6406534434957. ✔

```
repairs = db.session.query(GlassRepair).all()
result = []
for r in repairs:
    days = (r.fixed_at - r.broken_at).days
    if days > 7 and r.status == 'fixed':
        result.append((r.id, days))
```

6406534434958. ✖

```
repairs = GlassRepair.query(
    GlassRepair.id,
    (GlassRepair.fixed_at - GlassRepair.broken_at).label('days_to_fix')
).filter_by(status='fixed').filter(
    GlassRepair.fixed_at - GlassRepair.broken_at > 7
).all()
```

MLF

Section Id :	64065394377
Section Number :	4
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	12
Number of Questions to be attempted :	12
Section Marks :	40
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	No
Section Maximum Duration :	0
Section Minimum Duration :	0
Section Time In :	Minutes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	640653214215
Question Shuffling Allowed :	No

Question Number : 52 Question Id : 6406531324190 Question Type : MCQ
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 :

6406534434959. ✔ YES

6406534434960. ✖ NO

Sub-Section Number :	2
Sub-Section Id :	640653214216
Question Shuffling Allowed :	Yes

Question Number : 53 Question Id : 6406531324191 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Let $f : \mathbb{R}^n \to \mathbb{R}$ be a n times continuously differentiable function. Suppose that

$$\nabla f(x^*) = 0 \quad \text{and} \quad \nabla^2 f(x^*) > 0.$$

• Note: $\nabla^2 f(x^*) > 0$ means hessian matrix is positive definite.
What can we conclude about x^*?

Options :

6406534434961. ✖ x^* is a local maximum

6406534434962. ✖ x^* is a saddle point

6406534434963. ✔ x^* is a local minimum

6406534434964. ✖ Nothing can be concluded

Question Number : 54 Question Id : 6406531324192 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Given the quadratic form $Q(x, y, z) = x^2 + 2xy - 2xz$. Which of the following is true?

Options :

6406534434965. ✖ Q is positive definite.

6406534434966. ✖ Q is positive semi-definite.

6406534434967. ✖ Q is negative definite.

6406534434968. ✖ Q is negative semi-definite.

6406534434969. ✔ None of these

Sub-Section Number : 3

Sub-Section Id : 640653214217

Question Shuffling Allowed : Yes

Question Number : 55 Question Id : 6406531324193 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Which of the following statements is true about the matrix $A = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}$?

Options :

6406534434970. ✔ A is positive definite.

6406534434971. ✖ A is positive semi-definite.

6406534434972. ✖ A is negative definite.

6406534434973. ✖ A is negative semi-definite.

Question Number : 56 Question Id : 6406531324194 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Let $A \in \mathbb{R}^{n \times d}$ be a centered data matrix, where $d > n$. Which of the following statements about the eigenvalues of $AA^T \in \mathbb{R}^{n \times n}$ and $A^TA \in \mathbb{R}^{d \times d}$ is true?

Options :

6406534434974. ✖ AA^T and A^TA have different sets of non-zero eigenvalues.

6406534434975. ✔ The non-zero eigenvalues of AA^T and A^TA are equal.

6406534434976. ✖ All eigenvalues of A^TA are zero.

6406534434977. ✖ A^TA has more non-zero eigenvalues than AA^T.

Question Number : 57 Question Id : 6406531324195 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Let $A \in \mathbb{R}^{n \times d}$ be a centered data matrix, where $d > n$. Let $u_i \in \mathbb{R}^n$ be an eigenvector of AA^T corresponding to the eigenvalue $\lambda_i > 0$, representing the i-th principal component in the sample space. Let $v_i \in \mathbb{R}^d$ denote the corresponding principal component direction in the feature space (i.e., the eigenvector of $A^T A$).

Which of the following correctly computes v_i from u_i?

Options :

6406534434978. ✖ The i-th principal component direction is $v_i = u_i$.

6406534434979. ✖ The i-th principal component direction is $v_i = Au_i$.

