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20CS610

JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

VI Semester B.E Degree Examination

Department of Computer Science and Engineering

MACHINE LEARNING

Duration: 3Hrs Max. Marks: 100

NOTE: 1. Part A is Compulsory.
2. Part B has internal choice
3. Use of Scientific calculator is allowed

PART – A

Q.NO	CO	CD	PI	QUESTION	MARKS
1. (a)	CO2	L1	4.1.1	Explain the concept of Machine Learning with a flow diagram indicating various phases of Machine Learning	5
1. (b)				With a neat block diagram explain the term Reinforcement learning	3
1.(c)				List any four applications of Machine learning.	2
2. (a)	CO1	L3	1.1.2	Box P has 2 red balls and 3 blue balls and box Q has 3 red balls and 1 blue ball. A ball is selected as follows: (i) Select a box (ii) Choose a ball from the selected box such that each ball in the box is equally likely to be chosen. The probabilities of selecting boxes P and Q are (1/3) and (2/3), respectively. Given that a ball selected in the above process is a red ball, the probability that it came from the box P	4
2.(b)				Derive the expression to find optimal decision boundary, if the densities are continuous and overlapping with relevant sketches	4
2.(c).				What is probability of error and how do you minimize it	2
3. (a)	CO3	L1	4.1.2	What is clustering and list any three applications of clustering.	3
3. (b)				Explain the different categories of clustering.	5

3. (c)				Write the algorithm for agglomerative clustering	2
4. (a)				Explain the following terminologies : 1. Feature Selection, 2. Feature extraction.	4
4. (b)	CO4	L1	4.1.2 2.4.1	With relevant expressions and plot explain the following concepts 1. Within class Scatter Matrix 2. Between class scatter matrix	4
4.(c).				What are Eigen Vectors	2
5. (a)	CO5	L3	4.2.1	With a neat diagram explain the functioning of a Mc Culloch-Pitts Neuron.	4
5. (b)				How are OR , AND and NOT Functions realized using an artificial neuron? Indicate the decision boundaries for the same.	6

PART – B

Q.NO	CO	CD	PI	QUESTION	MARKS
6. (a)	CO1	L3	1.1.2	A committee of 3 persons is to be constituted from a group of 2 men and 3 women. In how many ways can this be done? How many of these committees would consist of 1 man and 2 women?	3
6. (b)			2.4.1	With relevant formula and graph explain the following a. Uniform Distribution b. Normal Distribution	2 5
				OR	
7. (a)	CO1	L3	1.1.2	A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has (i) no girls (ii) at least one boy and one girl (iii) at least three girls	3
7. (b)			2.4.1	With relevant expressions explain conditional probability and its use.	4
7. (c)				Explain the properties of normal distribution	3

8. (a)	CO2	L1	2.4.1	Explain Kernel density estimate with a suitable example.	5
8. (b)				Explain the properties of Kernel function	3
8.(c)				What is the loss function in machine learning? How do you calculate?	2
				OR	
9. (a)	CO2	L3	1.1.2	A factory has two machines I and II. Machine I produces 40% of items of the output and Machine II produces 60% of the items. Further 4% of items produced by Machine I are defective and 5% produced by Machine II are defective. An item is drawn at random. If the drawn item is defective, find the probability that it was produced by Machine II.	4
9. (b)			4.1.1	Write the advantages and disadvantages of KNN	3
9.(c)				Briefly explain any three applications of KNN	3

10. (a)	CO3	L4	4.2.1	Write your observations on choosing the value of K and initial centroids in partitional clustering	4
10. (b)				Apply single linkage algorithm for the following data samples and show the clustering results	6
				OR	
11. (a)	CO3	L4	4.2.1	With illustrations, explain the working of Wards algorithm.	8
11. (b)				Write the steps followed in divisive clustering algorithm	2

