Fifth Semester MCA Degree Examination, Jan./Feb. 2021
Machine Learning

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define a Well-Posed Learning Problem. Quote some successful applications of machine learning. **(10 Marks)**

b. Elaborate the design choices of choosing the training experience and choosing the Target Function while designing a learning system. **(10 Marks)**

OR

2 a. Depict the program modules of learning systems. **(04 Marks)**

b. Write the notation for most general hypothesis and most specific hypothesis. **(04 Marks)**

c. Consider the following set of training examples:

Example	Sky	Air Temp	Humidity	Wind	Water	Forecast	Enjoy Sport
1	Sunny	Warm	Normal	Strong	Warm	Same	Yes
2	Sunny	Warm	High	Strong	Warm	Same	Yes
3	Rainy	Cold	High	Strong	Warm	Change	No
4	Sunny	Warm	High	Strong	Cool	Change	Yes

Write the Candidate-Elimination Algorithm and illustrate the steps to arrive at a final version space using the above training examples. **(12 Marks)**

Module-2

3 a. List the advantages of Decision Tree representation. Which problems are appropriate for Decision Tree learning? **(10 Marks)**

b. Present the ID3 algorithm for decision tree learning. **(10 Marks)**

OR

4 a. Consider the following set of training examples:

Instance	Classification	a_1	a_2
1	+	T	T
2	+	T	T
3	−	T	F
4	+	F	F
5	−	F	T
6	−	F	T

(i) What is the entropy of this collection of training examples with respect to the target function-classification?

(ii) What is the information gain of a_2 relative to these training examples? **(08 Marks)**

b. Present your understanding about over fitting the data with decision tree learning and how it can be avoided. **(12 Marks)**

Module-3

5 a. Explain in detail about the problems appropriate for Neural Network learning and why? **(10 Marks)**

b. Discuss about the Perceptron Training Rule, and the Gradient Descent and Delta Rule. **(10 Marks)**

OR

6 a. Visualize the Hypothesis space and explain how it illustrates gradient descent problem. **(04 Marks)**

b. What type of unit shall we use as the basis for constructing multi-layer networks? **(04 Marks)**

c. Present the Backpropagation algorithm for feedforward networks containing two layers of sigmoid units. **(12 Marks)**

Module-4

7 a. Summarize the features of Bayesian Learning methods. **(08 Marks)**

b. Explain the Brute-Force Bayes Concept Learning with the help of Brute-Force MAP Learning algorithm. **(12 Marks)**

OR

8 a. Elaborate on Maximum Likelihood and Least-Squared Error Hypothesis. **(10 Marks)**

b. Describe the step-wise approach in Expectation/Estimation Maximization (EM) algorithm. **(10 Marks)**

Module-5

9 a. Define Sample Error and True Error with appropriate representation. **(06 Marks)**

b. Discuss on the role of confidence intervals for discrete-valued hypothesis in measuring the goodness of true-error estimate when the sample error is provided. **(14 Marks)**

OR

10 a. Explain briefly about the process of comparing learning algorithms. **(06 Marks)**

b. Write in detail about the K-Nearesct Neighbor algorithm and its approach to perform classification. **(08 Marks)**

c. Brief about the aspects with respect to which the reinforcement learning problem differs from other function approximation tasks. **(06 Marks)**

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