SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai — 600 044.
M.Sc.(Computer Science) END SEMESTER EXAMINATIONS NOVEMBER - 2023
SEMESTER - I

20PCSET1001 - Introduction to Machine Learning

Total Duration : 2 Hrs. 30 Mins. Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. Explain the fundamental concept of supervised learning in machine learning, providing an example.
2. Describe the bias and variance of an estimator. Show how these two properties affect the quality of an estimator in terms of accuracy and precision.
3. Apply the concept of Dimensionality Reduction to a real-world dataset of your choice.
4. Identify and briefly explain two nonparametric classification methods used for analyzing data. Provide an example of a scenario where each method would be suitable.
5. Explain the concept of the Backpropagation Algorithm in the context of training Multilayer Perceptrons (MLPs).
6. Explain the process of training a multilayer perceptron (MLP) using the back propagation algorithm.
7. Explain the process of Nonparametric Classification using the Condensed Nearest Neighbor method.
8. Describe the key components of Decision Trees, including nodes, branches, and leaves.

Section C

I - Answer any **TWO** questions $(2 \times 10 = 20$ Marks)

9. Classify different types of machine learning tasks into supervised, unsupervised, and reinforcement learning, predicting the appropriate algorithms for each.
10. Explain the concept of Maximum Likelihood Estimation (MLE) in the context of parametric methods.Provide a step-by-step illustration of how MLE is applied to estimate parameters in a given statistical model.

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11. Distinguish between Principal Components Analysis (PCA) and Factor Analysis as two distinct dimensionality reduction techniques.Compare and contrast their underlying assumptions, objectives, and the types of data they are best suited for.

12. Consider a weather dataset, perform the following tasks:
    a) Apply decision tree learning to build a classification model for the dataset.
    b) Choose an appropriate splitting criterion and demonstrate the construction of the decision tree.

II - Compulsory question $(1 \times 10 = 10$ Marks)

13. Determine the optimal hyperparameters for the CNN model, such as learning rate,batch size,and number of hidden layers, using appropriate optimization techniques like grid search or random search.Justify your choices based on the performance of the model.

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