University of Asia Pacific

Department of CSE

Name: Rashik Rahman

Reg ID: 17201012

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Answer to the Q. No. 1

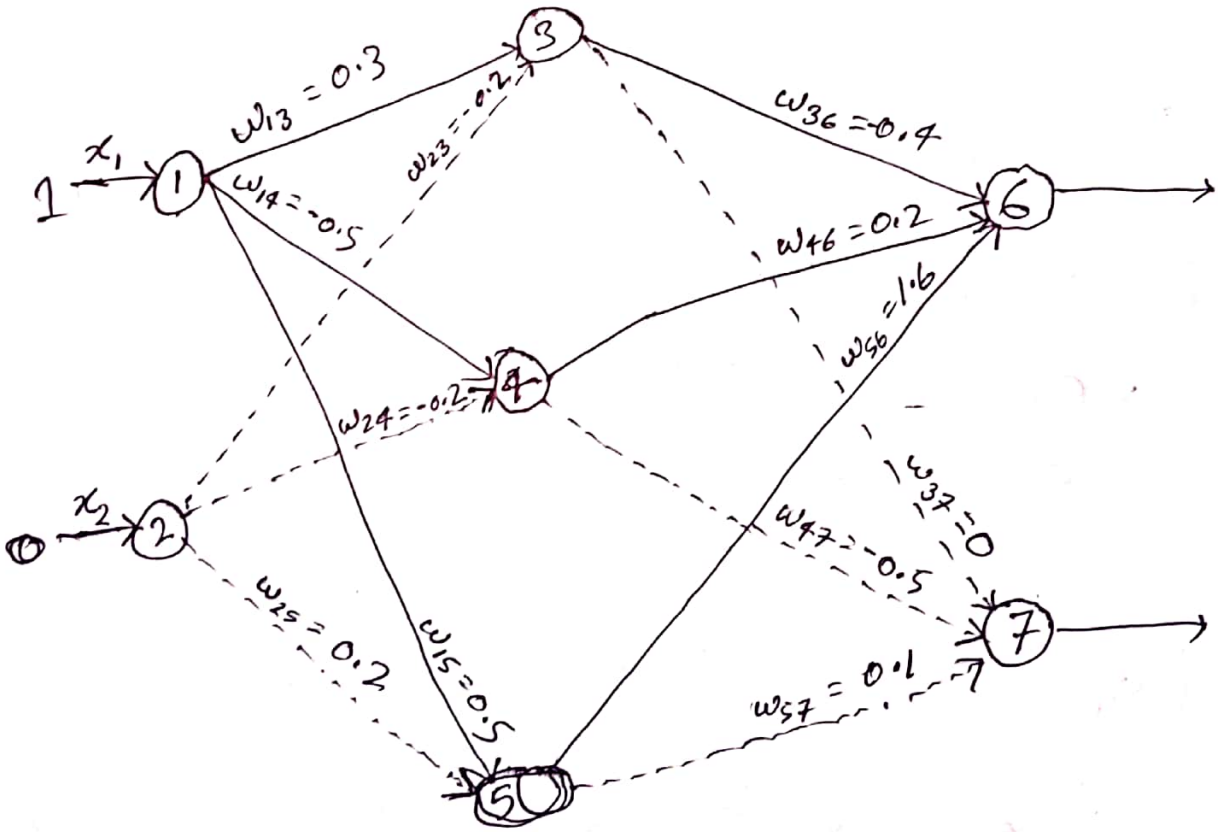
$w_{13} = 0.3$, $w_{14} = (12 \times .3) - 0.5 = -0.5$, $w_{15} = 0.5$

$w_{23} = (12 \times .2) - 0.2 = -0.2$, $w_{24} = (12 \times .4) - 0.2 = -0.2$, $w_{25} = 0.2$

