Exam Date & Time: 12-Dec-2023 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

MIT MPL VII Semester - End Semester Examination - Nov-Dec 2023

Principles of Soft computing [CSE 4305]

Marks: 50 **Duration: 180 mins.**

Descriptive

Answer all the questions.

* Answer all questions.
* Assume the missing data suitably.
* Write neatly and legibly.
* Give suitable examples wherever necessary.

1) Implement OR function with binary inputs and bipolar targets using single layer perceptron training algorithm up to 3 epochs. (4)

2) Describe the basic models of Artificial neural network. (3)

3) Explain any three types of activation functions used in neural network. (3)

4) Design a McCulloch-Pitts neuron for XOR function for binary inputs. (4)

5) State the perceptron training algorithm for multiple output classes. (3)

6) Explain sequential and batch mode learning. (3)

7) Consider a Kohonen self-organizing map with two cluster units and five input units. The weight vectors for the cluster units are given by:

w_1=[1.0 0.9 0.7 0.5 0.3]

w_2=[0.3 0.5 0.7 0.9 1.0] (4)

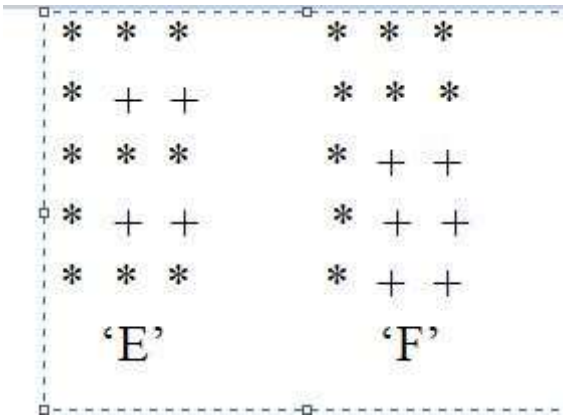
Use Euclidian distance to find the winning cluster unit for the input pattern x=[0.0 0.5 1.0 0.5 0.0]. Using a learning rate of 0.25, find the new weights for the winning units.

8) Construct an autoassociative network to store vectors [-1 1 1 1]. Use iterative autoassociative network to test the vector with three missing elements. (3)

9) With the help of model, explain recurrent neural network. (3)

10) (4)

Construct and test a BAM network to associate letters 'E' and 'F' with simple bipolar input-output vectors. The target output for E is (-1,1) and for F is (1,1).The input patterns are



11) Consider two given fuzzy sets

$$A=\{\frac{1}{2}+\frac{0.3}{4}+\frac{0.5}{6}+\frac{0.2}{8}\}$$

$$B=\{\frac{0.5}{2}+\frac{0.4}{4}+\frac{0.1}{6}+\frac{1}{8}\}$$

(3)

Perform Union, Difference and complement over fuzzy sets A & B.

12) Illustrate the outer product rule used in autoassociative network. (3)

13) Consider a universe of aircraft speed near the speed of sound as X= {0.72, 0.725, 0.75, 0.775, 0.78} and a fuzzy set on this universe for the speed "near mach 0.75" where (4)

$$M=\{\frac{0}{0.72}+\frac{0.8}{0.725}+\frac{1}{0.75}+\frac{0.8}{0.775}+\frac{0}{0.78}\}$$

Define a universe of altitudes as Y = {21, 22, 23, 24, 25, 26, 27} in k-feet and a fuzzy set on this universe for the altitude fuzzy set "approximately 24,000 feet" = N where

$$N=\{\frac{0}{21K}+\frac{0.2}{22K}+\frac{0.7}{23K}+\frac{1}{24K}+\frac{0.7}{25K}+\frac{0.2}{26K}+\frac{0}{27K}\}$$

(a) Construct a relation R=M x N

(b) For another aircraft speed, say M_1 in the region of mach 0.75 where

$$M_1=\{\frac{0}{0.72}+\frac{0.8}{0.725}+\frac{1}{0.75}+\frac{0.6}{0.775}+\frac{0}{0.78}\}$$

find relation $S = M_1 \circ R$ using max-min composition.

14) Explain the working of basic genetic algorithm. (3)

15) Describe the different types of selection techniques in genetic algorithm. (3)

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