

PROBLEM SOLVING 4

- Find a threshold logic neural network (with **hard limiter activation function**) that can correctly solve the two-class decision problem as shown in Fig. 1.

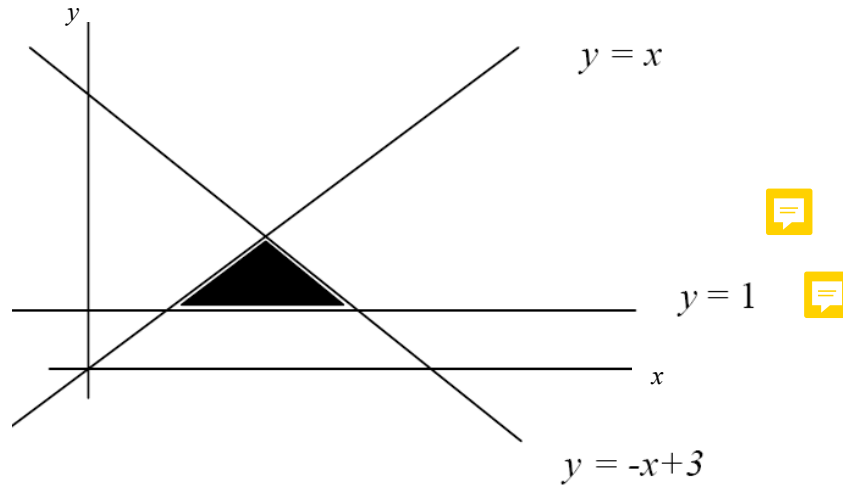


Fig. 1 A two-class decision problem

- Consider the cost functional

$$E = \frac{1}{2} \sum_{j=1}^N (e_j)^2$$

$$e_j = d_j - y(\mathbf{x}_j) = d_j - \sum_{i=0}^M w_i \phi_i(\mathbf{x}_j, \boldsymbol{\mu}_i, \sigma_i)$$

$$\text{where } \phi_i(\cdot) = \exp\left(-\frac{\|\mathbf{x}_j - \boldsymbol{\mu}_i\|^2}{2\sigma_i^2}\right)$$

The problem is to find the value of the free parameter w_i . Derive the partial derivative of $\frac{\partial E}{\partial w_i}$

in $\Delta w_i = -\eta \frac{\partial E}{\partial w_i}$ where η is the learning parameter > 0 .