GUJARAT TECHNOLOGICAL UNIVERSITY
PGDDS– SEMESTER I- EXAMINATION –SUMMER-2024

Subject Code: 1618003   **Date: 29/04/2024**

Subject Name: Fundamentals of Machine Learning

Time: 02:30 PM TO 05:00 PM   **Total Marks: 70**

Instructions:

    1. Attempt all questions.
    2. Make Suitable assumptions wherever necessary.
    3. Figures to the right indicate full marks.
    4. Use of simple calculators and non-programmable scientific calculators are permitted.

Q.1	**(a)** What is Bayesian Belief Network?	**03**
	(b) Write any four characteristics of a problem which is appropriate for decision tree.	**04**
	(c) What do you mean by learning system? What is the role of (i) training experience and (ii) target function in designing a good learning system?	**07**
Q.2	**(a)** Define following terms w.r.t machine learning: (i) training set (ii) validation set (iii) testing set.	**03**
	(b) Give an example of a biased hypothesis space.	**04**
	(c) Explain MAP hypothesis and consistent learners with suitable examples.	**07**

OR

	(c) Define: sensitivity, specificity. Make confusion matrix from given data and find sensitivity, specificity, accuracy and F-score from it: No. of samples in test data having class value POSITIVE = 100 No. of samples in test data having class value NEGATIVE = 300 No. of POSITIVE samples of test data classified as POSITIVE by model = 90 No. of NEGATIVE samples of test data classified as NEGATIVE by model = 280	**07**
Q.3	**(a)** What is multilayer feedforward artificial neural network?	**03**
	(b) Compare precision and recall. Find precision and recall for given data in confusion matrix:	**04**

	Predicted positive	Predicted negative
Actual positive	280	20
Actual negative	10	190

	(c) Differentiate supervised, unsupervised and semi-supervised machine learning paradigms with suitable examples. Clearly mention the applications of each one of them.	**07**

OR

Q.3	**(a)** Define following terms with respect to machine learning: (i) consistent hypothesis (ii) underfitting (iii) mean square error	**03**
	(b) How does decision tree pruning help to avoid overfitting?	**04**
	(c) With any one recommender system, explain the mechanism of predictive model with its usefulness & limitations.	**07**
Q.4	**(a)** Write any three termination conditions in backpropagation algorithm.	**03**
	(b) Define following terms with respect to machine learning: (i) gradient descent (ii) learning rate (iii) cost function (iv) epoch	**04**
	(c) Explain maximum likelihood hypothesis for predicting probabilities.	**07**

Q.4 **(a)** Define following terms with respect to machine learning: **03**
(i) target function (ii) inductive learning hypothesis (iii) version space

(b) What is brute-force bayes concept learning? **04**

(c) What is post-pruning? Explain the reduced error pruning method with suitable example. **07**

Q.5 **(a)** Differential between Gibbs algorithm and Bayes optimal classifier. **03**

(b) Briefly explain the steps to prepare the version space for given training dataset. **04**

(c) What is artificial neural network? For which type of the problems, learning by artificial neural network can be beneficial? **07**

OR

Q.5 **(a)** Define following terms with respect to machine learning: **03**
(i) precision (ii) overfitting (iii) concept learning

(b) How does supervised machine learning help in text classification? **04**

(c) What is inductive bias in decision tree learning? Explain the role of Occam's razor while considering the short hypothesis. **07**

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