

Computer Applications

Attempt All Questions

- 1-a) Discuss, why are artificial neural networks(ANNs) worth studying? What are ANNs used for?
- b) Explain the basic ideas of Adaline and Madaline. Describe Adaline gradient learning.
- c) Explain traditional and NN classifiers. What are NN classifiers for fixed patterns?
- 2-a) Discuss the learning theory for basic set-up, how are the examples picked, and how is the hypothesis tested?
- b) Perform training steps using delta learning rule with the initial weight $w^1 = [1 \ -1 \ 0]^T$, $c = 0.25$, $\lambda = 1$ and its inputs are

$$x_1 = \begin{bmatrix} 4 \\ 0 \\ -2 \end{bmatrix}, d_1 = -1, \quad x_2 = \begin{bmatrix} 2 \\ -4 \\ -2 \end{bmatrix}, d_2 = 1, \quad x_3 = \begin{bmatrix} 4 \\ 4 \\ 6 \end{bmatrix}, d_3 = -1$$

- 3-a) Explain the two types of learning in NNs. How to measure the performance in ANNs?
- b) The Hebbian training of a single neuron with the initial weight $w^1 = [1 \ 0 \ 1]^T$, for $c = 1$, $\lambda = 1$, using 4 inputs:

$$x_1 = \begin{bmatrix} 2 \\ 4 \\ -4 \end{bmatrix}, \quad x_2 = \begin{bmatrix} 2 \\ 0 \\ 2 \end{bmatrix}, \quad x_3 = \begin{bmatrix} 2 \\ 8 \\ 6 \end{bmatrix}, \quad x_4 = \begin{bmatrix} 2 \\ 4 \\ -2 \end{bmatrix}$$

Find final weights using:

- i) bipolar binary $f(\text{net})$. ii) bipolar continuous $f(\text{net})$

- 4-a) Define the concept of Backpropagation(BP), and explain BP algorithm. How to use such algorithm to be better?
- b) Derive an expression for tanh used as an activation function using MOS devices.
- c) Define radial basis function(RBF). What are main features? Discuss that XOR can implement linearly separable form using RBF.
- 5-a) Discuss multilayer perceptron(MLP), and explain why we prefer to use sigmoid function. How setup MLP?
- b) Explain: - Net talk Model of Reading - Time Series Prediction.
- c) Explain structure diagram for neuron and activation function implementation using FPGA technology. Why use FPGA to implement ANNs?