Hebbian Learning

* Based on Hebb's law

Training Algorithm

1) Initialise weights to zero $w_i = 0$ for all i.
2) Weight adjustments are performed.

$$w_i(n) = w_i(o) + \alpha x_i y_o$$

√ Activity Product Rule

Pattern association, categorization & classification

Using Hebb Rule, find weights required to perform the following classification of given i/p pattern. '+' represent +1 & empty squares indicate -1. Consider 'I' belongs to the members of class (target value 1) & 'O' does not belong to the members of class (Target value -1)

+	+	+
	+	
+	+	+

"I"

+	+	+
+		+
+	+	+

"O"

Sol^n 2-

Pattern

$I/p's$

$$x_1 \quad x_2 \quad x_3 \quad x_4 \quad x_5 \quad x_6 \quad x_7 \quad x_8 \quad x_9$$

Target

I

1	1	1	-1	1	-1	1	1	1	1
1	1	1	1	-1	1	1	1	1	-1

Case "I" :

Initial Weights $\quad W_1 = W_2 = W_3 = \cdots = W_9 = 6$

$\alpha = 1$

Update the weights

$W_{1(n)} = W_{1(o)} + x_i y_i$

$W_{1(o)} = 0 + 1 \times 1 \qquad = 1$

$W_2 = 1, \quad W_3 = 1, \quad W_4 = 0-1, \quad W_5 = 1, \quad W_6 = -1$

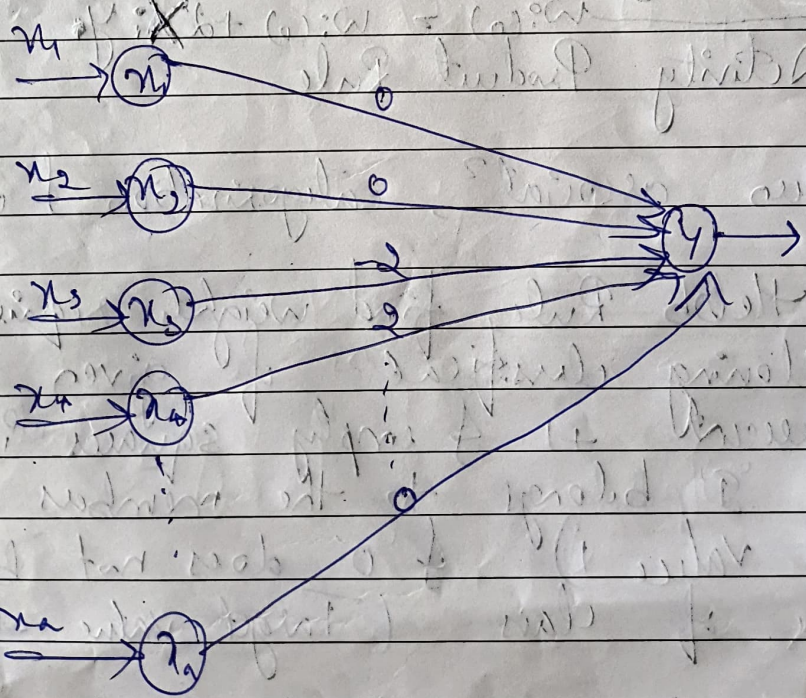$W_7 = 1, \quad W_8 = 1, \quad W_9 = 1$

$$W_{1(n)} = \begin{bmatrix} 1 & -1 & 1 & -1 & 1 & 1 & 1 \end{bmatrix}$$

Case "0" :

$W_{1(n)} = 1 + 1 \times (-1) = 0$

$W_{2(n)} = 0, \quad W_3(n) = 0, \quad W_4 = -2, \quad W_5 = 2$

$W_6 = -2, \quad W_7 = 0, \quad W_8 = 0, \quad W_9 = 0$

$$W_{(n)} = \begin{bmatrix} 0 & 0 & 0 & -2 & 2 & -2 & 0 & 0 & 0 \end{bmatrix}$$

$[1 1 1 -1 1 1 1] \quad y = 2 + 2 + 2 = 6. \quad \text{Step}(6) = 1.$

$y = -2 -2 -2 = -6 \quad \text{Step}(-6) = -1$