MLF

Section Id :	64065348507
Section Number :	9
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	11
Number of Questions to be attempted :	11
Section Marks :	40
Display Number Panel :	Yes
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 :	640653100839
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Number : 130 Question Id : 640653689544 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 FOUNDATIONS (COMPUTER BASED EXAM)"

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

Options :

6406532306726. ✔ YES

6406532306727. ✖ NO

Sub-Section Number :	2
Sub-Section Id :	640653100840
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 131 Question Id : 640653689545 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

Let U and V be two unitary matrices. Consider the following statements:

Statement 1: $U + V$ is unitary.

Statement 2: UV is unitary.

Select the correct options from the following:

Options :

6406532306728. ✔ Only statement 2 is correct.

6406532306729. ✖ Both statement 1 and statement 2 are incorrect.

6406532306730. ✖ Both statement 1 and statement 2 are correct.

6406532306731. ✖ Only statement 1 is correct.

Question Number : 132 Question Id : 640653689559 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

Consider a function $f(x, y) = x^2 + y^2 - 4x - 2y + 5$. Using gradient descent algorithm, with an initial guess of (3, 2) and learning rate of 0.1, what will be the value of *(x, y)* after one iteration?

Options :

6406532306764. �֍ *x* = 3.2, *y* = 2.2

6406532306765. ✖ *x* = 3, *y* = 2

6406532306766. ✖ *x* = 1.8, *y* = 0.8

6406532306767. ✔ *x* = 2.8, *y* = 1.8

Question Number : 133 Question Id : 640653689561 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

A firm produces two goods A and B. Let x and y denote the prices per unit of A and B, respectively. Sum of the prices for each unit of these two goods is 60. The profit on these goods is evaluated as $2x^2y$. What should the prices of these two products be if the profit is to be maximized?

Options :

6406532306769. ✔ *x* = 40, *y* = 20

6406532306770. ✖ *x* = 20, *y* = 40

6406532306771. ✖ *x* = 30, *y* = 30

6406532306772. ✖ *x* = 0, *y* = 60

6406532306773. ✖ None of these

Sub-Section Number :   3

Question Number : 134 Question Id : 640653689546 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 $A = \begin{pmatrix} 1 & 0 & 1 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$. One of the eigenvalue of A is given to be -1 with the corresponding eigenvector $[0, 1, 0]^T$. Find the Schur's decomposition of A, i.e., find a matrix U with orthonormal columns such that $U^T A U$ is uppertriangular.

Options :

6406532306732. ✖ $\begin{pmatrix} 1 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

6406532306733. ✖ $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

6406532306734. ✔ $\begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

6406532306735. ✖ $\begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$

Question Number : 135 Question Id : 640653689547 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3 Max. Selectable Options : 0

Question Label : Multiple Select Question

Let $A \in \mathbb{C}^{2 \times 2}$ where $A = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$.

Which of the following statements are true about A?

Options :

6406532306736. ✲ *A* is Hermitian matrix.

6406532306737. ✔ *A* is not Hermitian matrix.

6406532306738. ✔ *A* is unitarily diagonalizable.

6406532306739. ✲ *A* is not unitarily diagonalizable.

Question Id : 640653689548 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 : (136 to 137)

Question Label : Comprehension

Consider a matrix $A = \begin{pmatrix} 3 & 2 & 1 \\ 2 & 3 & 1 \\ 0 & 0 & 1 \end{pmatrix}$

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 136 Question Id : 640653689549 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

For an $n \times n$ invertible matrix A, the ratio $\dfrac{\sigma_1}{\sigma_n}$ gives the condition number of A, where σ_1 and σ_n represent the largest and the smallest singular values of A, respectively. What will be the condition number $\dfrac{\sigma_1}{\sigma_3}$ for the given matrix A? Enter the 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 :

2.20 to 2.26

Question Number : 137 Question Id : 640653689550 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Multiple Choice Question

Is the matrix A positive definite?

Options :

6406532306741. ✔ Yes

6406532306742. ✖ No

Question Id : 640653689551 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 : (138 to 139)

Question Label : Comprehension

Suppose the SVD of a matrix A is given as

$$A = \begin{bmatrix} 4/3\sqrt{5} & -1/\sqrt{5} & 2/3 \\ 5/3\sqrt{5} & 0 & -2/3 \\ -2/3\sqrt{5} & -2/\sqrt{5} & -1/3 \end{bmatrix} \begin{bmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} 2/\sqrt{5} & -1/\sqrt{5} & 0 \\ 1/\sqrt{5} & 2/\sqrt{5} & 0 \\ 0 & 0 & 1 \end{bmatrix}^T$$

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 138 Question Id : 640653689552 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Short Answer Question

What is the rank of A?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

2

Question Number : 139 Question Id : 640653689553 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following options are true?

