B.E.(with Credits)-Regular-Semester 2012-Computer Technology Sem VII

CT-Elective-II : Neural Network & Fuzzy Logic

P. Pages : 2 **GUG/W/16/6553**

Time : Three Hours * 4 7 1 2 * Max. Marks : 80

Notes : 1. Assume suitable data wherever necessary.
2. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Explain in brief, the operation of biological neuron with a neat sketch. **8**

b) Explain McCulloch - Pitts neuron model and also explain construction of memory cell using this model. **8**

OR

2. a) Explain Delta Learning Rule with mathematical analysis. **8**

b) Implement the perceptron rule training of the network using f(net) = sgn(net), c = 1 and the following data specifying the initial weight w' and the two training pairs. Repeat the training sequence $(x_1, d_1), (x_2, d_2)$ until two correct responses in a row are achieved. **8**

$$w' = \begin{bmatrix} 1 \\ -1 \\ 0 \\ 0.5 \end{bmatrix} \quad x_1 = \begin{bmatrix} 1 \\ -2 \\ 0 \\ -1 \end{bmatrix} \quad d_1 = -1 \quad x_2 = \begin{bmatrix} 0 \\ 1.5 \\ -0.5 \\ -1 \end{bmatrix} \quad d_2 = -1$$

3. a) Explain how the computation of minimum distance classifier is done with the help of mathematical equations. **8**

b) Compute the solution weight vector for the prototype points. **8**

$$x_1 = \begin{bmatrix} 2 \\ 5 \end{bmatrix} \quad x_2 = \begin{bmatrix} -1 \\ -3 \end{bmatrix}$$

Design the linear machine classifier and draw the decision the decision surfaces for the respective prototype pointer.

OR

4. a) Explain R-category discrete perceptron training algorithm. **8**

b) Implement the single discrete perceptron training algorithm for c = 1 for the discrete perceptron dichotomizer, which provides the following classification of six patterns. **8**

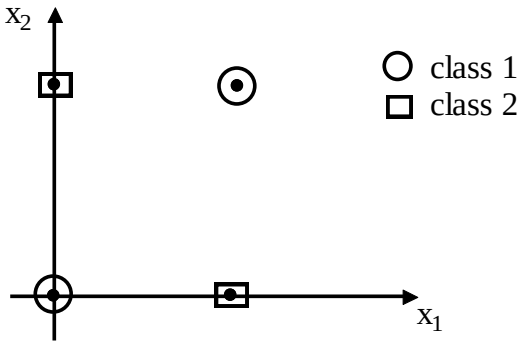
$$x_1 = \begin{bmatrix} 0.8 \\ 0.5 \\ 0 \end{bmatrix} \quad x_3 = \begin{bmatrix} 0.9 \\ 0.7 \\ 0.3 \end{bmatrix} \quad x_5 = \begin{bmatrix} 1 \\ 0.8 \\ 0.5 \end{bmatrix} \quad d_1 = d_3 = d_5 = 1 : \text{class } 1$$

$$x_2 = \begin{bmatrix} 0 \\ -2 \\ 0.3 \end{bmatrix} \quad x_4 = \begin{bmatrix} 0.2 \\ 0.1 \\ 0.3 \end{bmatrix} \quad x_6 = \begin{bmatrix} 0.2 \\ 0.7 \\ 0.8 \end{bmatrix} \quad d_2 = d_4 = d_6 = -1 : \text{class } 2$$

Perform the training task starting from initial weight vector w = 0 and obtain the solution weight vector.

5. a) Write and explain multicategory continuous perceptron training algorithm. **8**

b) Design the neural network for classification of pattern shown in figure. **8**



OR

6. a) What is meant by linearly non-seperable patterns ? Explain how multilayered network is used for classification of lineraly non-separable patterns. **8**

b) Explain functional link networks. **8**

7. a) Show that excluded middle laws does not hold for fuzzy set. **6**

b) Consider two fuzzy sets : **10**

$\tilde{A} = \{(x_1, 0.5), (x_2, 0.7), (x_3, 0.1)\}$

$\tilde{B} = \{(x_1, 0.8), (x_2, 0.2), (x_3, 1)\}$

Compute :

i) $\tilde{A} \cup \tilde{B}$ ii) $\tilde{A} \cap \tilde{B}$

iii) $\overline{\tilde{A}}$ OR $\tilde{A}^C$ iv) $\tilde{A} \cdot \tilde{B}$ v) $\tilde{A} - \tilde{B}$

OR

8. a) What is α-cuts and strong α-cuts ? Find all α-cuts and strong α-cuts for the fuzzy set $\tilde{A}$. **8**

$$\tilde{A} = \left\{ \frac{0.5}{x_1} + \frac{0.4}{x_2} + \frac{0.7}{x_3} + \frac{0.8}{x_4} + \frac{1}{x_5} \right\}$$

b) State different defuzzification strategies and explain in brief. **8**

9. a) Explain t-norm and t-conorm. **8**

b) Draw three overlapping fuzzy sets for the linguistic variables : **8**

i) age (of a person) with term set {young, middle, old}, on the universe of discourse in the interval [10, 100].

ii) temperature of Chandrapur city throughout the year with term set {low, medium, high}

OR

10. a) Consider two fuzzy sets A and B whose membership functions are given by : **10**

$$A(x) = \begin{cases} (x+2)/2 & \text{for} \quad -2 < x \le 0 \\ (2-x)/2 & \text{for} \quad 0 < x \le 2 \\ 0 & \text{otherwise} \end{cases} \qquad B(x) = \begin{cases} (x-2)/2 & \text{for} \quad 2 < x \le 4 \\ (6-x)/2 & \text{for} \quad 4 < x \le 6 \\ 0 & \text{otherwise} \end{cases}$$

Calculate the fuzzy numbers :

i) A + B ii) A - B iii) B - A

b) Write short notes on : **6**

i) Fuzzy equations. ii) Lattice of fuzzy number.

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