6406534434980. ✔ The i-th principal component direction is $v_i = \frac{1}{\sqrt{\lambda_i}} A^T u_i$

6406534434981. ✖ The i-th principal component direction is $v_i = \frac{1}{\lambda_i} A^T u_i$

Question Number : 58 Question Id : 6406531324196 Question Type : MCQ
Correct Marks : 3
Question Label : Multiple Choice Question

Consider the function $f(x, y) = (x-1)^2 + (y+2)^2$. Using the gradient descent algorithm with an initial guess $(x_0, y_0) = (3, -1)$ and learning rate $\eta_t = \frac{1}{t+1}$, where $t = 0, 1, 2, \ldots$, what will be the value of (x, y) after two iterations?

Options :

6406534434982. ✔ $x = 1,\ y = -2$

6406534434983. ✖ $x = 2,\ y = -2$

6406534434984. ✖ $x = 1.5,\ y = -2.5$

6406534434985. ✖ $x = 1.625,\ y = -2.375$

Sub-Section Number : 4
Sub-Section Id : 640653214218
Question Shuffling Allowed : Yes

Question Number : 59 Question Id : 6406531324197 Question Type : MSQ
Correct Marks : 3 Max. Selectable Options : 0
Question Label : Multiple Select Question

Consider a matrix $A = \begin{bmatrix} i & 1 \\ -1 & i \end{bmatrix}$. Which of the following options is/are true?

Options :

6406534434986. ✖ A is a Hermitian matrix.

6406534434987. ✖ A is a unitary matrix.

6406534434988. ✔ All eigenvalues of A are not real.

6406534434989. ✔ Eigenvectors corresponding to different eigenvalues of A are not orthogonal.

Question Number : 60 Question Id : 6406531324198 Question Type : MSQ
Correct Marks : 3 Max. Selectable Options : 0
Question Label : Multiple Select Question

Consider a Hermitian matrix A. Let α and β be the eigenvalues of A. Which of the following options is/are true?

Options :

6406534434990. ✔ α and β both are real.

6406534434991. ✔ if $\alpha \neq \beta$, then the corresponding eigenvectors are linearly independent

6406534434992. ✔ If $\alpha \neq \beta$, then the corresponding eigenvectors are orthogonal.

6406534434993. ✖ A is not diagonalizable.

Sub-Section Number : 5
Sub-Section Id : 640653214219
Question Shuffling Allowed : Yes

Question Number : 61 Question Id : 6406531324199 Question Type : SA
Correct Marks : 3
Question Label : Short Answer Question

Find the point(s) on the parabola $y = x^2$ that is closest to the point $(0, 2)$. If (x, y) is the closest point, find the value of $x^2 + y^2$.

Give 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 :
3.45 to 4.05

Sub-Section Number : 6
Sub-Section Id : 640653214220
Question Shuffling Allowed : No

Question Id : 6406531324200 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix
Question Numbers : (62 to 64)
Question Label : Comprehension

Consider the matrix $A = \begin{pmatrix} 3 & 2 & -2 \\ 2 & 3 & 2 \end{pmatrix}$. Let the singular value decomposition (SVD) form of A be written as $A = Q_1 \sum Q_2^T$.

Based on the above data, answer the given subquestions.
Sub questions

Question Number : 62 Question Id : 6406531324201 Question Type : MCQ
Correct Marks : 3
Question Label : Multiple Choice Question
Which of the following options is/are true?
Options :

6406534434995. ✖ $Q_1 = \begin{pmatrix} 1 & -1 \\ 1 & 1 \end{pmatrix}$

6406534434996. ✖ $Q_1 = \frac{1}{\sqrt{2}} \begin{pmatrix} 1 & 1 \\ -1 & 1 \end{pmatrix}$

6406534434997. ✔ $Q_1 = \frac{1}{\sqrt{2}} \begin{pmatrix} 1 & -1 \\ 1 & 1 \end{pmatrix}$

6406534434998. ✖ $Q_1 = \sqrt{2} \begin{pmatrix} -1 & 1 \\ 1 & 1 \end{pmatrix}$

Question Number : 63 Question Id : 6406531324202 Question Type : MCQ
Correct Marks : 3
Question Label : Multiple Choice Question
Which of the following options is/are true ?
Options :

6406534434999. ✔

$$Q_2^T = \begin{pmatrix} \frac{\sqrt{2}}{2} & \frac{-\sqrt{2}}{6} & \frac{2}{3} \\ \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{6} & \frac{-2}{3} \\ 0 & \frac{2\sqrt{2}}{3} & \frac{1}{3} \end{pmatrix}$$

