta_5 = \theta_7 = 0.2$$

$$\alpha = 0.1$$

weight.

$$w_{13} = 0.3$$

$$w_{25} = 0.2$$

$$w_{14} = 0.5$$

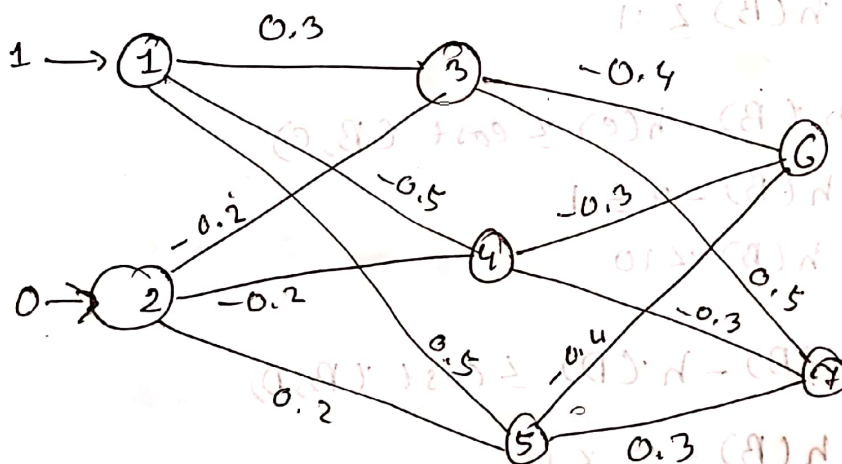
$$w_{46} = w_{47} = -0.3$$

$$w_{15} = w_{37} = 0.5$$

$$w_{57} = 0.1$$

$$w_{23} = w_{24} = -0.2$$

$$w_{36} = w_{56} = 0.4$$



Hidden neuron $\rightarrow 3, 4, 5$

Output layer neuron $\rightarrow 6, 7$

① Predicted Output of the hidden layers

$$y_3^{(1)} = \text{sigmoid}(x_1 w_{13} + x_2 w_{23} - \theta_3)$$

$$= \text{sigmoid}((1 \times 0.3) + (0 \times -0.2) - 0.2)$$

$$= \text{sigmoid}(0.1)$$

$$= 0.52 \left[\frac{1}{1 + e^{-0.1}} \right]$$

$$y_4^{(1)} = \text{sigmoid}(x_1 w_{14} + x_2 w_{24} - \theta_4)$$

$$= \text{sigmoid}((1 \times 0.5) + (0 \times -0.2) - 0.2)$$

$$= \text{sigmoid}(-0.7)$$

$$= 0.33 \quad \left[\frac{1}{1 + e^{0.7}} \right]$$

$$y_5^{(1)} = \text{sigmoid}(x_1 w_{15} + x_2 w_{25} - \theta_5)$$

$$= \text{sigmoid}((1 \times 0.5) + (0 \times 0.2) - 0.2)$$

$$= \text{sigmoid}(0.3)$$

$$= 0.57$$

after iteration, output of the hidden layer,

$$y_3 = 0.52$$

$$y_4 = 0.33$$

$$y_5 = 0.57$$

(ii) predict output of output layer:

$$y_6^{(1)} = \text{sigmoid}(y_3 w_{36} + y_4 w_{46} + y_5 w_{56} - \theta_6)$$

$$= \text{sigmoid}((0.52 \times -0.4) + (0.33 \times 0.3) + (0.57 \times 0.4) - 0.2)$$

$$= \text{sigmoid}(-0.735)$$

$$= 0.324$$

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$$\begin{aligned}
 y_{(7)}^1 &= \text{sigmoid} (y_3 w_{37} + y_4 w_{47} + y_5 w_{57} - \theta_7) \\
 &= \text{sigmoid} ((0.52 \times 0.5) + (0.33 \times -0.3) + (0.57 \times 0.1) - 0.2) \\
 &= \text{sigmoid} (0.018) \\
 &= 0.504
 \end{aligned}$$

output of the hidden layer

$$y_3 = 0.25$$

$$y_4 = 0.33$$

$$y_5 = 0.25$$

output of the output layer

$$\begin{aligned}
 y_{(7)}^2 &= \text{sigmoid} (y_3 w_{37} + y_4 w_{47} + y_5 w_{57} - \theta_7) \\
 &= \text{sigmoid} ((0.25 \times 0.5) + (0.33 \times -0.3) + (0.25 \times 0.1) - 0.2) \\
 &= \text{sigmoid} (-0.435) \\
 &= 0.39
 \end{aligned}$$