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18MCA53

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-Neareset 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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