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Q:1

On order to find the output of the network it is necessary to calculate weighted sums of hidden nodes 3 and 4

$$v_3 = w_{13}x_1 + w_{23}x_2, \quad v_4 = w_{14}x_1 + w_{24}x_2$$

Then find the output from hidden nodes using activation function φ:

$$y_3 = \varphi(v_3), \quad y_4 = \varphi(v_4)$$

Use the outputs of hidden nodes y_3 and y_4 as the input values to the output layer (nodes 5 and 6), and find weighted sums of output nodes 5 and 6:

$$v_5 = w_{35}y_3 + w_{45}y_4, \quad v_6 = w_{36}y_3 + w_{46}y_4$$

Finally, find the output from nodes 5 and 6 (also using φ)

$$y_5 = \varphi(v_5), \quad y_6 = \varphi(v_6)$$

The output pattern will be (y_5, y_6). Perform these calculation for each input pattern.

P1: input pattern (0,0)

$v_3 = -2.0 + 3.0 = 0$ $\quad y_3 = \varphi(0) = 1$

$v_4 = 4.0 - 1.0 = 0$ $\quad y_4 = \varphi(0) = 1$

$v_5 = 1.1 - 1.1 = 0$ $\quad y_5 = \varphi(0) = 1$

$v_6 = -1.1 + 1.1 = 0$ $\quad y_6 = \varphi(0) = 1$

The output of network is (1,1)

P_2 : input patteon (1,0)

$v_3 = -2.1 + 3.0 = -2$ $\quad y_3 = \varphi(2) = 0$

$v_4 = 4.1 - 1.0 = 4$ $\quad y_4 = \varphi(4) = 1$

$v_5 = 1.0 - 1.1 = -1$ $\quad y_5 = \varphi(-1) = 0$

$v_6 = -1.0 + 1.1 = 1$ $\quad y_6 = \varphi(1) = 1$

The output of network (0,1)

P_3 : Input (0,1)

$v_3 = -2.0 + 3.1 = 3$ $\quad y_3 = 1$

$v_4 = 4.0 - 1.1 = -1$ $\quad y_4 = 0$

$v_5 = 1.1 - 1.0 = 1$ $\quad y_5 = 1$

$v_6 = 1.1 + 1.0 = -1$ $\quad y_6 = 0$

Output of network is (1,0)

P_4 : Input patteon (1,1)

$v_3 = -2.1 + 3.1 = 1$ $\quad y_3 = \varphi(1) = 1$

$v_4 = 4.1 - 1.1 = 3$ $\quad y_4 = \varphi(3) = 1$

$v_5 = 1.1 - 1.1 = 0$ $\quad y_5 = \varphi(0) = 1$

$v_6 = -1.1 + 1.1 = 0$ $\quad y_6 = \varphi(0) = 1$

The output of network is (1,1)