

2054
M.E. (Information Technology)
Second Semester
MEIT-2103: Advanced Soft Computing

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each unit.

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1. Attempt the following: -

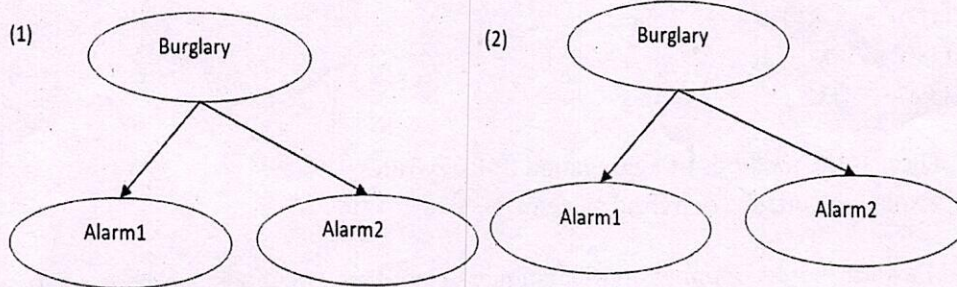
- Using linear separability concept, obtain the response for NAND function. (take bipolar inputs and targets)
- Examine various aspects of sigmoidal function, List its drawback.
- Why excluded middle law does not satisfied in fuzzy logic?
- State the relevance of fuzzification. Explain its different types.
- List the stopping conditions for genetic algorithm.

(5×2)

UNIT-I

2. (a) To safeguard your house, you recently installed two different alarm systems by two different reputable manufacturers that use completely different sensors for their alarm systems.

Which one of the two Bayesian networks given below makes independence assumptions that are not true? Explain all of your reasoning. Alarm1 means that the first alarm system rings, Alarm2 means that the second alarm system rings, and Burglary means that a burglary is in progress.



Consider the second Bayesian network. Assume that:

$$\begin{aligned} P(\text{Alarm1}) &= 0.1, P(\text{Alarm2}) = 0.2, P(\text{Burglary} | \text{Alarm1}, \text{Alarm2}) = 0.8 \\ P(\text{Burglary} | \text{Alarm1}, \neg \text{Alarm2}) &= 0.7, P(\text{Burglary} | \neg \text{Alarm1}, \text{Alarm2}) = 0.6 \\ P(\text{Burglary} | \neg \text{Alarm1}, \neg \text{Alarm2}) &= 0.5 \end{aligned}$$

(5)

Calculate $P(\text{Alarm2} | \text{Burglary}, \text{Alarm1})$. Show all of your reasoning.

- (b) Describe the applications of Artificial Neural Networks.

(5)

P.T.O.

(2)

3. Find the weights required to perform the following classifications using perceptron network:
The vectors (1, 1, -1, -1) and (1, -1, 1, -1) are belonging to a class having target 1. The vectors (-1, -1, -1, 1) and (-1, -1, 1, 1) are belonging to a class having target value -1. (10)
Assume learning rate 1 and initial weights as 0.
4. (a) Draw the architecture of Hopfield neural network for 4-bit bipolar pattern, the training patterns are $S_1 = [1, 1, -1, -1]$ and $S_2 = [-1, 1, -1, 1]$. Also, calculate the weight matrix. (5)
(b) Describe the Self Organizing feature Map (SOM). How to find change in weight in SOM network? (5)

UNIT-II

5. For aircraft simulator data the determination of certain changes in its operating conditions is made on the basis of hard break points in the mach region, We define two fuzzy sets A and B representing the conditions of "near" a mach number of 0.65 and "in the region" of a mach number of 0.65, respectively, as follows

$$A = \text{near mach } 0.65$$

$$= \left\{ \frac{0}{0.64} + \frac{0.75}{0.645} + \frac{1}{0.65} + \frac{0.5}{0.655} + \frac{0}{0.66} \right\}$$

$$B = \text{in the region of mach } 0.65$$

$$= \left\{ \frac{0}{0.64} + \frac{0.25}{0.645} + \frac{0.75}{0.65} + \frac{1}{0.655} + \frac{0.5}{0.66} \right\}$$

For these two fuzzy sets create

(i) $A \cup B$

(ii) $A \cap B$

(iii) $\overline{A \cup B}$

(iv) \overline{A}

(v) \overline{B}

(10)

6. (a) Discuss the methods of aggregation of fuzzy rules. (5)
(b) Explain Neuro-fuzzy hybrid system. (5)
7. Explain swarm based optimization techniques. How these methods can be used to solve the problem of exploitation? (10)