

Aliah University

Autumn Semester Examination - 2023

B.Tech 4th year, 7th semester Examination

Paper Name: Machine Learning and Soft Computing

Paper Code: CSEUGPC24

Full Marks: 80

Time: 3 hrs

Group-A

Answer any five

(2x5=10)

- ✓ 1. What is an artificial neuron? 2
2. Describe the multipoint crossover operation for a GA problem. 2
- ✓ 3. Differentiate the fuzzy sets for the triangular, and trapezoidal membership functions. 2
- ✓ 4. Compare the fuzzifier and defuzzifier component of a Fuzzy inference system. 2
- ✓ 5. Write the basic steps for a Genetic Algorithm problem. 2
- ✓ 6. What is Reinforcement Training? 2

Group-B

Answer any four

(5x4=20)

- ✓ 7. Maximize the function $f(x) = 4x^2 + 9x + 1$, where $x = 9, 11, 13, 15$ with (Chromosome size = 4) such that (i) selection operation (Rank Selection), (ii) Uniform crossover, (iii) Up to two iterations. 5
- ✓ 8. Establish a mamdani fuzzy inference system with proper examples. 5
- ✓ 9. Explain the terms "Chromosome, Gene, Allele, Locus, Genotype, Phenotype" with proper examples for a GA problem. 5
- ✓ 10. Establish a minimum distance classifier (MDC) for a 3-class classification problem. 5
- ✓ 11. Calculate specificity and f1-score from the given confusion matrix. 5

Predicted	Actual			
	12	1	3	5
	7	45	4	6
	0	2	23	4
	1	5	7	6

Group-C

Answer any five

(10x5=50)

12. Consider the fuzzy sets $small = \{0/0 + 0/2 + 1/3 + 0/4\}$ and $negative = \{0/1 + 0.7/2 + 1/3 + 0.7/4 + 0/5\}$, and the following fuzzy rule: "Rule 1: If x is small and y is negative Then z is low". Find the firing strength of Rule 1 when $x = 3$ and $y = 2$ where fuzzy "AND" operation is the minimum operator. What is ELITISM? 8+2=10
- ✓ 13. What is Gradient-Descent? Draw a very clear 4-3-2 ANN architecture with explaining all its components. What is a Self-organizing Feature Map? 3+5+2=10
- ✓ 14. What is clustering? What are the main parameters for a good clustering technique? What are Conventional and fuzzy sets theories? Define uniform crossover and single point crossover in Genetic Algorithm. 1+2+3+4=10
- ✓ 15. What is PCA and why is it important? Describe each step of PCA by considering a proper example. Give Some Real Time Applications of Neural Networks. 3+5+2=10
- ✓ 16. Describe Generative and Discriminative Machine Learning techniques. Suppose a genetic algorithm uses chromosomes of the form $x = abcdefgh$ with a fixed length of eight genes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as: $f(x) = (a + b) * (c + d) + (e + f) - (g + h)$. Let the initial population consist of four individuals with the following chromosomes: $x_1 = 72413532$; $x_2 = 97121601$; $x_3 = 53221285$; $x_4 = 71852494$. Use the following (i) Evaluate the fitness of each individual, (ii) Cross the fittest two individuals using one-point crossover at the middle point, (iii) Evaluate the fitness of the new population with the best four chromosomes (two-old and two-new) (iv) Perform (ii) to (iii) up to three iterations. 3+7=10
17. (a) Why is naive Bayes so 'naive'? (b) You came to know that your model is suffering from low bias and high variance. Which algorithm should you use to tackle it? Why? (c) What do you understand about Type I & Type II errors? (d) What is non linear classification of supervised learning? Explain with an example. 2+3+2+3=10

mean
matrix
value time
save the vector
select x component

Feature Selection
Extraction
Reduction