M.C.A. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Elective

MC 4006 – SOFT COMPUTING TECHNIQUES

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Using the intuition method develop fuzzy membership functions for the Gaussian function .

2. Differentiate between Memdani FIS and Sugeno FIS.

3. Why is ANN called adaptive system during training?

4. Differentiate between feed forward, feedback and recurrent networks.

5. Differentiate between batch and stochastic gradient descent.

6. What are counter propagation networks?

7. Is it acceptable to initialize weights of SOM to random un normalized values? Justify your answer in few lines.

8. What is "winner take all"? Which net is related to it?

9. What are the advantages of GA over conventional approaches?

10. "GA is a stochastic hill-climbing technique" – Justify.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain any two defuzzificatication methods. (6)

(ii) Consider the following two fuzzy sets. (7)

$$A = \left[\{\frac{0.2}{1}\right] + \frac{0.3}{2} + \frac{0.4}{3} + \frac{1}{4}\} \quad B = \{\frac{0.1}{1} + \frac{0.2}{2} + \frac{0.3}{3}\frac{0.5}{4}\} \text{ Find the algebraic sum,}$$

algebraic product, bounded sum and bounded difference.

Or

(b) Give the Canonical form of Fuzzy Rule Based System. Give the syntax for the formation of Fuzzy rule using.

(i) Assignment statements. (4)

(ii) Conditional statements. (4)

(iii) Unconditional statements (5)

12. (a) What is an activation function? Discuss the types of activation functions in Neural Networks with graphical and mathematical illustractions.

Or

(b) State and explain perceptron convergence theorem.

13. (a) How does back propagation algorithm work? Explain with an illustration.

Or

(b) What is the purpose of learning factors in back propagation networks? Explain the various learning factors and their effect.

4. (a) What is stability plasticity dilemma? How can it be adressed in ART? Illustrate with architecture of ART.

Or

(b) Explain in detail the architecture and learning in LVQ.

5. (a) Illustrate the various types of crossover and mutation operations in genetic algorithms.

Or

(b) Discuss how a Travelling Salesman Problem can be solved using Genetic Algorithm? Illustrate the operations performed in various phases with examples.

PART C — (1 × 15 = 15 marks)

(a) Given the following neural network with initialized weights as in the picture, explain the network architecture knowing that we are trying to distinguish between nails and screws and an example of training tupples is as follows: T1{0.6, 0.1, nail}, T2 {0.2, 0.3, screw}.
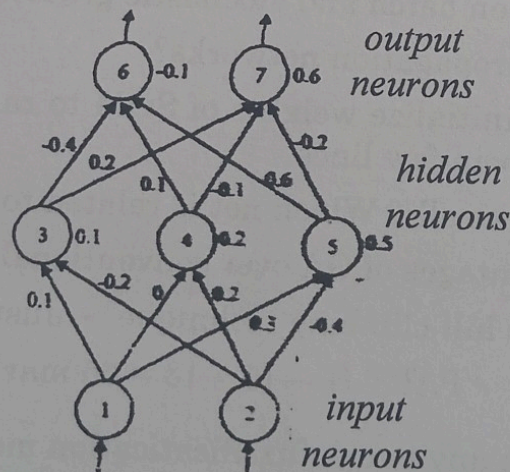
Let the learning rate η be 0.1 and the weights be as indicated in the figure above. Do the forward propagation of the signals in the network using T1 as input, then perform the back propagation of the error. Show the changes of the weights.

Or

(b) "XOR problem cannot be solved by a single Layer Perceptron" – Why? How can Multilayer perceptron be used to solve the problem.

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