CBCS SCHEME

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15CS73

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
Machine Learning

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define well posed learning problem with an example. **(02 Marks)**

b. Explain the major applications of the machine learning. **(04 Marks)**

c. Apply the candidate elimination algorithm for the following data samples. Give the algorithm for the same.

Data sample	Sky	Air Temp	Humidity	Wind	Water	Forecast	Enjoy sports
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	No

(10 Marks)

OR

2 a. Explain the futility of bias free learning for any concept learning method. Give the inductive bias for candidate elimination algorithm. **(06 Marks)**

b. Design a learning system in detail for playing checkers problem. **(10 Marks)**

Module-2

3 a. Define decision tree. Explain the appropriate problems for decision tree learning. **(06 Marks)**

b. Mention the different issues in decision tree learning and explain any two in detail. **(10 Marks)**

OR

4 a. Differentiate between restriction bias and preference bias with an example. **(03 Marks)**

b. Define entropy and information gain. **(03 Marks)**

c. Construct the decision tree for the given data samples using ID3 algorithm. Represent the same tree with the help of hypothesis [Target concept : Play Tennis]

Day	Outlook	Temperature	Humidity	Wind	Play Tennis
D1	Sunny	Hot	High	Weak	No
D2	Sunny	Hot	High	Strong	No
D3	Overcost	Hot	High	Weak	Yes
D4	Rain	Mild	High	Weak	Yes
D5	Rain	Cool	Normal	Weak	Yes
D6	Rain	Cool	Normal	Strong	No
D7	Overcost	Cool	Normal	Strong	Yes
D8	Sunny	Mild	High	Weak	No
D9	Sunny	Cool	Normal	Weak	Yes
D10	Rain	Mild	Normal	Weak	Yes
D11	Sunny	Mild	Normal	Strong	Yes
D12	Overcost	Mild	High	Strong	Yes
D13	Overcost	Hot	Normal	Weak	Yes
D14	Rain	Mild	High	Strong	No

(10 Marks)

Module-3

5 a. Define perceptron. Give the representation of different Boolean functions by perceptron. **(05 Marks)**

b. Differentiate between perceptron training rule and delta rule. **(05 Marks)**

c. Explain the derivation of gradient descent with an algorithm. **(06 Marks)**

OR

6 a. Explain the sigmoid function in detail. **(04 Marks)**

b. Give the algorithm of back propagation for the multilayer neural network and explain the derivation of : (i) Output unit weights (ii) Hidden unit weights **(12 Marks)**

Module-4

7 a. Define Bayes theorem. Explain in detail the different features of Bayesian learning. **(06 Marks)**

b. Consider a medical diagnosis problem in which there are 2 alternative hypothesis (i) the patient has a particular form of cancer ⊕ positive and (ii) the patient does not ⊖ negative. We have prior knowledge that over the entire population of people only 0.008 have this disease. The test returns a correct positive result in only 98% of the cases in which the disease is actually present, and a correct negative result in only 97% of the cases in which the disease is not present. Find out does new patient have cancer or not. **(10 Marks)**

OR

8 a. Mention different methods of Bayes theorem used for concept learning. Explain any one in detail. **(06 Marks)**

b. Explain Naïve Bayes Classifier (BC) learning method. For the training examples (samples) given in question 4C apply NBC to classify the following novel instance.
(Outlook = Sunny, Temperature = Cool, Humidity = High, Wind = Strong) **(10 Marks)**

Module-5

9 a. Differentiate between true error and sample error. **(06 Marks)**

b. Give the following definitions of sampling theory:

(i) Random variable	(ii) Probability distribution
(iii) Mean	(iv) Variance
(v) Standard deviation	(vi) Binomial distribution
(vii) Normal distribution	(viii) Central limit theorem
(ix) Estimator and estimation bias	(x) N% confidence interval

(10 Marks)

OR

10 a. What is reinforcement learning? Give an example. **(04 Marks)**

b. Write short notes on:
(i) K-Nearest Neighbour Learning
(ii) Locally Weighted Regression **(12 Marks)**

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