

**END TERM EXAMINATION**

FIFTH SEMESTER [BCA] DECEMBER 2023 - JANUARY 2024

Paper Code: BCAT-311

Subject: Machine Learning with Python

Time: 3 Hours

Maximum Marks: 75

Note: Attempt any five questions in all including Q. No.1 which is compulsory. Select one question from each unit.

- Q1 Write short notes on the following (Any Five) (5x5=25)
- Explain different types of machine learning techniques.
  - Differentiate overfitting and underfitting problems encountered during machine learning.
  - What is ROC curve? How is it constructed?
  - What do you mean by Rule-based classification?
  - Explain logistic regression and its applications.
  - Write down the applications of Neural Networks.
  - Write a short note on Principal Component Analysis.

**UNIT-I**

- Q2 (a) Consider a two-class classification problem of predicting whether a photograph contains a man or a woman. For the given test dataset of 10 records with expected outcomes and a set of predictions from a classification algorithm, (6)
- Compute the confusion matrix for the data.
  - Compute the accuracy, precision, recall, sensitivity, and specificity of the data.

	Expected/Actual	Predicted
1	man	woman
2	man	man
3	woman	woman
4	man	man
5	woman	man
6	woman	woman
7	woman	woman
8	man	man
9	man	woman
10	woman	woman

- (b) Compare Multiclass Classification with Multilabel Classification. Write down appropriate examples to explain the difference. (6.5)

**OR**

- Q3 (a) Under what circumstances Precision, or Recall are better performance metrics in comparison with Accuracy? Give an example each for the situations where "Recall is a more important evaluation metric than Precision". "Precision is a more important evaluation metric than Recall". (6)
- (b) Explain simple linear regression. What do you mean by least square method and Coefficient of Determination? (6.5)

**UNIT-II**

- Q4 (a) What do you mean by Decision tree? How does the decision tree algorithm work? Explain the attribute selection measure- Information gain. (6)

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- (b) Explain the working of Naïve Bayes' Classifier. For the dataset given below, check "If on a Sunny day, Player can play the game?" with the help of frequency table and likelihood table. (6.5)

	Outlook	Play
0	Rainy	Yes
1	Sunny	Yes
2	Overcast	Yes
3	Overcast	Yes
4	Sunny	No
5	Rainy	Yes
6	Sunny	Yes
7	Overcast	Yes
8	Rainy	No
9	Sunny	No
10	Sunny	Yes
11	Rainy	No
12	Overcast	Yes
13	Overcast	Yes

**OR**

- Q5 (a) What are ensemble learning models? Explain bagging and boosting in detail. (6)
- (b) Explain Support Vector Machine. Define the terms Hyperplane, Support Vectors, Kernel, Hard and Soft Margin. (6.5)

**UNIT-III**

- Q6 (a) What is the role of the Activation functions in Neural Networks? List down the names of some popular Activation Functions used in Neural Networks. (6)
- (b) Explain the architecture of the Multilayer Feed-Forward Neural Network. (6.5)

**OR**

- Q7 (a) Explain Gradient Descent and its types. What are the different steps used in Gradient Descent Algorithm? (6)
- (b) What is perceptron and what are its basic components? How does Perceptron work? (6.5)

**UNIT-IV**

- Q8 (a) Write down the algorithm for K-means Clustering technique. What are the Distance Metrics used for quantitative and qualitative attributes? (6)
- (b) What do you mean by Feature selection? Explain Filter methods, Wrapper methods and Embedded methods of feature selection. (6.5)

**OR**

- Q9 (a) Explain Hierarchical Clustering technique and its types. Draw appropriate diagrams to explain the same. (6)
- (b) What are Self-Organizing Maps? How do they perform the weight update of the winning vector in the process of learning? (6.5)

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