CBCS SCHEME

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17CS73

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
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. Explain the designing of a learning system in detail. **(10 Marks)**

b. Define learning. Specify the learning problem for handwriting recognition and robot driving. **(05 Marks)**

c. Explain the issues in machine learning. **(05 Marks)**

OR

2 a. Write the steps involved in find-S algorithm. **(05 Marks)**

b. Apply candidate elimination algorithm to obtain final version space for the training set shown in Table.Q2(b) to infer which books or articles the user reads based on keywords supplied in the article. **(10 Marks)**

Article	Crime	Academes	Local	Music	Reads
a_1	True	False	False	True	True
a_2	True	False	False	False	True
a_3	False	True	False	False	False
a_4	False	False	True	False	False
a_5	True	True	False	False	True

Table.Q2(b)

c. State the inductive bias rote-learner, candidate-elimination and Find-S algorithm. **(05 Marks)**

Module-2

3 a. Discuss the two approaches to prevent over fitting the data. **(08 Marks)**

b. Consider the following set of training example:

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 example with respect to the target function classification?

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

c. Discuss the decision learning algorithm. **(04 Marks)**

OR

4 a. List the issues of decision tree learning. **(04 Marks)**

b. Define decision tree. Construct the decision tree to represent the following Boolean functions:

(i) $A \vee \neg B$ (ii) $A \vee [B \wedge C]$

(iii) A XOR B (iv) $[A \cap B] \vee [C \wedge D]$ **(10 Marks)**

c. Write the ID3 algorithm and explain. **(06 Marks)**

Module-3

5 a. Define perceptron. Explain the concept of single perceptron with neat diagram. **(06 Marks)**

b. What is Artificial Neural Network? What are the types of problems in which ANN can be applied? **(07 Marks)**

c. Discuss the perceptron training rule and delta rule that solves the learning problem of perceptron. **(07 Marks)**

OR

6 a. List the appropriate problems for neural network learning. **(04 Marks)**

b. Explain the back propagation algorithm. Why is it not likely to be trapped in local minima? **(10 Marks)**

c. What is gradient descent and delta rule? Why stochastic approximation to gradient descent is needed? **(06 Marks)**

Module-4

7 a. Define Bayesian theorem and explain Maximum A Posteriori (MAP) and Maximum Likelihood (ML) hypothesis. **(10 Marks)**

b. Estimate conditional probabilities of each attributes {colour, type, origin} for the stolen classes: {yes, no} using the data given in the Table 7(b) using these probabilities estimate the probability values for the new instance – (color = red, type = SUV, origin = domestic).

Colour	Type	Origin	Stolen
Red	Sports	Domestic	Yes
Red	Sports	Domestic	No
Red	Sports	Domestic	Yes
Yellow	Sports	Domestic	No
Yellow	Sports	Imported	Yes
Yellow	SUV	Imported	No
Yellow	SUV	Imported	Yes
Yellow	SUV	Domestic	No
Red	SUV	Imported	No
Red	Sports	Imported	Yes

Table 7(b) **(10 Marks)**

OR

8 a. Explain the Naïve Bayes classifier algorithm and Bayesian belief networks with example. **(14 Marks)**

b. Explain EM algorithm. **(06 Marks)**

Module-5

9 a. Define the following terms:
i) Sample error ii) True error iii) Expected value. **(06 Marks)**

b. Explain the K-nearest neighbor algorithm for approximating a discrete valued function $f : R^n \rightarrow V$ with pseudo code. **(08 Marks)**

c. Explain case based reasoning with example. **(06 Marks)**

OR

10 a. What is reinforcement learning and explain the reinforcement learning problem with neat diagram. **(07 Marks)**

b. Explain locally weighted linear regression. **(07 Marks)**

c. Define ϕ - learning and write down ϕ - learning algorithm. **(06 Marks)**

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