POSSESION OF MOBILES IN EXAM IS UFM PRACTICE.

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B.Tech, ECE, VIth Semester

Course Name: Machine Learning for Signal Processing **Max Time: 2 hr**

Course Code: 18B13EC314 **Max Marks: 35**

After learning this course students will be able to:

CO1: Illustrate various machine learning approaches.
CO2: Experiment with the different techniques for feature extraction and feature selection
CO3: Apply and analyse various classifier models for typical machine learning applications
CO4: Make use of deep learning techniques in real life problems

Note: Attempt all questions in sequence only

Q1. [CO1] What is the difference between feature extraction and feature selection? List some techniques under each of them. [2M]

Q2. [CO1] List different classification models used for linear and non-linear data. [2M]

Q3. [CO2] For the given data in Table 1, compute Goodman-Kruskal measure.

Table 1

	Test Scores			
		Low	Medium	High
Time Taken	Low	7	7	9
	Medium	9	9	9
	High	9	9	7

Based on z-value (for 5% alpha level) mentioned in z table (z=1.96), Decide whether we can reject the null hypothesis or not. [5M]

Q4. [CO2] Given a dataset consisting of two blood pressure variables of six individuals in Table 2

Table 2

Systolic BP (X1)	Diastolic BP(X2)
126	78
128	80
128	82
130	82
130	84
132	86

Apply Principal component analysis (PCA) to reduce this dataset to one dimension. [6M]

Q5. [CO3] One of the most commonly used kernel in SVM is the Gaussian RBF kernel given by : $K(x_i, x_j) = exp\left(\frac{-\|x_i - x_j\|^2}{2\sigma}\right)$. Suppose we have three points z_1, z_2 & x. z_1 is geometrically very close to x and z_2 is geometrically far away from x. What is the value of $K(z_1, x)$ & $K(z_2, x)$? Choose one of the following. Give reasons for the same:

a) $K(z_1,x)$ will be close to 1 and $K(z_2,x)$ will be close to 0.
b) $K(z_1,x)$ will be close to 0 and $K(z_2,x)$ will be close to 1. [2M]

Q6. (a) [CO3] Our goal is to build a decision tree model to determine if credit card transaction are fraudulent. Build the decision tree using CART algorithm based on the dataset given in table 3. Also indicate the index and gain achieved at each node/leaf.

Table 3: A dataset of 6 transactions that have been labelled as fraudulent or not, with info about their value and their vendor

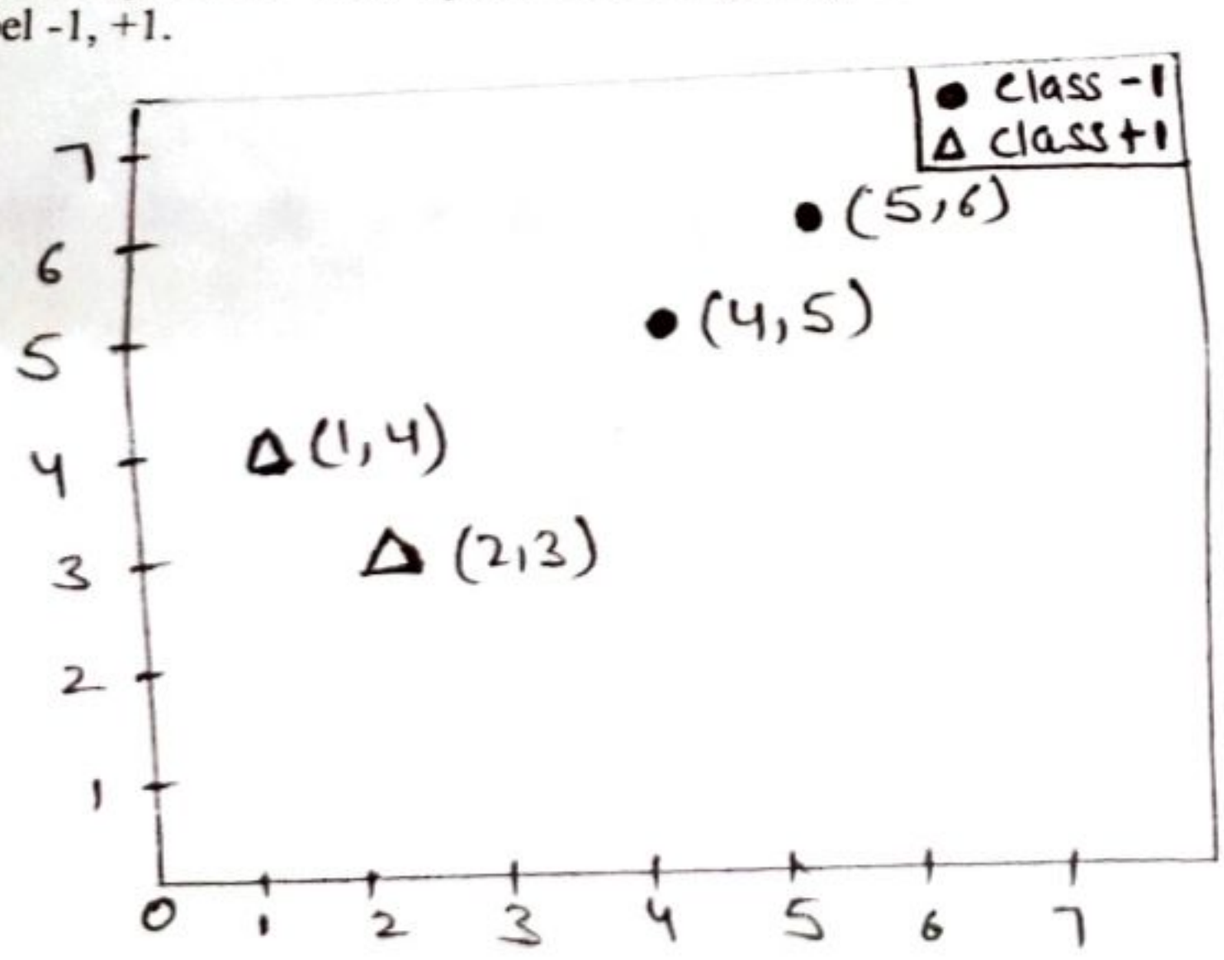
	Value	Approved vendor	Fraudulent
Transaction 1	100	Not Approved	Yes
Transaction 2	100	Approved	No
Transaction 3	10,000	Approved	No
Transaction 4	10,000	Not Approved	Yes
Transaction 5	5,000	Approved	Yes
Transaction 6	100	Approved .	No.

[5M]

(b) [CO3] Discuss pruning used in decision tree algorithm. [2M]

Q7. (a) [CO3] What is the difference between functional margin and geometrically margin in SVM? How does the scaling of weight vectors w and bias b affects the two margin? [3M]

(b) [CO3] Support vector machine learn a decision boundary leading to the largest margin from both classes. You are training SVM on a tiny dataset with 4 points in the figure given below. This dataset consists of two examples of two classes with label -1, +1.



Find the weight w and bias b. Write the equation corresponding to the decision boundary. [3M]

Q8 (a) [CO4] Give block diagram representation of Convolution Neural Network (CNN) architecture. Explain the working of all layers used in the architecture. [3M]

(b) [CO4] Discuss the application areas of deep learning briefly. [2M]