December 2024
B.Tech (CE) - 5th Sem
Machine Learning (PCC-CS-D-501)

Duration: 3 Hours **Max. Marks: 75**

Instructions:

- It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.
- Answer any four questions from Part-B in detail.
- Different sub-parts of a question are to be attempted adjacent to each other.

PART A (1.5 marks each)

Q1 (a) What are outliers? List any two methods to deal with outliers. (1.5)

(b) Define (i) Prior Probability (ii) Conditional Probability (iii) Posterior Probability. (1.5)

(c) How precision, recall and accuracy are related? (1.5)

(d) What is regularization? (1.5)

(e) How is covariance different from correlation? What is Pearson's Coefficient? (1.5)

(f) What is the curse of Dimensionality? (1.5)

(g) Describe LMS weight update rule. (1.5)

(h) What is bias and variance? Explain bias-variance tradeoff? (1.5)

(i) Why are SVMs often more accurate than logistic regression? (1.5)

(j) Differentiate between Batch Gradient Descent and Stochastic Gradient Descent. (1.5)

PART B

Q2 (a) Use K Means clustering to cluster the following data into two groups. Assume the cluster centroid is $m_1 = 2$ and $m_2 = 4$. The distance function used is Euclidean distance. $\{2, 4, 10, 12, 3, 20, 30, 11, 25\}$ (7.5)

(b) Derive the expression for minimizing cost function in linear regression. (7.5)

Q3 Describe in detail an unsupervised method for dimensionality reduction. Can we use the same method for feature selection or classification? Give reasons to support your answer. (15)

Q4 (a) Write the steps of the decision tree learning algorithm. Explain Entropy and Information Gain with an example. What is the use of GINI index? (7.5)

(b) What is AR/ARMA/ARIMA? Explain. (7.5)

Q5 (a) Describe model evaluation approaches. (7.5)

(b) Draw and explain the architecture of the neural network. Explain the formula for backpropagation. (7.5)

Q6 State the mathematical formulation of the soft margin SVM as a convex optimization problem. Describe how dual form is useful in applying kernel tricks. List any two kernel functions. (15)

Q7 (a) What is active learning? How is it different from Reinforcement learning? (7.5)

(b) How matrix factorization is used in recommender systems? Explain with examples. (7.5)