Artificial Intelligence course (Spring 2021-2022)
## Assignment # 4

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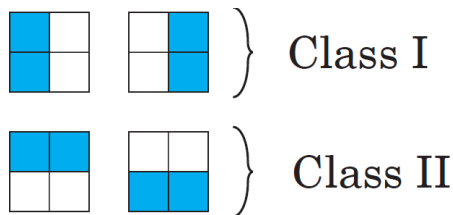
i. Are these categories linearly separable?
ii. Design a multilayer network to distinguish these categories.

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)

All file should be included in one (.rar file) and submitted at Assignment page.

Good Luck
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