Artificial Intelligence course (Spring 2024-2025)
Assignment # 3

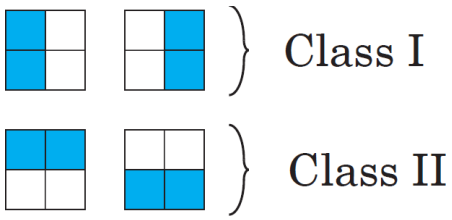
Q1) Design perceptron neural network to classify the following

$$\left\{\mathbf{p}_1 = \begin{bmatrix}2\\2\end{bmatrix}, t_1 = 0\right\}\left\{\mathbf{p}_2 = \begin{bmatrix}1\\-2\end{bmatrix}, t_2 = 1\right\}\left\{\mathbf{p}_3 = \begin{bmatrix}-2\\2\end{bmatrix}, t_3 = 0\right\}\left\{\mathbf{p}_4 = \begin{bmatrix}-1\\1\end{bmatrix}, t_4 = 1\right\}$$

Use the initial weights and bias:

$$\mathbf{W}(0) = \begin{bmatrix}0 & 0\end{bmatrix} \qquad \theta(0) = 0.$$

Q2) Consider the two classes of patterns that are shown in Figure. Class I represents vertical lines and Class II represents horizontal lines.



i. Are these categories linearly separable?
ii. Design a multilayer network to distinguish these categories.

Q3) write two codes to find the best solution to maximize *f* (*x*).
a) One code by GA using 8 bits for each variable within interval [-2, 2].
b) Another code by Evolution strategy using interval [-2, 2] for each variable.

$$f(x) = 100(x_2 - x_1^2)^2 + (1 - x_1)^2$$

Submit: - your final result as screenshot picture
- Python or Matlab codes
- describe your procedures (explain your codes)

Good Luck
Prof. Dr. Mohammed Alhanjouri