

INDIAN STATISTICAL INSTITUTE
(MS-QMS)_2024
FINAL-SEMESTER EXAMINATION
(Pattern Recognition)

Duration: 180 minutes

Maximum Marks: 60

Note: Answer any TEN

- (1) Explain:
Why is mean square error unsuitable as the linear regression's cost function? Which cost function is normally used for logistic regression and why? [3+3]
- (2) (i) Explain the working principle of using logistic regression for a multiclass problem. [3]
(ii) Why softmax activation function is used at the last layer of an NN instead of the sigmoid activation function? [3]
- (3) (i) How do you find a model's true positive and negative recognition rates? [3]
(ii) Provide the complete interpretation of the ROC curve for a model. [3]
- (4) (i) Describe the primary challenges of a Bayes Decision rule for the classification task. [4]
(ii) How do you determine the confidence level in a minimum distance classifier? [2]
- (5) (i) What is the FLANN classification model? How is it different from a multilayered ANN. [3]
(ii) Describe the complete interpretation of a confusion matrix. [3]
- (6) If X is a data set with 9 samples and 2 features each. Find the Euclidean and Mahalanobis distances between 2nd and 5th samples of X. Explain the significance of both the distance values. [6]
- $XX = \begin{bmatrix} 4 & 5 \\ 3 & 2 \\ 3 & 2 \\ 1 & 6 \\ 0 & 2 \\ 5 & 7 \\ 7 & 9 \\ 3 & 7 \\ 2 & 1 \end{bmatrix};$
- (7) Describe the operational steps of KNN algorithm. Describe the advantages and disadvantages of KNN Algorithm. [6]
- (8) Provide the significance of the cross-validation method in a decision-making process. Describe THREE methods of cross-validation. [6]

- (9) Draw the single-layer neural network architecture for OR, AND and NOT logic gates. [6]
- (10) Provide a detailed description of the significant challenges in developing a clustering algorithm. [6]
- (11) Compare the advantages and disadvantages of K-means and density-based segmentation algorithms. [6]
- (12) Why is regularization required in a neural network classification model? Describe the significance and operational steps of any one regularization method with the equation. [6]

=====END of the Question Paper=====