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Elective-III : Pattern Recognition

P. Pages : 2

Time : Three Hours



NRJ/KW/17/4748

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Assume suitable data whenever necessary.
 9. Illustrate your answers whenever necessary with the help of neat sketches.
 10. Use of non programmable calculator is permitted.

1. A) What is pattern recognition? Explain steps in pattern recognition system with example. 7
- B) Explain the design cycle of pattern recognition system. 6

OR

2. A) Can the features vector $(x, y) = (2, 3) (3, 5) (4, 2) (2, 7)$ from class A, be separated from four samples from class B located at $(6, 2), (5, 4), (5, 6), (3, 7)$ by a linear decision boundary? If so give the equation of one such boundary and plot it. Draw scatter plot. 7
- B) What is learning and adaptation? Explain different types of learning. 6
3. A) What is negative binomial distribution? A basket player is an 80 percent successful free throw shooter. To make 20 free throws, what is the probability that he or she will need to shoot exactly 25 times? 7
- B) Explain following methods of estimation of parameters from samples. 6
 - i) The method of moments.
 - ii) Maximum Likelihood Estimates.

OR

4. A) Find the expected value & variance of uniform random variable with range a to b. 6
- B) When does following equation hold? $P[(A \text{ and } B)|C] = P(A|C) \cdot P(B|C)$. 4
- C) A fair coin is tossed 50 times. What is the probability that heads will appear exactly 25 times? 3
5. A) Determine the optimal decision boundary between two simple bivariate normal classes when the features are independent within each class. Assume that the classes A and B are having equal prior probability. The parameter for class A are $\mu_x = 0, \mu_y = 0, \sigma_x = 1, \sigma_y = 1, \rho_{xy} = 0$ and the parameters for class B are $\mu_x = 2, \mu_y = 0, \sigma_x = 1, \sigma_y = 2, \rho_{xy} = 0$ Also draw the sketches for the same. 8

- B) Explain following three methods of error rates estimation. 6
 i) Model based estimation ii) Simple counting iii) Fractional counting

OR

6. A) Explain leaving-One-Out & Leaving-Some-Out Technique in detail. What for it is used? 7

- B) Refer the following table and find confusion matrix in integer and fractional 7

Sample	True Class	$\hat{P}(A x)$	$\hat{P}(B x)$	$\hat{P}(C x)$
1	A	0.3	0.4	0.3
2	A	0.5	0.1	0.4
3	B	0.5	0.3	0.2
4	C	0.1	0.1	0.8

7. A) Explain Fuzzy based classifier in detail. 7

- B) Write short notes on artificial neural network. 6

OR

8. A) Explain support vector Machine. How SVM is trained and how X-OR operation is implemented? 7

- B) Explain Hidden Markov Model in detail. 6

9. A) Explain following types of distances with their formulas and calculate those distance for two points A(1, 2) and B (3, 3) 9

- i) Euclidean distance. ii) City block distance iii) Maximum distance

- B) What is histogram? Explain. 5

OR

10. A) Explain Adaptive Decision boundary algorithm in detail. 8

- B) Explain k-nearest Neighbour classification technique. 6

11. A) Explain Ward's Method for clustering. 6

- B) Perform Partitional clustering using Forgy's algorithm for the following 5 samples. 7

Samples	1	2	3	4	5
x	4	8	15	24	24
y	4	4	8	4	12

OR

12. A) Explain k-means algorithm in detail for performing clustering. 6

- B) Perform Hierarchical clustering of 5 samples using simple Linkage algorithm, on the data shown below. (4, 4), (8, 4), (15, 8), (24, 4), (24, 12) 7



~ Babe Ruth

