JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATIONS-2022
B.Tech-VII Semester (ECE)

COURSE CODE (CREDITS): 19B1WEC732 (3)

COURSE NAME: Pattern Analysis in Machine Intelligence

MAX. MARKS: 25

COURSE INSTRUCTORS: Dr. Alok Kumar

MAX. TIME: 1 Hour and 30 Minutes

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q.1. How discriminant function is helpful in pattern recognition (PR)? Explain any two discriminate function used in PR.

[CO2, CO3] [3 Marks]

Q.2 Where we prefer Manhattan distance metric over Euclidean distance? Consider two vectors X and Y as follows: $X = (4,2,5,7,1)$ and $Y = (3,5,2,9,4)$. Find L_1, L_2, and L_∞ norm.

[CO1] [3 Marks]

Q.3 How Bayes theorem is helpful to minimized the error in classification? Derived the expression for minimum error rate classifier while considering that, given samples may belongs from either class ω_1 or class ω_2.

[CO2, CO3] [3 Marks]

Q.4 Consider the 3- dimensional feature vectors having two class (ω_1, and ω_2). Find the weight vector when $p(\omega_1) = 0.5$ and $p(\omega_2) = 0.5$. Consider $p_i = 0.8$ and $q_i = 0.5$ for $i = 1,2,3$.

[CO4] [3 Marks]

Q.5. 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.6 What are the different probability density function estimation techniques are employed? Explain any one estimation technique.

[CO3] [4 Marks]

Q.7 Consider the two class ω_1 and ω_2 and data belongs to these two classes are as follows:

$$\omega_1 : \left\{ \begin{pmatrix} 3 \\ 6 \end{pmatrix}, \begin{pmatrix} 4 \\ 4 \end{pmatrix}, \begin{pmatrix} 4 \\ 8 \end{pmatrix}, \begin{pmatrix} 4 \\ 6 \end{pmatrix} \right\}$$

$$\omega_2 : \left\{ \begin{pmatrix} 3 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 \\ -2 \end{pmatrix}, \begin{pmatrix} 3 \\ -4 \end{pmatrix}, \begin{pmatrix} 5 \\ -3 \end{pmatrix} \right\}$$

Assume $p(\omega_1) = 0.5$ and $p(\omega_2) = 0.5$. Find out the equation for quadratic classifier for the given data sets and show the decision boundary between two classes ω_1 and ω_2.

[CO3] [5 Marks]