



CBCS SCHEME

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? (08 Marks)
- (ii) What is the information gain of a₂ relative to these training examples? (04 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) $A \text{ XOR } B$ (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 Bayesian 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 (08 Marks)
 (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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