Tribhuvan University
Institute of Science and Technology
SCHOOL OF MATHEMATICAL SCIENCES
First Assessment 2079

Subject: **Applied Machine learning** *Full Marks:* 45

Course No: **MDS 552** *Pass Marks:* 22.5

Level: **MDS /I Year /II Semester** *Time:* 2hrs

Candidates are required to give answer in their own words as far as practicable.

Attempt All Questions

Group A **[5 × 3 = 15]**

1. Why data normalization is important? Explain Min-max and Z-score data normalization.
2. Discuss the concept of model overfitting and underfitting.
3. Discuss the concept of Bagging in ensemble learning.
4. How K-Means++ differs from K-Means? Explain.
5. Why SVD is used? Discuss its working.

Group B **[5 × 6 = 30]**

6. Derive weigh update rule for logistic regression using gradient descent.

OR

Discuss the concept of locally weighted linear regression. Consider a query point x= 5 and let x^1=6, x^2=4, and x^3=3 are three points in the training set. Find Cost function for the locally weighted linear regression.

7. Consider the following dataset. Find Information of gain of each attribute and draw decision tree for first iteration.

Weather	Temperature	Wind Level	Go Out (Class)
Sunny	High	Low	No
Sunny	Normal	Normal	Yes
Cloudy	High	Normal	No
Cloudy	Normal	High	Yes
Sunny	Normal	High	No
Rainy	High	Normal	No
Rainy	Low	High	No

8. Continue question number 7 and construct complete decision tree. Then, predict class label for the tuple {Cloudy, Low, Normal}.
9. When DBSCAN algorithm gives better performance than other clustering algorithms? Discuss its working.

OR

Divide the data points {(2,10), ((2,5), (8,4), (5,8), (6,4)} into two clusters using agglomerative clustering.

10. What are the features of principle components? Discuss the working of PCA algorithm.

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Group A **[5 ×3=15]**

1. Discuss about sensitivity and specificity metrics
2. Explain R^2 metrics.
3. How dynamics of MDP proceeds? Explain.
4. Discuss value iteration algorithm briefly.
5. Discuss deterministic model of neuron.

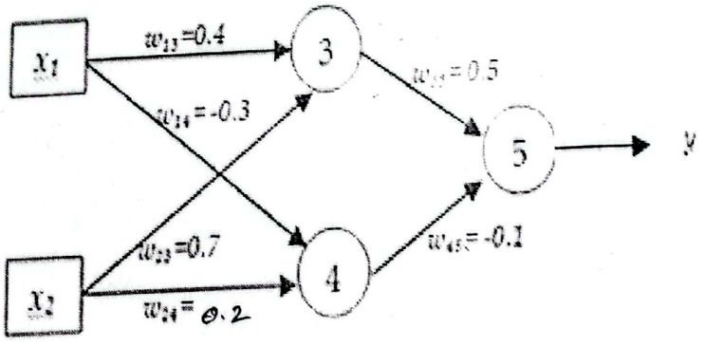
Group B **[5 × 6 = 30]**

6. What is perceptron? Derive weight update rule for perceptron.

OR

State XOR problem Can we realize XOR function using perceptron? If yes, realize it using perceptron. Otherwise, realize XOR function using MLP.

7. Consider a MLP given below. Let the learning rate be 0.7. The initial weights of the network are shown in the MLP. Assume that first training tuple is (1, 0) and its target output is 1. Calculate weight updates by using back-propagation algorithm. Assume logistic activation function.



8. Discuss working of RNN with suitable block diagram and mathematical formulation.
9. How soft clustering methods differs from soft clustering methods? Discuss working of EM algorithm for Gaussian mixture models.
10. Discuss working of hierarchical clustering algorithms.

OR

Divide the data points {(2,2),(4,3), (4,8),(6,6), (2,7), (3,1)} into two clusters using k-medoid algorithm.

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2079

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Master Level / I Year /IInd Semester/ Science
Data Science (MDS 552)
(Applied Machine Learning)

Full Marks: 45
Pass Marks: 22.5
Time: 2 hours

Candidates are required to give their answers in their own words as for as practicable.
Attempt All Questions

Group A (5×3=15)

1. Differentiate between supervised and unsupervised learning.
2. Discuss the concept of mini-batch gradient descent algorithm.
3. What are various distance measures used for measuring similarity? Explain briefly.
4. What is Dunn Index? Explain.
5. What is meant by activation function? Discuss ReLU and Leaky ReLU activation functions.

Group B (5×6=30)

6. Derive weight update rule for logistic regression.

OR

Fit the logistic regression model through the following data. Show one epoch of training. Assume α=0.1.

x_1	0.8	0.4	0.5	0.6
x_2	0.7	0.3	0.8	0.25
Y	0	1	0	1

7. Use Agglomerative clustering algorithm to divide the data points {(2,10), ((2,5), (8,4), (5,8), (7,5), (6,4)} into two clusters.

8. Derive weigh update rule for BPTT?

OR

Consider a 2 bit grey level image with resolution 6x6 and a 3x 3 filter whose all diagonal elements are 1 and non-diagonal elements are zero. Compute feature map and then compute pooled feature map using 3x3 window. Use average pooling.

9. Discuss various measures used in multi-class classification with example.

10. Define the terms value and policy functions? Explain value and policy iteration algorithms.