Point	a	b
P1	0.07	0.83
P2	0.85	0.14
P3	0.66	0.89
P4	0.49	0.64
P5	0.80	0.46

12. (a)	CO4	L5	2.4.1	Apply PCA for the following dataset containing 4 samples and obtain the principal components, also calculate the percentage of feature captured by each principal component. **Feature** | **Sample1** | **Sample2** | **Sample3** | **Sample4** **X1** | 4 | 8 | 13 | 7 **X2** | 11 | 4 | 5 | 14	8
12. (b)				How is LDA different from PCA	2
				OR	
13. (a)	CO4	L4	2.4.1	Find the singular values for the following Matrix A = 1 1 0 1 0 0 0 1 1 1 0 0	7
13. (b)				Briefly Explain the concept of SVD	3
14. (a)	CO5	L5	4.2.1	Trace and explain Perceptron Model for implementing OR function with at least one solution indicating the decision boundary .	7
14. (b)				Summarize the limitations of perceptron	3
				OR	
15	CO5	L2	4.2.1	With relevant plots, explain any four commonly used activation functions	10

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SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VI SEMESTER B.E DEGREE – CIE-1/TEST-1 (Section – 'A', 'B' and 'C')

Branch: CS&E

Name of the Paper Setter: Dr. HCV and Prof. Rakshitha R

20CS610 – Machine Learning

Duration: 01 Hr. (7:30 AM to 8:30 AM)
Date: 17/04/2023

Max. Marks: 20
Day: Monday

STUDENT NAME: **Roll No:**

COURSE OUTCOMES		*Blooms Cognitive Domains*
After completing this course, students should be able to:		1. *Knowledge* 2. *Comprehension* 3. *Application* 4. *Analysis* 5. *Synthesis* 6. *Evaluation*
CO-1	Estimating Parameters from Samples.	
CO-2	Classify Patterns using Parametric and Non-Parametric Techniques.	
CO-3	Clustering of Samples using different Clustering Algorithms.	
CO-4	Apply various Dimensionality Reduction Techniques to reduce the Dimension.	

Note: Answer any two questions

Q. No.	CO	Cognitive Domain	Questions	Marks
1(a)	CO-1	Knowledge	Explain the various components of a typical Machine Learning Algorithm along with the flow diagram indicating the various activities of ML.	04
1(b)			What is Reinforcement learning. Illustrate the same with a suitable example.	03
1(c)			List and explain the different methods of obtaining probability estimates	03
2(a)	CO-1	Comprehension Application	Consider two unfair coins A and B. A has P(H) = 0.7 and B has P(T) = 0.4 Flip the coin A, if the outcome is Head, flip coin B otherwise Flip coin A again. Write the outcome of sample space with the outcome distribution.	02
2(b)			If you draw three cards from a deck one at a time, what is the probability : (i) All the three cards are Red. (ii) you do not draw any spades. (iii) A Club, a Heart and a Diamond	06
2(c)			Are the events "Drawing an Ace" and " Drawing a Red card" independent.	02
3(a)	CO-2	Application	Define parametric decision making with the underlying assumptions and justify the use of term parametric decision.	02
3(b)			Write the Bayes expression and explain the various terms used in Bayes theorem	05
3(c)			A factory has two machines I and II. Machine I produces 40% of items of the output and Machine II produces 60% of the items. Further 4% of items produced by Machine I are defective and 5% produced by Machine II are defective. An item is drawn at random. If the drawn item is defective, find the probability that it was produced by Machine II.	03

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VI SEMESTER B.E DEGREE – CIE-1/TEST-1 (Section – 'A', 'B' and 'C')

Branch: CS&E

Name of the Paper Setter: Dr. HCV and Prof. Rakshitha R

20CS610 – Machine Learning

Duration: 01 Hr. (9:30 AM to 10:30 AM)
Date: 25/05/2023

Max. Marks: 20
Day: Monday

STUDENT NAME: **Roll No:**

COURSE OUTCOMES		*Blooms Cognitive Domains*
	After completing this course, students should be able to:	*1. Knowledge* *2. Comprehension* *3. Application* *4. Analysis* *5. Synthesis* *6. Evaluation*
CO-1	Estimating Parameters from Samples.	
CO-2	Classify Patterns using Parametric and Non-Parametric Techniques.	
CO-3	Clustering of Samples using different Clustering Algorithms.	
CO-4	Apply various Dimensionality Reduction Techniques to reduce the Dimension.	

