q13

Due Oct 12 at 9am **Points** 5 **Questions** 5
Available Oct 11 at 9am - Oct 12 at 9am 1 day **Time Limit** 20 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	14 minutes	2 out of 5

Correct answers will be available on Oct 12 at 9:01am.

Score for this quiz: **2** out of 5
Submitted Oct 11 at 10:46pm
This attempt took 14 minutes.

Incorrect

Question 1

0 / 1 pts

Let A have SVD $A = U\Sigma V'$. The solution to

$\hat{x} = \arg\max_{x:\|x\|_2=1} \|AA'x\|_2$

, where A is a $M \times N$ matrix of rank r is

- u_M
- σ_1^2
- σ_1
- v_r
- v_1
- u_1

- u_N
- v_N
- u_r
- v_M
- none of these

$$AA' = U\Sigma\Sigma'U'$$

so its principal right singular vector is u_1.

Question 2

1 / 1 pts

A Hermitian matrix having some elements that are negative can be positive definite.

- True
- False

Yes, consider [3 -1; -1 2]

Incorrect

Question 3

0 / 1 pts

The pseudoinverse of

$$A = \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$$

is

- $\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$
- $\begin{bmatrix} 1/2 & 1/2 \\ 0 & 0 \end{bmatrix}$
- $\begin{bmatrix} 0 & 1 \\ 0 & 1 \end{bmatrix}$
- $\begin{bmatrix} 0 & 0 \\ 1/2 & 1/2 \end{bmatrix}$
- $\begin{bmatrix} 0 & 1/2 \\ 0 & 1/2 \end{bmatrix}$
- $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$
- None of these.

Here we have an outer product:

$$A = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \begin{bmatrix} 1 & 1 \end{bmatrix}$$

.

Incorrect

Question 4

0 / 1 pts

Let U be an $N \times N$ unitary matrix and let y be an N-dimensional vector. Which is the most computationally efficient Julia code for solving $\arg\min_x \|Ux - y\|_2^2$?

- `x = inv(U) * y`
- `x = U \ y`
- `x = U' * y`
- `x = U / y`
- `y = U * y`
- The question cannot be answered with the given information.
- `x = pinv(U) * y`

Because U is unitary $U^+ = U'$.

Question 5

1 / 1 pts

If U_1, U_2, U_3 are all $N \times N$ unitary matrices and $\Phi = \begin{bmatrix} U_1 & U_2 & U_3 \end{bmatrix} / \sqrt{3}$ then the frame bound of Φ is

- $1/\sqrt{3}$
- 3
- $1/3$
- $1/9$

- 9
- 2
- $\sqrt{3}$
- None of these.
- 1

$\Phi\Phi' = I$

so $\sigma_1 = \sigma_N = 1$

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Quiz Score: **2** out of 5