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1104E114

Candidate's Seat No :_____

IM.Sc. DS Sem.-6 Examination

CC-313

Machine Learning-II

April-2025

Time : 2-30 Hours] **[Max. Marks : 70**

Instructions: All questions are compulsory. Use of non-programmable scientific calculator is allowed.

Q.1 **(a)** What is clustering? Explain Different types of Clustering? **(07)**

(b) What are some differences between Unsupervised Learning and Reinforcement Learning? **(07)**

OR

(a) What is Unsupervised Machine Learning? Explain with its types. **(07)**

(b) What is the difference between Classification and Clustering? **(07)**

Q.2 **(a)** What is Dimension Reduction? What is the Curse of Dimensionality? Explain in detail. **(07)**

(b) Find a Singular Value Decomposition of the Matrix $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}$ **(07)**

OR

(a) Explain all the ways to choose the right value of K for a K-means clustering. **(07)**

(b) Based on given data points and membership values compute the new cluster centers using the Fuzzy C-Means (FCM) algorithm with m = 2. **(07)**

	Membership values	
Datapoints (x, y)	C1	C2
(1, 3)	0.8	0.2
(2, 5)	0.7	0.3
(4, 8)	0.2	0.8
(7, 9)	0.1	0.9

Q.3 **(a)** What is the DBSCAN clustering algorithm? How does it work? **(07)**

(P.T.O)

(b) Apply the DBSCAN algorithm to the given data points and create the cluster with minpts= 4 and epsilon = 1.9 **(07)**

P1 : (3,7)	P2 : (4.,6)
P3 : (5,5)	P4 : (6,4)
P5 : (7,3)	P6 : (6,2)
P7 : (7,2)	P8 : (8,4)
P9 : (3,3)	P10 : (2,6)
P11 : (3,5)	P12 : (2,4)

Use Euclidian distance and calculate the distance between each point.

OR

(a) What is the Hierarchical Clustering Algorithm? Explain its types. **(07)**

(b) Using the distance matrix, perform single-link hierarchical clustering. Draw a dendrogram that clearly illustrates the order in which the points are merged. How does the clustering process proceed step by step? **(07)**

	P1	P2	P3	P4	P5
P1	0	0.10	0.41	0.55	0.35
P2	0.10	0.00	0.64	0.47	0.98
P3	0.41	0.64	0.00	0.44	0.85
P4	0.55	0.47	0.44	0.00	0.76
P5	0.35	0.98	0.85	0.76	0.00

Q.4 **(a)** How do you evaluate the clustering algorithm? **(07)**

(b) Give the comparison between DBSCAN with K-Means and Hierarchical Clustering. **(07)**

OR

(a) What is PCA? How Principal Component Analysis (PCA) is used for Dimensionality Reduction? **(07)**

(b) What is Mean Shift clustering? Explain in detail. **(07)**

Q.5 Attempt any **SEVEN** out of **TWELVE:** **(14)**

(1) What is PCA (Principal Component Analysis)?

(2) How does Fuzzy C-Means differ from K-Means?

(3) What are different distance measures used in clustering?

(4) What is Curse of Dimensionality?

(5) Mention some real-world applications of unsupervised learning.

(6) How does Factor Analysis differ from PCA?

(7) What are the two types of hierarchical clustering?

(8) What is the full form of DBSCAN clustering?

(9) What are the limitations of K-Means clustering?

(10) How does unsupervised learning differ from supervised learning?

(11) What is linkage in hierarchical clustering?

(12) What are the key steps in Singular Value Decomposition (SVD)?

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