USN

Seventh Semester B.E. Degree Examination, June/July 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.   Define Machine Learning. Explain with examples, why Machine Learning is important.
(06 Marks)

   b.   Describe the following problems with respect to Task, Performance and Experience.
   - a)   A Checkers learning problem.
   - b)   A Handwritten recognition learning problem.
   - c)   A Robot driving learning problem.
   (06 Marks)

   c.   Write FIND – S Algorithm and explain with example given below :

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

(08 Marks)

OR

2   a.   Explain in detail the Inductive Bias of Candidate Elimination algorithm. **(08 Marks)**

   b.   Write the Candidate Elimination algorithm and illustrate with example. **(12 Marks)**

Module-2

3   a.   Explain representation of decision tree with example. **(04 Marks)**

   b.   Describe the ID3 Algorithm for decision tree learning with example. **(10 Marks)**

   c.   What are issues in learning decision trees? **(06 Marks)**

OR

4   a.   Consider the following set of training examples :
   - i)   What is entropy of this collection of training example with respect to the target function classification?
   - ii)   What is the information gain of a_2 and a_1 relative to these training examples?

Instance	1	2	3	4	5	6	7	8	9
a_1	T	T	T	F	F	F	F	T	F
a_2	T	T	F	F	T	T	F	F	T
Classification	+	+	–	+	–	–	–	+	–

(12 Marks)

   b.   Discuss Inductive Bias in Decision Tree Learning. **(08 Marks)**

Module-3

5   a.   Explain the concept of a Perceptron with a neat diagram. **(08 Marks)**

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

   c.   Differentiate between Gradient Descent and Stochastic Gradient Descent. **(04 Marks)**

OR

6 a. Derive the Back Propagation Rule. **(10 Marks)**
   b. Define Maximum A Posteriori (MAP) and Maximum Likelihood (ML) Hypothesis. Derive the relation for h_{MAP} and h_{ML} using Bayesian Theorem. **(10 Marks)**

Module-4

7 a. Explain Brute Force Bayes concept learning. **(06 Marks)**
   b. Discuss Maximum Likelihood and Least Square Error Hypothesis. **(06 Marks)**
   c. Describe the concept of MDL. Obtain the equation for h_{MDL}. **(08 Marks)**

OR

8 a. Explain Naïve Bayes classifier with an example. **(10 Marks)**
   b. Explain the concept of EM Algorithm. Discuss what are Gaussian Mixtures. **(10 Marks)**

Module-5

9 a. Define the following terms :
   i)   Sample error   ii) True error   iii) Random variable
   iv) Expected value   v)   Variance   vi) Standard Deviation. **(12 Marks)**
   b. Explain K – Nearest Neighbor learning algorithm. **(08 Marks)**

OR

10 a. Explain Locally Weighted Linear Regression. **(06 Marks)**
    b. Write Reinforcement Learning problem characteristics. **(06 Marks)**
    c. Explain the Q Function and Q Learning Algorithm assuming deterministic rewards and actions with example. **(08 Marks)**

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