U.S.N. | | | | | | | | | | |

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

May / June 2019 Semester End Main Examinations

Programme: B.E.
Branch : Information Science and Engineering
Course Code: 16IS6DEMLG
Course: Machine Learning

Semester : VI
Duration: 3 hrs.
Max Marks: 100
Date: 04.06.2019

Instructions: 1. Answer any FIVE full questions, There is no internal choice in unit 1, 2 and 5. Whereas there is internal choice in unit 3 (Question 3 **OR** 4) and unit 4 (Question 5 **OR** 6).

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1 a) Specify a learning task for 'Checkers learning problem' and discuss the following with respect to the learning task **10**

i. Choosing a training experience.

ii. Choosing a target function.

iii. Choosing a function approximation algorithm.

b) Write the Candidate Elimination algorithm and show the sequence of S and G boundary set for the below training examples. **10**

Example	Sky	Air	Humidity	Wind	Water	Forecast	EnjoySport
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

UNIT - II

2 a) What is decision tree learning? Discuss ID3 algorithm specialized to learning Boolean valued function. **06**

b) For the transaction shown in the table. Compute the following **10**

Instances	1	2	3	4	5	6	7	8	9
a_1	T	T	T	F	F	F	F	T	F
a_2	T	F	T	F	T	F	F	F	T
Classification	+	+	-	+	-	-	-	+	-

i. Entropy of the collection of records of the table with respect to the classification?

ii. Information gain of a_1 and a_2 relative to the transaction of the table

iii. Which attribute will be chosen as a root node of a tree? Justify your answer.

c) Discuss the issues of decision tree learning. **04**

UNIT - III

3 a) Illustrate the working of Perceptron. Derive an expression for gradient descent rule to minimize the error. **10**

b) Discuss the importance of the following terms with respect to backpropagation algorithm in neural networks. **10**

i. Hidden Layer

ii. Generalization

iii. Overfitting

iv. Stopping Criterion

OR

4 a) Design the following by applying the concept of Perceptron **10**

i. A two-input Perceptron that implements the Boolean function **A** $\wedge\neg$**B**.

ii. A two-layer network of Perceptron that implements **A *XOR B***.

b) Write an algorithm for backpropagation which uses stochastic gradient descent method. Comment on the effect of adding momentum to the network. **10**

UNIT - IV

5 a) Using Bayes theorem, derive an equation for Maximum A Posteriori (MAP) hypothesis. **06**

b) The following table gives data set about stolen vehicles. Use Naïve Bayes classifier to classify the new data (Red, SUV, Domestic). **08**

Color	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

c) In medical diagnosis, prior probabilities of diseases are based on the physician's assessment of such things as geographical location, seasonal influence, occurrence of epidemics, and so forth. Assume that a patient is believed to have one of two diseases, denoted D_1 and D_2 with $P(D_1)=0.6$ and $P(D_2)=0.4$ Suppose that given diseases D_1 and D_2, the probabilities that the patient will have symptoms S_1, S_2 or S_3 are as follows. **06**

	S_1	S_2	S_3
D_1	0.15	0.1	0.15
D_2	0.80	0.15	0.03

Compute the posterior probabilities of each disease given the following medical findings.

i. The patient has symptom S_1.

ii. For the patient with symptom S_1 in part (i), suppose we also find symptom S_2. What are the revised probabilities of D_1 and D_2.

OR

6 a) Discuss Naive Bayes Classifier? Illustrate with an example **10**

b) Derive an expression for gradient search to maximize likelihood in a neural network. **10**

UNIT - V

7 a) Describe K-NN algorithm for continuous valued target function. Discuss one major drawback of this algorithm and suggest a solution to optimize a problem? **08**

b) Describe locally weighted linear regression. Mention three possible criteria to derive a local approximation of training example. **06**

c) Differentiate between Analytical learning and Reinforcement learning. **06**

*****