Note: Question 1 is compulsory, Internal choice between Qn 2 and Qn 3.

Q. No.	CO	Cognitive Domain	Questions	Marks
1(a) 1(b)	CO-2	Application	Define the following a. Histogram density estimation b. Entropy c. Information Gain	2+1+1
1(c)			Below is a small fictional dataset with fifteen entries. Each entry has answers to a series of questions. Most questions are about if people liked a certain type of food, in which the participant answered (1) for yes or (0) for no. The last column("midwest?") is our **target column indicating True or False Class.** Compute **Entropy** and **information gain of apple_Pie , Potato_Salad and sushi**	6

name	age	apple_pie?	potato_salad?	sushi?	midwest?
Jeff	32	0	1	1	1
Pete	25	1	1	0	1
Anne	33	1	1	0	1
Natalie	26	0	0	1	0
Stella	30	1	1	1	1
Rob	25	1	0	0	1
Joe	42	1	1	0	1
Jim	38	1	1	0	1
Lisa	36	1	1	0	0
Sarah	29	1	0	1	0
David	35	1	0	0	1
Eric	28	1	1	1	0
Mike	20	0	1	0	1
Karen	38	1	0	0	1
Megan	31	0	0	1	0

2(a)	CO-2	Application	Explain kernel density estimation steps for a triangular kernel with base = 3 for the sample points <x1,x2,x3> being <1,2,4>	5
2(b)			Compute the density for the data samples <3, 4.5, 5.2, 6, 7.5, 8.2> using a bin width 2 and with the density plot sketch.	3
2(c)			What is Jaccard distance. Find jaccard_similarity between 2 strings ("Morning", "Daylight")	2

Or

3(a)	CO-2	Application	With suitable illustrations explain the concept of Majority Vote and how the value of K impacts classification.	03
3(b)			How do you determine the value of K in KNN algorithm, explain the steps.	03
3(c)			Apply KNN for classifying the test data in the last row with K =3 and 5	04

Brightness	Saturation	Color
40	20	Red
50	50	Blue
60	90	Blue
10	25	Red
70	70	Blue
60	10	Red
25	80	Blue
30	**40**	**?**

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VI SEMESTER B.E DEGREE – CIE-3/TEST-3 (Section – 'A', 'B' and 'C')

Branch: CS&E

Name of the Paper Setter: Dr. HCV and Prof. Rakshitha

20CS610 – Machine Learning

Duration: 01 Hr. (12.30pm to 1.30pm)
Date: 19/6/2023

Max. Marks: 20
Day: Monsday

STUDENT NAME: Roll No:

COURSE OUTCOMES		Blooms Cognitive Domains
	After completing this course, students should be able to:	
CO-1	Use the concepts of probability and combinatorics, statistics to solve the real world problems.	1. Knowledge 2. Comprehension 3. Application 4. Analysis 5. Synthesis 6. Evaluation
CO-2	Develop simple ML algorithms using Bayes theorem, decision tree, and KNN for classification of real life patterns.	
CO-3	Use different types of clustering techniques to categorize data in any given dataset.	
CO-4	Use various dimensionality reduction techniques to select robust feature sets.	
CO-5	Use MLP to perform digit, character and image classification	

Note: Answer any two questions. Question Number 1 is compulsory.

Q. No.	CO	Cognitive Domain	Questions	Marks
1a	CO-4 4	Comprehension & Application	Define characteristic polynomial of a (3X3) matrix with a suitable example	3
1b	CO-3		Apply complete linkage Algorithm on the following dataset Data Points: 1 (X=4, Y=4); 2 (8, 4); 3 (15, 8); 4 (24, 4); 5 (24, 12)	7
2a	CO3	Application	Apply single linkage and complete linkage algorithms and generate hierarchical clusters followed by cluster dendrogram for the following data points < 8, 12, 20, 26, 36, 42>	6
2b			Write the algorithm for agglomerative clustering	2
2c			Define proximity matrix ith a suitable example	2

OR

3a	CO-4	Comprehension & Application	Explain tSingular value decomposition concepts with a suitable example	4
3b			Find the singular values of the following matrix A = 0 1 1 √2 2 0 0 1 1	6

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