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15EC834

Eighth Semester B.E. Degree Examination, June/July 2023
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 machine learning. Describe the steps in designing learning system. **(08 Marks)**
   b. Write candidate-elimination algorithm and illustrate with an example. **(08 Marks)**

2 a. Describe FIND-S algorithm. Explain it by considering the training instance of Enjoy Sport given in Table.Q2(a).

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

Table.Q2(a)   **(10 Marks)**

   b. Describe the following problems with respect to tasks, performance and experience.
   (i)   A checkers learning problem
   (ii) Hand-written recognition learning problem
   (iii) A robot driving learning problem. **(06 Marks)**

Module-2

3 a. With the help of an example, describe ID3 algorithm for decision tree learning. **(08 Marks)**
   b. What is decision tree? Describe its use for classification with an example. **(08 Marks)**

4 a. For the transaction shown in the Table.Q4(a), compute:
   (i) Entropy of the collection of transaction records of table with respect to classification.
   (ii) What are the information gain of a_1 and a_2 relative to the transactions of the table?

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
Target class	+	+	−	+	−	−	−	+	−

the Table.Q4(a)   **(08 Marks)**

   b. How a single perceptron can be used to represent the Boolean functions such as AND and OR? **(08 Marks)**

Module-3

5 a. Define Bayesian theorem and Maximum A Posteriori (MAP) hypothesis. **(04 Marks)**
   b. Derive an equation for MAP hypothesis using Bayes theorem. **(05 Marks)**
   c. Consider a medical diagnosis problem in which there are two alternative hypothesis :
   i) That the patient has a particular form of cancer (+) and
   ii) That the patient does not (−). A patient takes a lab test and the result comes back positive. 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. Furthermore, 0.008 of the entire populations have this cancer. Determine whether the patient has cancer or not using MAP hypothesis. **(07 Marks)**

6   a. Describe Brute – Force MAP learning algorithm.   (04 Marks)
    b. Discuss the Naive Bayees classifier.   (04 Marks)
    c. The following table gives–data set about stolen vehicles. Using Naïve bayes classifier classify the new data (RED, SUV, 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

(08 Marks)

Module-4

7   a. Discuss the K-nearest neighbor learning.   (04 Marks)
    b. Discuss locally weighted regression.   (04 Marks)
    c. Explain the CADET system using case based reasoning.   (08 Marks)

8   a. Define the following terms with respect to K-nearest neighbor learning.
        i) regression   ii) residual   iii) kernel function.   (03 Marks)
    b. Explain radial basis functions.   (05 Marks)
    c. Explain the FOIL algorithm.   (08 Marks)

Module-5

9   a. Illustrate PROLOG – EBG algorithm with an example.   (07 Marks)
    b. Discuss Inductive – Analytical approaches to learning.   (09 Marks)

10 a. Compare the essential difference between analytical and inductive learning methods.
                                                                                                    (08 Marks)
    b. Elucidate the FOCL algorithm.   (08 Marks)

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