Q. Code:875170

Reg. No. | | | | | | | | | | | | | |

B.E / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Sixth Semester

EC18016 - MACHINE LEARNING

(Electronics and Communication Engineering)

(Regulation 2018 / 2018A)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Distinguish between supervised and unsupervised classifiers.	**4**
CO 2	Categorize the data and identify the patterns.	**4**
CO 3	Illustrate methods for automatic training of classification systems.	**2**
CO 4	Examine classification problems probabilistically and estimate classifier performance.	**4**
CO 5	Use the principles of Bayesian parameter estimation and apply them in relatively simple probabilistic models.	**3**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Discuss the difference between a training set and a testing set.	**1**	**2**
2.	An insurance company insured 2000 scooter drivers, 4000 car drivers, and 6000 truck drivers. The probability of an accident involving a scooter driver, a car driver, and a truck is 0.01, 0.03, and 0.015, respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver?	**1**	**3**
3.	Compare the probabilistic model and the deterministic model.	**2**	**3**
4.	Identify the disadvantages of the K-NN algorithm.	**2**	**2**
5.	Summarise the advantages of the EM algorithm.	**3**	**2**
6.	Explain the two ways of calculating the principal components.	**3**	**2**
7.	Explain how to minimise the error in the backpropagation algorithm.	**4**	**2**
8.	Under what conditions does the perceptron rule fail and it becomes necessary to apply the delta rule?	**4**	**2**
9.	Summarise the properties of a Markov chain.	**5**	**2**
10.	Explain how to create a Bayesian network.	**5**	**2**

Part B (5 x 10 = 50 Marks)

11. (a)	Explain Bayes decision theory. Analyze the two category classifications with suitable example.	**(14)**	**1**	**4**
	(OR)			
(b)	**(i)** A person uses his car 30% of the time, walks 30% of the time and rides the bus 40% of the time as he goes to work. He is late 10% of the time when he walks; he is late 3% of the time when he drives; and he is late 7% of the time he takes the bus. a. What is the probability he took the bus if he was late? b. What is the probability he walked if he is on time?	**(6)**	**1**	**4**
	(ii) Analyze the Gaussian distribution with its probability density function.	**(8)**	**1**	**4**
12. (a)	Consider the table in which the data represents the two attributes as rating of acting of actors in that movie and other is rating of story line of that movie. The rating scale is used from 1(excellent) to 7 (poor). Classify whether a given movie is good or not using k-NN. Apply K Nearest Neighbour classifier to predict the class with the given features brightness and saturation. if the training examples are,	**(14)**	**2**	**4**

Brightness	Saturation	Class
40	20	Red
50	50	Blue
60	90	Blue
10	25	Red
70	70	Blue
60	10	Red
25	80	Blue

Assume k=5, for the test example

Brightness = 20, Saturation = 35, Class=?

(OR)

(b) For the given data, compute two clusters using K-means algorithm for clustering where initial cluster centers are (1.0, 1.0) and (5.0, 7.0). Execute for two iterations. **(14) 2 4**

Record number	A	B
R1	1.0	1.0
R2	1.5	2.0
R3	3.0	4.0
R4	5.0	7.0
R5	3.5	5.0
R6	4.5	5.0
R7	3.5	4.5

13. (a) Consider the two dimensional patterns (2, 1), (3, 5), (4, 3), (5, 6), (6, 7), (7, 8). Compute the principal component using PCA Algorithm. **(14) 3 4**

(OR)

(b) **(i)** Let there be a discrete Markov process with three states S1, S2 and S3. Suppose we have the following 10 observation sequences each of length 5: **(8) 3 4**

O1: S1 S2 S1 S1 S1
O2: S2 S1 S1 S3 S1
O3: S3 S1 S3 S2 S2
O4: S1 S3 S3 S1 S1
O5: S3 S2 S1 S1 S3
O6: S3 S1 S1 S2 S1
O7: S1 S1 S2 S3 S2
O8: S2 S3 S1 S2 S2
O9: S3 S2 S1 S1 S2
O10: S1 S2 S2 S1 S1

Estimate the transition probabilities.

(ii) Describe the dimensionality reduction technique. **6 3 4**

14. (a) State the mathematical formulation of the SVM problem. Give an outline of the method for solving the problem. **(14) 4 3**

(OR)

(b) **(i)** How a single perceptron can be used to represent the Boolean functions such as AND, OR? **(4) 4 3**

(ii) Discuss the steps involved in Back propagation algorithm. **(10) 4 3**

15. (a) What are Dynamic Bayesian Networks? Describe about the structure of a **(14) 5 3**

dynamic Bayesian network and its interpretation.

(OR)

(b)	Discuss the Bayesian network and use the example of "Exam Fear" to go into depth. Describe the creation of Bayesian networks as well.	**(14)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	**CO**	**RBT LEVEL**
16.	Use the following transition probabilities:	**(10)**	**5**	**5**

		Today		
		sunny	**cloudy**	**rainy**
Tomorrow	**sunny**	0.8	0.4	0.2
	cloudy	0.2	0.4	0.6
	rainy	0.0	0.2	0.2

Assume that today is cloudy so that the initial probabilities that it is sunny, cloudy, or rainy today is 0, 1, and 0, respectively.

If today is cloudy, what is the probability that the day after tomorrow from today it is sunny? cloudy? rainy?

Also propose only the steps in short, to find the probability that a week from today it is sunny? cloudy? rainy? if today is cloudy.

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