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Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 33705 Roll No.

B. Tech. Examination 2023-24

(Even Semester)

CONCEPTS OF MACHINE LEARNING WITH PYTHON

Time : Three Hours] *[Maximum Marks : 60*

Note :– Attempt all questions.

SECTION–A

1. Attempt all parts of the following : 8×1=8

   (a) Explain different types of machine learning techniques.

   (b) Differentiate overfitting and underfitting problems encountered during machine learning.

   (c) What is the ROC curve? how is it constructed?

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(d) What do you mean by rule-based classification?

(e) Explain logistic regression and its applications.

(f) Write down the applications of neural networks.

(g) Write a short note on principal component analysis.

(h) What is mutation?

SECTION – B

2. Attempt any two parts of the following : 2×6=12

(a) Compare multiclass classification with multi-label classification. Write down appropriate examples to explain the difference.

(b) Consider two classes of 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.

(i) Compute the confusion matrix for the data.

(ii) Compute the accuracy, precision, recall, sensitivity and specificity of the data.

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	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

(c) Under what circumstances are precision, or recall 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".

(d) Explain simple linear regression. What do you mean by the least square method and coefficient of determination?

SECTION – C

Note :– Attempt all questions. Attempt any two parts from each questions. 8×5=40

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3. (a) What do you mean by decision tree? How does the decision tree algorithm work? Explain the attribute selection measure information gain.

(b) Explain the working of Naive 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.

	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

(c) What is ensemble learning models? Explain bagging and boosting in detail.

4. (a) Explain support vector machine. Define the terms hyperplane, support vectors, kernel, hard and soft margin.

(b) What is the role of the activation functions in neutral networks? List down the names of some popular activation functions used in neural networks.

(c) Explain the architecture of the multilayer feed-forward neural network.

5. (a) Explain gradient descent and its types. What are the different steps used in the gradient descent algorithm?

(b) What is perceptron and what are its basic components? How does perceptron work?

(c) Write down the algorithm for the K-means clustering technique. What are the distance metrics used for quantitative and qualitative attributes?

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6. (a) What do you mean by feature selection? Explain filter methods, wrapper methods and embedded methods of feature selection.

(b) Explain the hierarchical clustering technique and its types. Draw appropriate diagrams to explain the same.

(c) What are self-organizing maps? How do they perform the weight update of the winning vector in the process of learning?

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