Nirma University

Institute of Technology

Semester End Examination (RPR), December - 2018

B. Tech. in Computer Engineering / Information Technology, Semester-VI

CE623 Machine Learning

Roll / Exam No. _____ Supervisor's initial with date _____

Time: 3 Hours Max. Marks: 100

Instructions:
1 Attempt all questions of Section I and II separately in same Answerbook.
2. Figures to right indicate full marks.
3. Draw neat sketches wherever necessary.
4. Make suitable assumptions wherever necessary.

SECTION I

Q.1 Answer the following questions: **[18]**

(a) A dietetic student wants to look at the relationship between calcium intake and knowledge about calcium in sports science students. Following table shows data collected by student. Using statistical approach, find linear relation between knowledge about calcium and calcium intake in sports science students. [12]

Knowledge score	Calcium Intake
10	450
15	525
22	710
14	493
25	733
28	763
18	798
24	754
30	805
26	730

(b) What is the need of scaling input feature before applying any of the machine learning algorithm? Give proper example for the same. [06]

Q.2 Answer the following questions: **[16]**

(a) Differentiate between hard clustering and soft clustering with proper example. [06]

OR

(a) Describe appropriate applications where model-based and density based clustering techniques are used. [06]

(b) For following data, use information gain and find out the root node for decision tree. [10]

Attribute				Class Label
Gender	Car Ownership	Travel Cost	Income Level	Transportation
Male	0	Cheap	Low	Bus
Male	1	Cheap	Medium	Bus
Female	1	Cheap	Medium	Train
Female	0	Cheap	Low	Bus
Male	1	Cheap	Medium	Bus
Male	0	Standard	Medium	Train
Female	1	Standard	Medium	Train
Female	1	Expensive	High	Car
Male	2	Expensive	Medium	Car
Female	2	Expensive	High	Car

Q.3 Answer the following questions: **[16]**

(a) Define following terms with appropriate examples. [06]
VC Dimension
PAC Learning
Version Space

OR

(a) From the below given confusion matrix, find out accuracy, error rate, sensitivity and specificity. [06]

Actual class	Predicted class		
	Classes	Yes	No
	Yes	650	50
	No	75	625

(b) Use linear SVM to find hyper plane equation for support vectors s1=(2,2), s2=(3,2), s3=(2,0). Here s1 and s2 represent positive class and s3 represents negative class. Classify point (4,3) into positive or negative class according to the hyperplane parameter. [10]

SECTION II

Q.4 Answer the following questions: **[18]**

(a) For the following data tuples compute the values for the number of true positives (TP), false positives (FP), true negatives (TN) and false negatives (FN), True Positive Rate (TPR) and False Positive Rate (FPR). Also plot ROC curve for the data. [08]

Tuple No.	Class	Probability
1	P	0.90
2	P	0.85
3	P	0.84
4	N	0.79
5	N	0.75
6	P	0.73
7	N	0.70

8	N	0.68
9	P	0.65
10	N	0.63

(b) Define following terms with example: [06]
1) Elitism
2) Rank based selection
3) Roulette wheel selection

(c) In machine learning, how underfitting and overfitting is defined? How the problem of overfitting can be handled? [04]

Q.5 Answer the following questions: **[16]**

(a) What is Q-learning? Give the application where Q-learning can be applied. [06]

(b) Show working of Artificial Neural Network with proper example. [06]

OR

(b) Give application area in which reinforcement learning can be used. Also explain components of reinforcement learning with an example. [06]

(c) Design the fitness function for knapsack problem which can be used in genetic programming. [04]

Q.6 Answer the following questions: **[16]**

(a) Apply Gaussian naïve bayes classification for the following problem. [10]

Gender	height (feet)	weight (lbs)	foot size(inches)
Male	6	180	12
Male	5.92 (5'11")	190	11
Male	5.58 (5'7")	170	12
Male	5.92 (5'11")	165	10
Female	5	100	6
Female	5.5 (5'6")	150	8
Female	5.42 (5'5")	130	7
Female	5.75 (5'9")	150	9

(b) Explain the influence of outliers in model creation? Explain the same with proper example. [06]

OR

(b) Give proper example of AdaBoost ensemble method. List out it's advantages and disadvantages. [06]