Associative Memory Network

Maximum Memory ⇒ $0.15 \times n$ (no. of neurons)

HEEB Rule ⇒

$$W_{ij}(old) = W_{ij}(n) + x_i y_j$$

(x_i: input, y_j: output)

Input vector ⇒ [1, 0, 1, 0]

Output vector ⇒ [1, 0]

$w_{11}^0 = w_{11}^n + x_1 y_1 = 0 + 1 \cdot 1 = 1$ (2 + 0 = 2)

$w_{12}^0 = w_{12}^n + x_1 y_2 = 0 + 0 \cdot 0 = 0$ (1 + 1 · 1 = 2)

$w_{21} = 0 + 0 \cdot 1 = 0$ (0 + 1 · 1 = 1)

$w_{22} = 0 + 0 \cdot 0 = 0$ (0 + 1 · 1 = 1)

$$w_{31} = 0 + 1 \cdot 1 = 1 \quad (1 + 0 \cdot 1 = 1)$$
$$w_{32} = 0 + 3 \cdot 0 = 0 \quad (0 + 1 \cdot 1 = 1)$$
$$w_{41} = 0 + 0 \cdot 1 = 0 \quad (0 + 1 \cdot 1 = 1)$$
$$w_{42} = 0 + 0 \cdot 0 = 0 \quad (0 + 1 \cdot -1 = 1)$$

$$w = \underbrace{\begin{bmatrix} 1 & 0 \\ 0 & 0 \\ 1 & 0 \\ 0 & 0 \end{bmatrix}}_{w_1}, \underbrace{\begin{bmatrix} 2 & 0 \\ 0 & 0 \\ 1 & 0 \\ 1 & 0 \end{bmatrix}}_{w_2}, \underbrace{\begin{bmatrix} 2 & 1 \\ 0 & 1 \\ 1 & 0 \\ 1 & 0 \end{bmatrix}}_{w_3}, \underbrace{\begin{bmatrix} 2 & 1 \\ 0 & 1 \\ 1 & 1 \\ 1 & 1 \end{bmatrix}}_{w_4}$$

Final

* Outer Product →

$$\left[w = \sum_{i=0}^{n} s_i^T(p) \cdot t_i(p) \right]$$

$$\begin{bmatrix} 1 \\ 0 \\ 1 \\ 0 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 0 \\ 1 & 0 \\ 0 & 0 \end{bmatrix}$$