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?

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 :

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 :

Sub-Section Id : 640653100841

Question Shuffling Allowed : Yes

Is Section Default? : null

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 $U^T AU$ 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. ✖ $\begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$

Sub-Section Number : 4

Sub-Section Id : 640653100842

Question Shuffling Allowed : Yes

Is Section Default? : null

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.

Sub-Section Number : 5

Sub-Section Id : 640653100843

Question Shuffling Allowed : No

Is Section Default? : null

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 $\frac{\sigma_1}{\sigma_n}$ 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 $\frac{\sigma_1}{\sigma_3}$ 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

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

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