✔ 6

6406532240044. ✖ 8

MLT

Section Id :	64065344905
Section Number :	11
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	11
Number of Questions to be attempted :	11
Section Marks :	50
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	64065395189
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Number : 167 Question Id : 640653668608 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL : MACHINE LEARNING

TECHNIQUES (COMPUTER BASED EXAM)"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?

CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

(IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS REGISTERED BY YOU)

Options :

6406532240045. ✔ YES

6406532240046. ✖ NO

Sub-Section Number :	2
Sub-Section Id :	64065395190
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 168 Question Id : 640653668609 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Multiple Choice Question

In the K-means algorithm, cluster centroids (μ_k) are updated at each iteration to minimize the sum of squared distances between data points and their assigned centroids. The formula used for this update is:

$$\mu_k = \frac{\sum x_i \mathbb{1}(z_i = k)}{\sum \mathbb{1}(z_i = k)}$$

Here:

- x_i represents i^{th} data point in the dataset.
- z_i represents the cluster assignment for data point x_i, where z_i is an integer indicating the cluster index (k).

Suppose you have a dataset of 9 two-dimensional data points and are performing K-means clustering with $K = 3$ clusters. After the first iteration, clusters C_1, C_2, and C_3 have the following data points:

C_1: {(2, 2), (3, 3), (4,4) }

C_2: { (6, 6), (7, 7),(8,8)}

C_3: {(10, 10), (11, 11), (12, 12)}

After the second iteration, which of the following options represents the updated cluster centroid μ_k for C_1 using the provided formula?

Options :

6406532240047. ✖ μ1 = (2.5, 2.5)

6406532240048. ✖ μ1 = (4.5, 4.5)

6406532240049. ✔ μ1 = (3, 3)

6406532240050. ✖ μ1 = (5.5, 5.5)

Question Number : 169 Question Id : 640653668610 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Multiple Choice Question

Consider 9 data points $x_1, x_2, \ldots, x_9$: (2,3),(1,2),(3,1),(5,6),(7,8),(9,9),(6,7),(10,10),(11,11). Suppose we aim to form 3 clusters from these points using the K-Means algorithm. After the first iteration, clusters C_1, C_2, C_3 have the following data points:

C_1: (1, 2), (3, 1)

C_2: (2, 3), (5, 6), (6,7)

C_3: (9, 9), (7, 8), (10, 10), (11, 11)

After the second iteration, to which cluster will the data point (2, 3) be reassigned?

Options :

6406532240051. ✔ C_1

6406532240052. ✖ C_2

6406532240053. ✖ C_3

6406532240054. ✖ It remains in the same cluster as in the first iteration

Sub-Section Number :	3
Sub-Section Id :	64065395191
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 170 Question Id : 640653668616 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following statements are true regarding applying standard PCA on a centered dataset?

Options :

6406532240065. ✔ The variance of the dataset along the first principal component is maximum.

6406532240066. ✔ Eigenvectors are always orthogonal to each other in PCA.

6406532240067. ✔ The first principal component is the eigenvector corresponding to the largest eigenvalue of the covariance matrix.

6406532240068. ✖ The first principal component is the eigenvector corresponding to the smallest eigenvalue of the covariance matrix.

Sub-Section Number : 4

Sub-Section Id : 64065395192

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 171 Question Id : 640653668614 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Short Answer Question

Consider a dataset that has 200 data-points, each of which is either a zero or one. The Bernoulli distribution is used to model this data. If the MLE estimate for the parameter *p* of the Bernoulli distribution is 0.3, how many zeros does the dataset have?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

140

Question Number : 172 Question Id : 640653668615 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Short Answer Question

Consider a dataset that has 4 points in R^2 that lie on a line passing through the origin:

$$D\left\{\begin{bmatrix}-10\\-30\end{bmatrix},\begin{bmatrix}-5\\-15\end{bmatrix},\begin{bmatrix}5\\15\end{bmatrix},\begin{bmatrix}10\\30\end{bmatrix}\right\}$$

If normal PCA is performed on this dataset, what is the variance along the first principal component?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

625

Question Number : 173 Question Id : 640653668617 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Short Answer Question

Consider a dataset of 50 points all of which lie in $\mathbb{R}^5$. The eigenvalues of the covariance matrix are given below:

$$1.7,\quad 1.4,\quad 0.25,\quad 0.20,\quad 0.005$$

If we run the PCA algorithm on this dataset and retain the top-k principal components, what is a good choice of k? (Hint: A good precise mean it captures atleast 95% of variance)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

4

Question Number : 174 Question Id : 640653668619 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Short Answer Question

