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 ($x_1, x_2, \ldots x_n$) 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)**

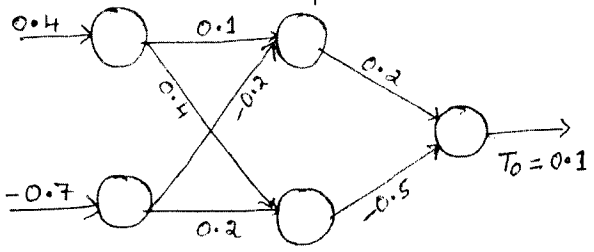

Fig.Q.2(b)

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)**

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} X {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

$$\begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \end{array} \begin{array}{c} \begin{array}{cc} y_1 & y_2 \end{array} \\ \begin{bmatrix} 0.5 & 0.1 \\ 0.2 & 0.9 \\ 0.8 & 0.6 \end{bmatrix} \end{array}$$ and $\tilde{S}$ fuzzy relation $$\begin{array}{c} \\ y_1 \\ y_2 \end{array} \begin{array}{c} \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{bmatrix} 0.6 & 0.4 & 0.5 \\ 0.5 & 0.8 & 0.9 \end{bmatrix} \end{array}$$ **(06 Marks)**

Module-5

9 a. Explain how predicate logic is different from propositional logic. **(04 Marks)**

b. Explain the following with respect to fuzzy interference:

i) Generalized Modus Ponens (GMP).

ii) Generalized Modus Tollens (GMT) **(06 Marks)**

c. Define the term defuzzification and explain the following defuzzification methods.

i) Centre of Sums (COS) method.

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)**

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