JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech- VII Semester (ECE)

COURSE CODE (CREDITS): 19B1WEC732 (3) MAX. MARKS: 35

COURSE NAME: Pattern Analysis in Machine Intelligence

COURSE INSTRUCTORS: Dr. Alok Kumar MAX. TIME: 2 Hours

Note: *(a)All questions are compulsory.*

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

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Q.1 Consider the 3- dimensional feature vectors having two class (ω_1, and ω_2). Find the weight vector when $p(\omega_1) = 0.4$ and $p(\omega_2) = 0.6$. Consider $p_i = 0.65$ and $q_i = 0.35$ for $i = 1,2,3$.

[CO4] **[3 Marks]**

Q.2 What is the role of features in a decision tree, and how are they selected during training? Can decision trees handle multicollinearity among features? Justify your answer with suitable explanations.

[CO2, CO4] **[4 Marks]**

Q.3 Consider the 5 data points shown below

P1: (1,2,3), P2: (0,1,2), P3: (3,0,5), P4: (4,1,3), and P5: (5,0,1),

Apply the k mean clustering algorithm to group those data points into 2 clusters, using the L1 distance measure. Consider the initial centroid as C1: (1, 0, 0) and C2: (0, 1, 1).

[CO1, CO4] **[4 Marks]**

Q.4 How do you evaluate the performance of an ensemble of classifiers compared to individual classifiers? What role does feature selection play in the context of combining classifiers?

[CO3,CO5] **[4 Marks]**

Q.5 Given a one-dimensional dataset {1, 5, 8, 10, 2} use the agglomerative clustering algorithms with the complete link with Euclidean distance to establish a hierarchical grouping relationship. Construct the dendogram.

[CO1, CO4] **[5 Marks]**

Q.6 What is the role of covariance matrices in Linear Discriminant Analysis? How does Linear Discriminant Analysis handle the case of more than two classes in a classification problem? What is the relationship between Fisher's Linear Discriminant and Linear Discriminant Analysis?

[CO2, CO3] **[4 Marks]**

Q.7. In PR, multivariable Gaussian Distribution function is employed. Consider a feature vector X which has two attributes x_1 and x_2 as $= \begin{Bmatrix} x_1 \\ x_2 \end{Bmatrix}$. The variables x_1 and x_2 having mean μ_1 and μ_2 and variance σ_1^2 and σ_2^2 respectively. Write the expression for bi-variants normal density function and show the effect on locaii of PDF for the following cases:

a) Samples are independent identically distributed and $\sigma_1^2 = \sigma_2^2$

b) Samples are independent identically distributed and $\sigma_1^2 \neq \sigma_2^2$

c) Samples are not independent identically distributed and $\sigma_1^2 \neq \sigma_2^2$

[CO1, CO2] **[4 Marks]**

Q.8 What is single linkage in hierarchical clustering? How does the choice of distance metric affect the results in single linkage clustering? How do you interpret the clusters formed by single linkage in practical applications?

[CO4] **[4 Marks]**

Q.9 In what scenarios would you prefer bagging over boosting, and vice versa?

[CO5] **[3 Marks]**