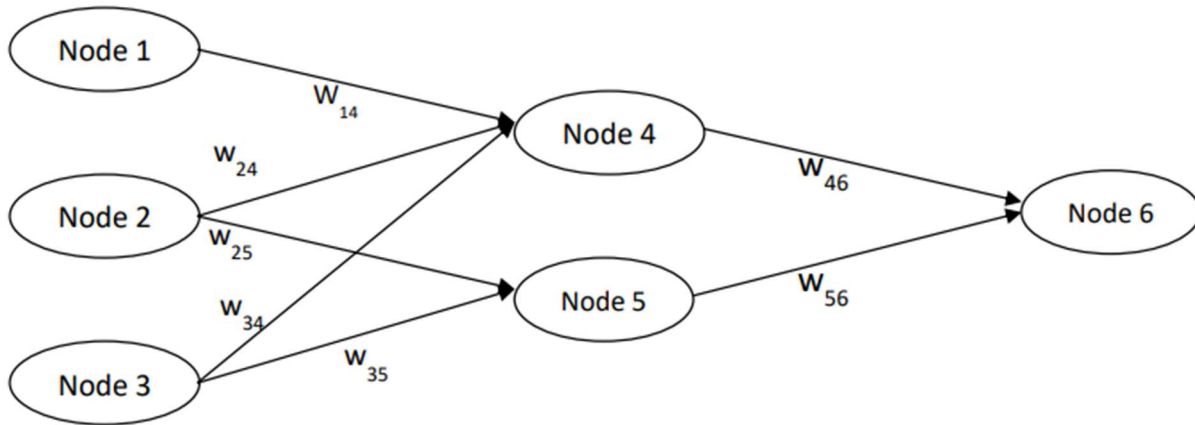


AI Assignment 2

Question 3

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$w_{14}=0.35, w_{24}=0.15, w_{25}=-0.10, w_{34}=-0.20, w_{35}=0.20, w_{46}=0.40, w_{56}=0.25$

Actual Output (T) = 0.8, Learning Rate (r) = 0.8

Input: (0.5, 0.3, 0.9)

Activation function = sigmoid

Input of Node 4	0.04	Error at Node 6	0.0525
Output of Node 4	0.51	Error at Node 4	5.25×10^{-3}
Input of Node 5	0.15	Error at Node 5	3.26×10^{-3}
Output of Node 5	0.54	Updated w_{46}	0.421
Input of Node 6	0.339	Updated w_{56}	0.273
Output of Node 6	0.584	Updated w_{14}	0.3521
		Updated w_{24}	0.1513
		Updated w_{34}	-0.196
		Updated w_{25}	-0.0992
		Updated w_{35}	0.202

Working:

Input of node 4:

$$0.5(w_{14}) + 0.3(w_{24}) + 0.9(w_{34})$$

$$0.5(0.35) + 0.3(0.15) + 0.9(-0.20) = 0.04$$

Output of node 4:

Applying sigmoid function: $\frac{1}{1+e^{-x}}$

$$\frac{1}{1+e^{-0.04}} = 0.51$$

Input of node 5:

$$0.3(w_{25}) + 0.9(w_{35})$$

$$0.3(-0.10) + 0.9(0.20) = 0.15$$

Input of node 6:

$$O_4(w_{46}) + O_5(w_{56})$$

$$0.51(0.40) + 0.54(0.25) = 0.339$$

Error at node 6

$$(T - O_6) O_6 (1 - O_6)$$

$$(0.8 - 0.584) 0.584 (1 - 0.584) = 0.0525$$

Error at node 5

$$\text{Error}_6 \times w_{56} \times O_5 (1 - O_5)$$

$$(0.0525)(0.25)(0.54)(1 - 0.54) = 3.26 \times 10^{-3}$$

Error at node 4

$$\text{Error}_6 \times w_{46} \times O_4 (1 - O_4)$$

$$(0.0525)(0.40)(0.51)(1 - 0.51) = 5.25 \times 10^{-3}$$

Updated w46

$$\Delta w_{46} = r \times \text{Error}_6 \times O_4 = 0.8 \times 0.0525 \times 0.51 = 0.021$$

$$W_{46} = w_{46} (\text{current}) + \Delta w_{46} = 0.40 + 0.021 = 0.421$$

Updated w56

$$\Delta w_{56} = r \times \text{Error}_6 \times O_5 = 0.8 \times 0.0525 \times 0.54 = 0.023$$

$$W_{56} = w_{56} (\text{current}) + \Delta w_{56} = 0.25 + 0.023 = 0.273$$

Output of node 5:

$$\text{Applying sigmoid function: } \frac{1}{1 + e^{-x}}$$

$$\frac{1}{1 + e^{-0.15}} = 0.54$$

Output of node 6:

$$\text{Applying sigmoid function: } \frac{1}{1 + e^{-x}}$$

$$\frac{1}{1 + e^{-0.339}} = 0.584$$

Updated w14

$$\Delta w_{14} = r \times \text{Error}_4 \times O_1 = 0.8 \times 5.25 \times 10^{-3} \times 0.5 = 2.1 \times 10^{-3}$$

$$W_{14} = w_{14} (\text{current}) + \Delta w_{14} = 0.35 + 2.1 \times 10^{-3} = 0.3521$$

Updated w24

$$\Delta w_{24} = r \times \text{Error}_4 \times O_2 = 0.8 \times 5.25 \times 10^{-3} \times 0.3 = 1.26 \times 10^{-3}$$

$$W_{24} = w_{24} (\text{current}) + \Delta w_{24} = 0.15 + 1.26 \times 10^{-3} = 0.1513$$

Updated w34

$$\Delta w_{34} = r \times \text{Error}_4 \times O_3 = 0.8 \times 5.25 \times 10^{-3} \times 0.9 = 3.78 \times 10^{-3}$$

$$W_{34} = w_{34} (\text{current}) + \Delta w_{34} = -0.20 + 3.78 \times 10^{-3} = -0.196$$

Updated w25

$$\Delta w_{25} = r \times \text{Error}_5 \times O_2 = 0.8 \times 3.26 \times 10^{-3} \times 0.3 = 7.824 \times 10^{-4}$$

$$W_{25} = w_{25} (\text{current}) + \Delta w_{25} = -0.10 + 7.824 \times 10^{-4} = -0.0992$$

Updated w35

$$\Delta w_{35} = r \times \text{Error}_5 \times O_3 = 0.8 \times 3.26 \times 10^{-3} \times 0.9 = 2.3472 \times 10^{-3}$$

$$W_{35} = w_{35} \text{ (current)} + \Delta w_{35} = 0.20 + 2.3472 \times 10^{-3} = 0.202$$