Nirma University

Institute of Technology

Semester End Examination (IR/RPR) / SPE, February - 2022

B. Tech. in Computer Science and Engineering, Semester-V

2CS501 Machine Learning

Roll / Exam No.		Supervisor's initial with date	

Time: 2 Hours | Max. Marks: 50

Instructions:
1. Attempt all questions.
2. Figures to right indicate full marks.
3. Draw neat sketches wherever necessary.
4. Make suitable assumptions wherever necessary.

Q.1 Answer the following questions: **[20]**

(a) CLO1 A dietetic student wants to look at the relationship between calcium intake and knowledge about calcium in 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. [08]

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) CLO3 Consider the training data in the following table where Play is a class attribute. In the table, the Humidity attribute has values "L" (for low) or "H" (for high), Sunny has values "Y" (for yes) or "N" (for no), Wind has values "S" (for strong) or "W" (for weak), and Play has values "Yes" or "No". What is class label for the following day (Humidity=L, Sunny=N, Wind=W), according to naïve Bayesian classification? [06]

Humidity	Sunny	Wind	Play
L	N	S	NO
H	N	W	YES
H	Y	S	YES
H	N	W	YES
L	Y	S	NO

(c) CLO3 Define following machine learning techniques and give its real life applications techniques: [06]

1) Kernel tricks in Support Vector Machine
2) Reinforcement Learning
3) Expectation Maximization

Q.2 **Answer the following questions:** **[20]**

(a) CLO2 Take 10 points in two dimensions having coordinate values as: A: (2,10), B:(3,5), C:(2,2), D:(4,5), E:(2,6), F:(10,15), G:(12,14), H:(14,11), I:(13,13), J:(15,12). Use hierarchical clustering to cluster them also prepare dendograms. Use *min* distance to update the distance between the clusters. [06]

OR

(a) CLO2 Supervised learning is a learning paradigm where the model is given a labelled data and the outcome is the learned model. A user is training Naïve Bayes and ANN using the same training data. The training data is Iris data with 150 instances and three class and hence first 50 instance belongs to Class-I followed by 50 instances of Class-II and finally 50 instances of class-III. The user trains both the model with shuffling and without shuffling the sequence of training instances. What will be the difference in the outcome in both the models and both the options? Explain with proper reasons. [06]

(b) CLO3 Use linear SVM to find hyper plane equation using support vectors s1=(0,1), s2=(0,-1), s3=(2,0). Here s1 and s2 represents negative class and s3 represents positive class. [08]

OR

(b) CLO3 Which type of artificial neural network is needed to classify non-linearly separable data? How backpropogation updates the network parameters? Explain with suitable example. [08]

(c) CLO2 Find out accuracy, error rate, sensitivity, specificity, F1 score using the below given confusion matrix. Which evaluation measure help to identify the imbalance in the dataset? [06]

		Predicted class	
Actual class	Classes	Yes	No
	Yes	300	150
	No	50	1500

Q.3 **Answer the following questions:** **[10]**

(a) CLO3 In a housing price prediction regression problem, there are three attributes A1, A2, and A3 and the dependent variable is Y (housing price). There are 100 instances and after using gradient descent algorithm the learnt coefficient are $[\theta_0\ \theta_1\ \theta_2\ \theta_3] = [1.2, -0.3, 1.1, 0.003]$. Later it was revealed that the attribute names are *size of the house, age of the house and height of the owner*. Match the attributes A1, A2 and A3 with attribute names: *size of the house, age of the house and height of the owner* with proper justification. [04]

(b) CLO1 How linear discriminant analysis helps in dimensionality reduction? Give proper example. [04]

(c) CLO1 Which are the assumptions considered in Naïve Bayes classification? [02]