Options :

6406532306744. ✔

$$\text{Columnspace}(A) = \text{span}\left\{\begin{pmatrix} 4 \\ 5 \\ -2 \end{pmatrix}, \begin{pmatrix} -1 \\ 0 \\ -2 \end{pmatrix}\right\}$$

6406532306745. ✖

$$\text{Columnspace}(A) = \text{span}\left\{\begin{pmatrix} 2 \\ 1 \\ 0 \end{pmatrix}, \begin{pmatrix} -1 \\ 2 \\ 0 \end{pmatrix}\right\}$$

6406532306746. ✖

$$\text{Nullspace}(A) = \text{span}\left\{\begin{pmatrix} 2 \\ 1 \\ 0 \end{pmatrix}, \begin{pmatrix} -1 \\ 2 \\ 0 \end{pmatrix}\right\}$$

6406532306747. ✔

$$\text{Nullspace}(A) = \text{span}\left\{\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}\right\}$$

Sub-Section Number :	6
Sub-Section Id :	640653100844
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 140 Question Id : 640653689554 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which among the following statements are true about principal component analysis (PCA)?

Options :

6406532306748. ✖ PCA is a supervised learning algorithm.

6406532306749. ✔ Principal components are the eigenvectors of the sample covariance matrix.

6406532306750. � Principal components are eigenvectors of the centered data matrix.

6406532306751. ✔ If p_1 and p_2 are the principal component vectors, then p_1 is orthogonal to p_2.

Sub-Section Number :   7

Sub-Section Id :   640653100845

Question Shuffling Allowed :   No

Is Section Default? :   null

Question Id : 640653689555 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 : (141 to 143)

Question Label : Comprehension

Consider the following dataset:

$$\left\{ \begin{pmatrix} 4 \\ 1 \end{pmatrix}, \begin{pmatrix} 2 \\ 3 \end{pmatrix}, \begin{pmatrix} 5 \\ 4 \end{pmatrix}, \begin{pmatrix} 1 \\ 0 \end{pmatrix} \right\}$$

Suppose we want to project the above dataset onto a 1 dimensional space.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 141 Question Id : 640653689556 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

Compute the sample covariance matrix C for the given dataset.

Options :

6406532306752. ✖ $C = \frac{1}{4} \begin{pmatrix} 46 & 30 \\ 30 & 36 \end{pmatrix}$

6406532306753. ✔

$$C = \frac{1}{4} \begin{pmatrix} 10 & 6 \\ 6 & 10 \end{pmatrix}$$

6406532306754. ✖ $C = \frac{1}{4} \begin{pmatrix} 46 & 30 \\ 30 & 46 \end{pmatrix}$

6406532306755. ✖ $C = \frac{1}{4} \begin{pmatrix} 36 & 30 \\ 30 & 36 \end{pmatrix}$

Question Number : 142 Question Id : 640653689557 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

Which is the principal direction that is chosen for performing PCA?

Options :

6406532306756. ✖ $\begin{pmatrix} 1/\sqrt{2} \\ -1/\sqrt{2} \end{pmatrix}$

6406532306757. ✔ $\begin{pmatrix} 1/\sqrt{2} \\ 1/\sqrt{2} \end{pmatrix}$

6406532306758. ✖ $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$

6406532306759. ✖ $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$

Question Number : 143 Question Id : 640653689558 Question Type : MCQ Is Question

Correct Marks : 3

Question Label : Multiple Choice Question

If $\tilde{x}_1, \tilde{x}_2, \tilde{x}_3$ and $\tilde{x}_4$ are the projections of the data points onto the first principal component, then which among the following are true?

Options :

6406532306760. ✖ $\tilde{x}_1 = \begin{pmatrix} 3 \\ 0 \end{pmatrix}, \tilde{x}_2 = \begin{pmatrix} 3 \\ 0 \end{pmatrix}, \tilde{x}_3 = \begin{pmatrix} 5 \\ 0 \end{pmatrix}, \tilde{x}_4 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$

6406532306761. ✖ $\tilde{x}_1 = \begin{pmatrix} 5/2 \\ 5/2 \end{pmatrix}, \tilde{x}_2 = \begin{pmatrix} 5/2 \\ 5/2 \end{pmatrix}, \tilde{x}_3 = \begin{pmatrix} 9/2 \\ 9/2 \end{pmatrix}, \tilde{x}_4 = \begin{pmatrix} 1/2 \\ 1/2 \end{pmatrix}$

6406532306762. ✖ $\tilde{x}_1 = \begin{pmatrix} 3 \\ 0 \end{pmatrix}, \tilde{x}_2 = \begin{pmatrix} 3 \\ 0 \end{pmatrix}, \tilde{x}_3 = \begin{pmatrix} 5 \\ 4 \end{pmatrix}, \tilde{x}_4 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$

6406532306763. ✔ $\tilde{x}_1 = \begin{pmatrix} 3 \\ 2 \end{pmatrix}, \tilde{x}_2 = \begin{pmatrix} 3 \\ 2 \end{pmatrix}, \tilde{x}_3 = \begin{pmatrix} 5 \\ 4 \end{pmatrix}, \tilde{x}_4 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$

Sub-Section Number :	8
Sub-Section Id :	640653100846
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 144 Question Id : 640653689560 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

Find the area of the largest rectangle that can be inscribed in a semicircle $y = \sqrt{2 - x^2}$.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

2

Java

Section Id :	64065348508
Section Number :	10
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	16
Number of Questions to be attempted :	16
Section Marks :	50
Display Number Panel :	Yes
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 :	640653100847
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Number : 145 Question Id : 640653689562 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0