

CBCS SCHEME

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15EE661

Sixth Semester B.E. Degree Examination, June/July 2018 Artificial Neural Networks and Fuzzy Logic

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. List the characteristics of neural networks. (05 Marks)
- b. What is XOR problem? Explain how it can be solved using MADALINE network. (06 Marks)
- c. Explain fixed increment perceptron learning algorithm for a classification problem with n input features (x_1, x_2, \dots, x_n) and two output classes (0/1). (05 Marks)

OR

- 2 a. Explain gradient descent algorithm used in back propagation network. (08 Marks)
- b. Use back propagation algorithm for the network shown below in Fig.Q.2(b), to update the weights to minimize the error. Take $\alpha = 0$ and $\eta = 0.6$. (08 Marks)

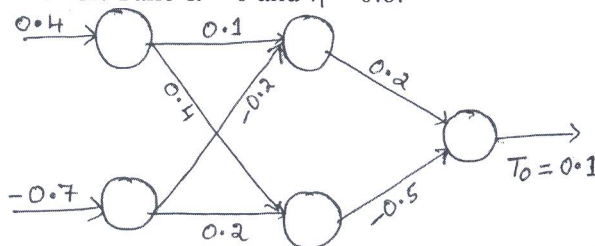


Fig.Q.2(b)

Module-2

- 3 a. Discuss the effects of tuning parameters of the back propagation neural network. (08 Marks)
- b. Discuss the following variations of standard back propagation algorithm:
 - i) Decremental Iteration Procedure
 - ii) Augmented BP networks. (08 Marks)

OR

- 4 a. Explain the steps to store the following patterns in an autocorrelator:
 - $A_1 = (-1, 1, -1, 1)$
 - $A_2 = (1, 1, 1, -1)$
 - $A_3 = (-1, -1, -1, 1)$
 Also explain how to retrieve A_2 from it, what would be retrieval when noisy vector $A' = (1, 1, 1, 1)$ is presented to auto correlator? (08 Marks)
- b. What are the advantages of eBAM? Also explain how to retrieve Y_2 corresponding to X_2 in eBAM.
 - $X_1 = (-1, -1, -1, -1, -1, 1, -1, -1, 1, 1, 1, -1, 1, 1, 1, 1), Y_1 = (1, -1, -1)$
 - $X_2 = (-1, -1, -1, -1, -1, 1, 1, -1, -1, 1, 1, -1, 1, 1, 1, 1), Y_2 = (-1, 1, -1)$
 - $X_3 = (-1, -1, -1, -1, -1, -1, 1, -1, -1, 1, 1, 1, 1, 1, 1, 1), Y_3 = (-1, -1, 1).$ (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. What is meant by stability-plasticity dilemma in ART network? (02 Marks)
 b. Explain the simplified ART architecture. (08 Marks)
 c. What are the applications of ART? (06 Marks)

OR

- 6 a. What is 2/3 rule in ART? (02 Marks)
 b. Explain ART1 algorithm. (08 Marks)
 c. What are the advantages of ART over competing patterns recognition techniques? (06 Marks)

Module-4

- 7 a. Define partition and covering. Using this definition prove the following:
 i) $\{A_1, A_2, A_3\}$ is a partition on A given $A = \{a, b, c, d, e\}$, $A_1 = \{a, b\}$, $A_2 = \{c, d\}$ and $A_3 = \{e\}$.
 ii) $\{A_1, A_2, A_3\}$ is a covering on A given $A = \{a, b, c, d, e\}$, $A_1 = \{a, b\}$, $A_2 = \{b, c, d\}$ and $A_3 = \{d, e\}$. (06 Marks)
 b. Define the following Fuzzy set operations: i) Union ii) Intersection iii) Complement iv) Equality. Using the above operations compute the following:
 $\tilde{A} \cup \tilde{B}$ if $\tilde{A} = \{(x_1, 0.5), (x_2, 0.7), (x_3, 0)\}$ and $\tilde{B} = \{(x_1, 0.8), (x_2, 0.2), (x_3, 1)\}$
 $\tilde{A} \cap \tilde{B}$ if $\tilde{A} = \{(x_1, 0.5), (x_2, 0.7), (x_3, 0)\}$ and $\tilde{B} = \{(x_1, 0.8), (x_2, 0.2), (x_3, 1)\}$
 \tilde{A}^c if $\tilde{A} = \{(x_1, 0.5), (x_2, 0.7), (x_3, 0)\}$. (10 Marks)

OR

- 8 a. Define Crisp max-min composition operations on relation. Using the above definition compute max-min composition RoS where R and S defined on sets $\{1, 3, 5\} \times \{1, 3, 5\}$ as $R : \{(x, y) | y = x + 2, s : \{(x, y) | x < y\}$. (10 Marks)
 b. Compute fuzzy max-min composition RoS for the following \tilde{R} fuzzy relation

$$\begin{array}{c} y_1 \quad y_2 \\ x_1 \begin{bmatrix} 0.5 & 0.1 \\ 0.2 & 0.9 \\ 0.8 & 0.6 \end{bmatrix} \text{ and } \tilde{S} \text{ fuzzy relation } \begin{array}{c} z_1 \quad z_2 \quad z_3 \\ y_1 \begin{bmatrix} 0.6 & 0.4 & 0.5 \\ 0.5 & 0.8 & 0.9 \end{bmatrix} \end{array} \end{array} \quad (06 \text{ Marks})$$

Module-5

- 9 a. Explain how predicate logic is different from propositional logic. (04 Marks)
 b. Explain the following with respect to fuzzy inference:
 i) Generalized Modus Ponens (GMP). (06 Marks)
 ii) Generalized Modus Tollens (GMT). (06 Marks)
 c. Define the term defuzzification and explain the following defuzzification methods.
 i) Centre of Sums (COS) method. (06 Marks)
 ii) Mean of Maxima (MOM) method. (06 Marks)

OR

- 10 a. Define Type-2 fuzzy set and explain how it is different from interval-valued fuzzy sets. (06 Marks)
 b. Write a short note on fuzzy rule based system. (04 Marks)
 c. Give some applications of fuzzy logic. (06 Marks)
