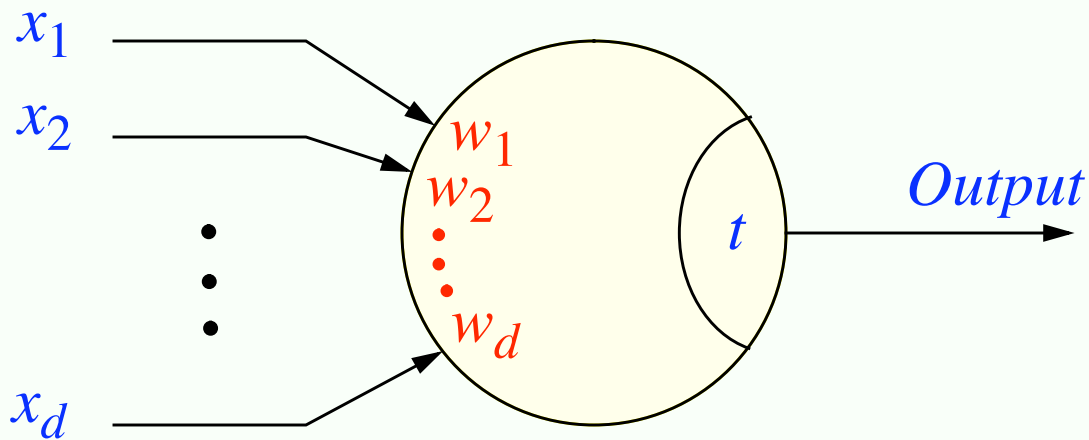


The One-Layer **Two-Class** Linear Neural Network

1. *Perceptron* - Rosenblatt - 1962
2. *McCulloch-Pitts neuron* - 1943
3. *Threshold Logic Unit (TLU)* - Dertouzos - 1965
4. *Linear discriminant function* - Fisher - 1936



$$\text{if } \sum_{k=1}^d w_k x_k + w_{d+1} > 0 \quad \text{output} = 1$$

else output = 0

Minimum-Distance Pattern Classification Perceptron

Each class is represented by a *prototype vector* P_i .

Classify an unknown X into class C_i if:

$d(X, P_i) \leq d(X, P_j)$ for all $j \neq i$, or if:

$g_i(X) \equiv -d(X, P_i) > -d(X, P_j) \equiv g_j(X)$ for all $j \neq i$.

$$g_i(X) = -(X - P_i) \cdot (X - P_i)$$

$$g_i(X) = -(X \cdot X - 2P_i \cdot X + P_i \cdot P_i)$$

$$g_i(X) = P_i \cdot X - (P_i \cdot P_i)/2$$

$$g_i(X) = \sum_{k=1}^d w_{ik} x_k + w_{d+1}$$

where $w_{ik} = p_{ik}$ and $w_{i,d+1} = -(P_i \cdot P_i)/2$.