USN

Fifth Semester MCA Degree Examination, Dec.2024/Jan.2025
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 machine learning. Mention five applications of machine learning. **(10 Marks)**
   b. Apply candidate elimination algorithm and obtain the version space considering the training examples given in Table Q1(b).

Eyes	Name	Head	Fcolor	Hair?	Smile? Tc
Round	Triangle	Round	Purple	Yes	Yes
Square	Square	Square	Green	Yes	No
Square	Triangle	Round	Yellow	Yes	Yes
Round	Triangle	Round	Green	No	No
Square	Square	Round	Yellow	Yes	Yes

Table Q1(b)   **(10 Marks)**

OR

2 a. Explain the following with respect to designing a learning system:
   i) Choosing the training experience   ii) Choosing the target function
   iii) Choosing a representation for the target function.   **(10 Marks)**
   b. Write Find-S algorithm. Apply the Find-S for Table Q1(b) to find maximally specific hypothesis.   **(10 Marks)**

Module-2

3 a. Explain the concept of decision tree learning. Discuss the necessary measures required to select the attribute for building a decision tree using ID3 algorithm.   **(10 Marks)**
   b. Explain the following with respect to decision tree learning:
   i) Incorporating continuous valued attributes
   ii) Alternative measures for selecting attributes
   iii) Handling training examples with missing attribute values.   **(10 Marks)**

OR

4 a. Construct decision tree using ID3 considering the following training examples given in the table below.

Weekend	Weather	Parental availability	Wealthy	Decision class
H_1	Sunny	Yes	Rich	Cinema
H_2	Sunny	No	Rich	Tennis
H_3	Windy	Yes	Rich	Cinema
H_4	Rainy	No	Poor	Cinema
H_5	Rainy	Yes	Rich	Home
H_6	Rainy	No	Poor	Cinema
H_7	Windy	No	Poor	Cinema
H_8	Windy	No	Rich	Shopping
H_9	Windy	Yes	Rich	Cinema
H_{10}	Sunny	No	Rich	Tennis

(12 Marks)

b. Discuss the issues of avoiding overfitting the data and handling attributes with differing costs.   **(08 Marks)**

Module-3

5 a. Discuss the application of neural network which is used to steer an autonomous vehicle.   **(10 Marks)**
   b. Write gradient descent algorithm to train a linear unit along with the derivation.   **(10 Marks)**

OR

6 a. List any 5 appropriate problems for neural network learning.   **(05 Marks)**
   b. Define perceptron and discuss its training rule.   **(05 Marks)**
   c. Show the derivation of back propagation training rule for output unit weights.   **(10 Marks)**

Module-4

7 a. Explain Bayes theorem and mention the features of Bayesian learning.   **(10 Marks)**
   b. Prove that a maximum likelihood hypotheses can be used to predict probabilities.   **(10 Marks)**

OR

8 a. Describe MAP learning algorithm.   **(10 Marks)**
   b. Write and explain EM algorithm.   **(10 Marks)**

Module-5

9 a. Explain K-nearest neighbor learning algorithm.   **(10 Marks)**
   b. Write a note on Q-learning.
(10 Marks)

OR

10 a. Explain locally weighted linear regression and radial basis functions.   **(10 Marks)**
    b. What is reinforcement learning? How it differs from other function approximation tasks?   **(10 Marks)**

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