$w_{36} = -0.4$, $w_{37} = -0.5 + 0.5 = 0$, $w_{46} = 0.5 - 0.3 = 0.2$,

$w_{47} = -0.2 - 0.3 = -0.5$, $w_{56} = (12 \times .5 - 0.4) = 1.6$

$w_{57} = 0.1$



Given,

$O_6 = O_7 = O_3 = O_4 = O_5 = 0.2$

learning rate, $\alpha = 0.1$

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(i) Outputs of hidden layer:

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

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

$= \text{sigmoid}(0.3 - 0.2) = \text{sigmoid}(0.1)$

$= \frac{1}{1+e^{-0.1}} = 0.53$

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

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

$= \text{sigmoid}(-0.5 - 0.2)$

$= \text{sigmoid}(-0.7) = \frac{1}{1+e^{0.7}} = 0.33$

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

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

$= \text{sigmoid}(0.3) = \frac{1}{1+e^{-0.3}} = 0.574$

(ii) Outputs of the output layer:

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

$= \text{sigmoid}(0.53 \times 0.4 + 0.33 \times 0.2 + 0.574 \times 1.6 - 0.2)$

$= \text{sigmoid}(0.572) = \frac{1}{1+e^{-0.572}} = 0.64$

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$$y_7 = \overset{\text{sigmoid}}{(}y_3 w_{37} + y_4 w_{47} + y_5 w_{57} - \theta_7)$$

$$= \overset{\text{sigmoid}}{(}0.53 \times 0 + 0.33 \times 0.5 + 0.574 \times 0.1 - 0.2)$$

$$= \text{sigmoid}(0.022)$$

$$= 0.51$$

(iii) Update weights:

→ error calculation

$$e_6 = y_{d6} - y_6 = 0 - 0.64 = -0.64$$

$$e_7 = y_{d7} - y_7 = 1 - 0.51 = 0.49$$

→ calculating error gradient:

$$s_6 = y_6[1 - y_6] \times e_6 = 0.64[1 - 0.64] \times (-0.64)$$

$$= 0.23 \times (-0.64)$$

$$= -0.147$$

$$s_7 = y_7[1 - y_7] \times e_7 = 0.51[1 - 0.51] \times 0.49$$

$$= 0.51 \times 0.49 \times 0.49$$

$$= 0.122$$

→ new weights:

$$\Delta w_{36} = \alpha \times y_3 \times s_6 = 0.1 \times 0.53 \times (-0.147)$$

$$= -0.008$$

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(4)

$$\Delta w_{37} = \alpha \times y_3 \times \delta_7 = 0.1 \times 0.53 \times 0.122$$
$$= 0.006$$

$$\Delta w_{46} = \alpha \times y_4 \times \delta_6 = 0.1 \times 0.33 \times (-0.144)$$
$$= -0.005$$

$$\Delta w_{47} = \alpha \times y_4 \times \delta_7 = 0.1 \times 0.33 \times 0.122 = 0.004$$

$$\Delta w_{56} = \alpha \times y_5 \times \delta_6 = 0.1 \times 0.574 \times (-0.144)$$
$$= -0.008$$

$$\Delta w_{57} = \alpha \times y_5 \times \delta_7 = 0.1 \times 0.574 \times 0.122$$
$$= 0.007$$

∴ Therefore new weights after 1 iteration are,

$$w_{36} = w_{36} + \Delta w_{36} = -0.4 - 0.008 = -0.408$$

$$w_{37} = w_{37} + \Delta w_{37} = 0 + 0.006 = 0.006$$

$$w_{46} = w_{46} + \Delta w_{46} = 0.2 - 0.005 = 0.195$$

$$w_{47} = w_{47} + \Delta w_{47} = -0.5 + 0.004 = -0.496$$

$$w_{56} = w_{56} + \Delta w_{56} = 1.6 - 0.008 = 1.592$$

$$w_{57} = w_{57} + \Delta w_{57} = 0.1 + 0.007 = 0.107$$

Ans.

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