A GMM is fit for a dataset with 5 points. At some time-step in the EM algorithm, the following are the values of λ_k^i for all points in the dataset for the k^{th} mixture after the E-step:

$\lambda_k^1 = 0.3, \lambda_k^2 = 0.1, \lambda_k^3 = 0.5, \lambda_k^4 = 0.5, \lambda_k^5 = 0.3$

What is the estimate of π_k after the M-step? Enter your answer correct to two decimal places.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.3 to 0.4

Sub-Section Number :	5
Sub-Section Id :	64065395193
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 175 Question Id : 640653668618 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Short Answer Question

Suppose you have been given a task of estimating the conversion rate of google click of new online advertisement campaign. You have collected data from a limited sample of 50 users, where 15 of them have converted. You want to use Bayesian estimation with a prior distribution to provide a more robust estimate of the conversion rate.

Assume you have prior information and you decide to use a beta distribution as your prior. You choose a beta distribution with parameters $\alpha = 3$ and $\beta = 4$ to capture your prior beliefs.

Calculate the posterior mean?

Enter your answer correctly up to two decimals

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.2 to 0.3

Sub-Section Number :	6
Sub-Section Id :	64065395194
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Id : 640653668611 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (176 to 177)

Question Label : Comprehension

A k-means++ algorithm with k= 3 was applied to the following 2D points:

(2, 2), (3, 3), (4, 4), (10, 10), (12, 12), (13, 13)

(2, 2) is chosen as the first cluster mean.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 176 Question Id : 640653668612 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Multiple Choice Question

Which point has the highest probability of being chosen as the 2^{nd} cluster mean? Use the Manhattan distance to compute the distances.

Options :

6406532240055. ✖ (4, 4)

6406532240056. ✖ (12, 12)

6406532240057. ✔ (10, 10)

6406532240058. ✖ (13, 13)

Question Number : 177 Question Id : 640653668613 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Multiple Choice Question

Let's assume that (3, 3), (10, 10), and (12, 12) are the cluster means. You introduce a new data point, (−5, 10). Which cluster mean is the data point (−5, 10) closest to when using the Euclidean distance method?

Options :

6406532240059. ✖ (3, 3)

6406532240060. ✔ (10, 10)

6406532240061. ✖ (12, 12)

6406532240062. ✖ None of these

Sub-Section Number : 7

Sub-Section Id : 64065395195

Question Shuffling Allowed : No

Is Section Default? : null

Question Id : 640653668620 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (178 to 180)

Question Label : Comprehension

Suppose that we have a dataset (data matrix) $X \in \mathbb{R}^{d \times n}$, where d denotes the number of features and n denotes the number of samples. Assume that $d >> n$ and the data is centered. The representative line is given by the **unit vector**, pointing in the direction of the line, $\mathbf{w}$.

In all the cases, we maximize the objective function given below

$$f(\mathbf{w}) = \mathbf{w}^T C \mathbf{w}$$

where $C = \frac{1}{n} X X^T$ is a covariance matrix. The kernel matrix is defined to be $K = X^T X$.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 178 Question Id : 640653668621 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following statements are true?

Options :

6406532240072. ✖ The eigenvectors of C and K are related by a scaling factor $r \in \mathbb{R}$

6406532240073. ✔ Computing eigenvectors using the matrix K reduces number of computations significantly than using the matrix C

6406532240074. ✔ Suppose the maximum eigenvalue of C is λ_1, then the maximum eigenvalue of XX^T is $n\lambda_1$

6406532240075. ✖ The eigenvectors of $C \in \mathbb{R}^d$ and $K \in \mathbb{R}^d$

6406532240076. ✔ The eigenvalues of both C and K are non-negative

Question Number : 179 Question Id : 640653668622 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Multiple Choice Question

Which of the following matrices helps in transforming the eigenvectors of *K* to the eigenvectors of *C*?

Options :

6406532240077. ✔ *X*

6406532240078. ✖ X^T

6406532240079. ✖ C^{-1}

6406532240080. ✖ K^{-1}

6406532240081. ✖ X^{-1}

Question Number : 180 Question Id : 640653668623 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Suppose that the 95% of the variance of the data is captured using $d - 1$ eigenvectors. This implies that

Options :

6406532240082. ✖ The features are highly correlated (or dependent)

6406532240083. ✔ The features have low correlation (or independent)

MLP

Section Id :	64065344906
Section Number :	12
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	23
Number of Questions to be attempted :	23
Section Marks :	50
Display Number Panel :	Yes
Section Negative Marks :	0