CBCS SCHEME

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17CS73

Seventh Semester B.E. Degree Examination, July/August 2022
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. Discuss with examples, some useful application of machine learning. **(06 Marks)**

b. Describe in detail all the steps involved in designing a learning system. **(06 Marks)**

c. Describe Find-S algorithm. Explain its working taking the Enjoysports concept and training instances given below:

Example	Sky	Air Temp.	Humidity	Wind	Water	Forecast	Enjoy Sports
1	Sunny	Warm	Normal	Strong	Warm	Same	Yes
2	Sunny	Warm	High	Strong	Warm	Same	Yes
3	Rainy	Cold	High	Strong	Warm	Change	Yes
4	Sunny	Warm	High	Strong	Cool	Change	No

(08 Marks)

OR

2 a. What do you mean by well-posed learning problem? Explain with example. **(04 Marks)**

b. Explain the various stages involved in designing a learning system in brief. **(08 Marks)**

c. Consider the following training example and apply candidate elimination algorithm:

RID	Origin	Manufacture	Color	Decade	Type	Class
1	Japan	Honda	Blue	1980	Economy	Positive
2	Japan	Toyota	Green	1970	Sports	Negative
3	Japan	Toyota	Blue	1990	Economy	Positive
4	USA	Chrysler	Red	1980	Economy	Negative
5	Japan	Honda	White	1980	Economy	Positive

(08 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. Explain Naïve Bayes classifier and Baysiean belief networks. **(10 Marks)**

b. 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 corrects negative in only 97% of the cases in which the disease is not present. Furthermore, 0.008 of the entire population has this cancer. Determine whether the patient has cancer or not using MAP hypothesis. **(10 Marks)**

OR

8 a. Explain the concept of EM algorithm. Discuss what are Gaussian mixtures. **(08 Marks)**

b. Define MAP hypothesis. Derive the relation for hMAP using Bayesian theorem. **(08 Marks)**

c. Describe Brute-Force MAP learning algorithm. **(04 Marks)**

Module-5

9 a. Define the following terms:

(i) Sample error (ii) True error (iii) Random variable

(iv) Expected value (v) Variance **(10 Marks)**

b. Explain locally weighted linear regression. **(04 Marks)**

c. Explain the Q function and Q learning algorithm. **(06 Marks)**

OR

10 a. Write short notes on the following:

(i) Estimating Hypothesis Accuracy

(ii) Binomial Distribution **(08 Marks)**

b. Discuss the learning task and Q learning in the context of reinforcement learning. **(08 Marks)**

c. Write a short note on radial basis function. **(04 Marks)**

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