6406534435000. ✖ $$Q_2^T = \begin{pmatrix} \frac{\sqrt{2}}{2} & \frac{-\sqrt{2}}{6} & \frac{2}{3} \\ \frac{\sqrt{2}}{2} & \frac{-\sqrt{2}}{6} & \frac{-2}{3} \\ 0 & \frac{2\sqrt{2}}{3} & \frac{1}{3} \end{pmatrix}$$

6406534435001. ✖ $$Q_2^T = \begin{pmatrix} \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{6} & \frac{2}{3} \\ \frac{\sqrt{2}}{2} & \frac{-\sqrt{2}}{6} & \frac{-2}{3} \\ 0 & \frac{2\sqrt{2}}{3} & \frac{1}{3} \end{pmatrix}$$

6406534435002. ✖ $$Q_2^T = \begin{pmatrix} \frac{\sqrt{2}}{2} & \frac{-\sqrt{2}}{6} & \frac{2}{3} \\ \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{6} & \frac{-2}{3} \\ 0 & \frac{2\sqrt{2}}{3} & \frac{1}{2} \end{pmatrix}$$

Question Number : 64 Question Id : 6406531324203 Question Type : MCQ
Correct Marks : 2
Question Label : Multiple Choice Question
Which of the following options is true?
Options :

6406534435003. ✖ $$\sum = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \end{pmatrix}$$

6406534435004. ✖ $$\sum = \begin{pmatrix} -5 & 0 & 0 \\ 0 & 3 & 0 \end{pmatrix}$$

6406534435005. ✔ $$\sum = \begin{pmatrix} 5 & 0 & 0 \\ 0 & 3 & 0 \end{pmatrix}$$

6406534435006. ✖ $\Sigma = \begin{pmatrix} 5 & 0 & 0 \\ 0 & 0 & 3 \end{pmatrix}$

Sub-Section Number : 7
Sub-Section Id : 640653214221
Question Shuffling Allowed : No

Question Id : 6406531324204 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix
Question Numbers : (65 to 67)
Question Label : Comprehension

Consider the following dataset:

$$\left\{ \begin{pmatrix} 1 \\ 2 \end{pmatrix}, \begin{pmatrix} 3 \\ 4 \end{pmatrix}, \begin{pmatrix} 5 \\ 6 \end{pmatrix} \right\}$$

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

Based on the above data, answer the given subquestions.
Sub questions

Question Number : 65 Question Id : 6406531324205 Question Type : MCQ
Correct Marks : 2
Question Label : Multiple Choice Question
The sample covariance matrix *C* for the given dataset is
Options :

6406534435007. ✔ $C = \frac{1}{3}\begin{pmatrix} 8 & 8 \\ 8 & 8 \end{pmatrix}$

6406534435008. ✖ $C = \frac{1}{3}\begin{pmatrix} 4 & 4 \\ 4 & 4 \end{pmatrix}$

6406534435009. ✖ $C = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$

6406534435010. ✖ $C = \frac{1}{3}\begin{pmatrix} 2 & 2 \\ 2 & 2 \end{pmatrix}$

Question Number : 66 Question Id : 6406531324206 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

The eigenvalues of the covariance matrix are

Options :

6406534435011. ✔ $\lambda_1 = 4, \lambda_2 = 0$

6406534435012. ✖ $\lambda_1 = \frac{8}{3}, \lambda_2 = 0$

6406534435013. ✖ $\lambda_1 = \frac{16}{3}, \lambda_2 = 0$

6406534435014. ✖ $\lambda_1 = 8, \lambda_2 = 0$

Question Number : 67 Question Id : 6406531324207 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

The first principal component is

Options :

6406534435015. ✖ $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$

6406534435016. ✖ $\begin{pmatrix} 1 \\ -1 \end{pmatrix}$

6406534435017. ✔ $\frac{1}{\sqrt{2}} \begin{pmatrix} 1 \\ 1 \end{pmatrix}$

6406534435018. ✖ $\frac{1}{\sqrt{2}} \begin{pmatrix} 1 \\ -1 \end{pmatrix}$

Appdev2

Section Id :	64065394378
Section Number :	5
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	16