CBCS SCHEME

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17CS73

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
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. Describe the following problems with respect to tasks, performance and experience
   i) A checkers learning problem
   ii) A handwriting recognition learning problem
   iii) A robot driving learning problem. **(06 Marks)**

b. List out any four applications of machine learning. **(04 Marks)**

c. Find the maximally general hypothesis and maximally specific hypothesis taking the enjoy sport concept and training instances given in Table 1(c) and discuss the advantages of the algorithm. **(10 Marks)**

Table 1(c)

Examples	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

OR

2 a. Explain the steps in designing learning system in details. **(10 Marks)**

b. Describe the find-s algorithm. Find the most specific hypothesis by taking data set given in Table 2(b) and discuss the issues with the algorithm. **(10 Marks)**

Table 2(b)

Example	Eyes	Nose	Head	Fcolor	Hair	Smile
1	Round	Triangle	Round	Purple	Yes	Yes
2	Square	Square	Square	Green	Yes	No
3	Square	Triangle	Round	Yellow	Yes	Yes
4	Round	Triangle	Round	Green	No	No
5	Square	Square	Round	Yellow	Yes	Yes

Module-2

3 a. Explain the concept of entropy and information gain. **(04 Marks)**

b. Apply ID3 algorithm for constructing decision tree for the training example shown in Table 3(b). Here the target attribute is classification. Draw the complete decision tree. **(12 Marks)**

Table 3(b)

Day	A1	A2	A3	Classification
1	True	Hot	High	No
2	True	Hot	High	No
3	False	Hot	High	Yes
4	False	Cool	Normal	Yes
5	False	Cool	Normal	Yes
6	True	Cool	High	No
7	True	Hot	High	No
8	True	Hot	Normal	Yes
9	False	Cool	Normal	Yes
10	False	Cool	High	No

c. Explain Inductive bias in decision tree. **(04 Marks)**

OR

4 a. Discuss the following issues in detail:
i) Alternative measures for selecting attributes
ii) Incorporating continuous valued attributes
iii) Handling training examples with missing attribute values. **(06 Marks)**

b. Discuss the two approaches to prevent over fitting the data. **(06 Marks)**

c. Construct decision trees to represent the Boolean functions:
i) A && ¬ B
ii) A ∨ [B&&C]
iii) A XOR B
iv) [A&&B] ∨ [C&&D] **(08 Marks)**

Module-3

5 a. What is Artificial Neural Network? Explain appropriate problem for neural network learning with its characteristics. **(08 Marks)**

b. Define perception. Explain the concept of single perception with neat diagram and represent the Boolean function of AND, OR using perceptron. **(12 Marks)**

OR

6 a. Write a note on: i) Perceptron training rule ii) Gradient descent and Delta rule. **(08 Marks)**

b. Describe the multilayer neural network. Derive the back propagation rule considering the output layer and training rule for output unit weights. **(12 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). **(10 Marks)**

Table 7(b)

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

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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