B.E. (Computer) (Sem -VIII) (CBSGS)

Time: 03 Hours   **Marks: 80**

Note: 1. Question 1 is compulsory

   2. Answer any three out of remaining five questions.
   3. Assume any suitable data wherever required and justify the same.

Q1 a) Explain the Expectation Maximization Algorithm (EMA)   [5]

   b) Explain kernel functions and kernel trick   [5]

   c) What are the issues in decision tree learning?   [5]

   d) "Entropy is a thermodynamic function used to measure the disorder of a system in   [5]
       Chemistry." Clarify the concept of entropy in Machine Learning?

Q2 a) Compare and contrast Linear and Logistic regressions with respect to their   [10]
       mechanisms of prediction.

   b) Consider 2-D dataset given in the table below. Construct a SVM classifier model.   [10]
       Given (2, 1), (2, -1) and (4, 0) as support vectors; estimate the parameters of the
       model and classify (4, 2). Why is SVM called as optimal binary hyper plane
       classifier?

(X1, X2)	(1, -1)	(2, -1)	(5, -1)	(4, 0)	(6, 0)	(1, 1)	(2, 1)	(5, 1)
Class	C1	C1	C2	C2	C2	C1	C1	C2

Q3 a) You are given a data set on cancer detection. You have built a classification model   [10]
       and achieved an accuracy of 96%. Why shouldn't you be happy with your model
       performance? What can you do about it?

   b) What is a HMM? What are the issues in Hidden Markov Model (HMM)?   [10]

Q4 a) You came to know that your model is suffering from low bias and high variance.   [10]
       Which algorithm should you use to tackle it? Why?

   b) Differentiate between simple linkage, average linkage and complete linkage   [10]
       algorithms. Use complete linkage algorithm to find the clusters from the following
       dataset.

X	4	8	15	24	24
Y	4	4	8	4	12

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Q5 a) Draw the block diagram of Error Back Propagation Algorithm and explain with flow [10]
        chart the concept of Back Propagation.

    b) The following table consists of training data from an employee database. The data [10]
        have been generalized. For example, "31 . . . 35" for age represents the age range of
        31 to 35. For a given row entry, count represents the number of data tuples having
        the values for department, status, age, and salary given in that row. Let the status be
        the class-label attribute.
        (i)   Design a multilayer feed-forward neural network for the given data. Label
              the nodes in the input and output layers.
        (ii) Using the multilayer feed-forward neural network obtained in (i), show the
              weight values after one iteration of the back propagation algorithm, given the
              training instance "(sales, senior, 31 . . . 35, 46K . . . 50K)".

        Assume initial weight values and biases. Assume learning rate to be 0.9. Use binary
        input and draw (one input layer, one output layer and one hidden layer) neural
        network. Solve the problem for one epoch.

department	status	age	salary	count
sales	senior	31 ... 35	46K ... 50K	30
sales	junior	26 ... 30	26K ... 30K	40
sales	junior	31 ... 35	31K ... 35K	40
systems	junior	21 ... 25	46K ... 50K	20
systems	senior	31 ... 35	66K ... 70K	5
systems	junior	26 ... 30	46K ... 50K	3
systems	senior	41 ... 45	66K ... 70K	3
marketing	senior	36 ... 40	46K ... 50K	10
marketing	junior	31 ... 35	41K ... 45K	4
secretary	senior	46 ... 50	36K ... 40K	4
secretary	junior	26 ... 30	26K ... 30K	6

Q6 Write short notes on any two of the following: [20]

    a) Temporal Difference Learning in Reinforcement Learning
    b) Over fitting' in Machine learning
    c) Independent Component Analysis

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