Q1 Instructions
5 Points

Open notes: The quiz is open notes. You are free to use any content from the course website or from your own personal notes.

No communication: ANY communication with other students about the quiz content is strictly forbidden and will result in a failing grade for the whole class (not just this quiz).

No partial credit: Every question is all or nothing credit. Thus, you must get the answer exactly right to get credit for the question (including SELECT ALL questions). No partial credit will be given on quizzes.

Number Format: When giving numbers as short answers, please give in standard decimal notation with preceding "0." for decimals if needed but no trailing 0s (e.g., "0.15", "2.9", "0.001", "100" but NOT "0.15000" NOR ".15" NOR ".001" NOR "6.0").

Honor Pledge: I assert that I have not received any information about this quiz and will not share any quiz content with anyone else. I understand that any violation of this will result in a failing grade for the whole class (not just this quiz).

Yes, I understand the policies above and assert the honor pledge.

No

Q2
1 Point

If $X = \begin{bmatrix} 1 & -2 \\ 2 & -1 \end{bmatrix}$ what is $\|X\|_F^2$?

Q3
1 Point

Which of the following matrices is singular?

$\begin{bmatrix} 5 & 0 \\ 0 & 2 \end{bmatrix}$

$\begin{bmatrix} 1 & 3 \\ 3 & 9 \end{bmatrix}$

$\begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}$

$\begin{bmatrix} 0 & 5 \\ 5 & 0 \end{bmatrix}$

Q4
1 Point

What is the ℓ_∞-norm of the vector $\mathbf{x} = [-1, -2, 3, -5, -4, 3, 1]$ (i.e., what is $\|\mathbf{x}\|_\infty$)?

0

Q5
1 Point

If $X_c = USV^T$ is the SVD decomposition of the centered matrix and $\Sigma_x = \frac{1}{n} X_c^T X_c$ is the covariance matrix whose eigendecomposition is $Q\Lambda Q^T$, which of the following are solutions of the principal component vectors for the dataset X_c (i.e., W^*)?

$U_{1:k}$

✓ $S_{1:k}$

✓ $V_{1:k}$

$Q_{1:k}$

$\Lambda_{1:k}$

Q6
1 Point

Assuming that A, B, C, D are 3 x 3 real matrices, which of the following statements are ALWAYS true?

$A(B+C) = AB + CA$

✓ $ABC + ABD = (AB)(C+D)$

$(AB)^T = A^T B^T$

✓ A is not singular if and only if rank$(A) = 3$

Q7
1 Point

Which of the following are equivalent PCA problems (select all)?

✓ Minimizing reconstruction error

Minimizing variance of latent projection

Maximizing reconstruction error

✓ Maximizing variance of latent projection

Q8
1 Point

Suppose $A = \begin{bmatrix} 4 & 2 \\ 1 & 3 \\ 6 & 8 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 5 \\ 3 & 6 & 0 \end{bmatrix}$, what is $\mathrm{Tr}(AB) - \mathrm{Tr}(BA)$?

0

Q9
1 Point

Suppose $x = [10, 5]^T$ and $w = [\frac{3}{5}, \frac{4}{5}]^T$ (note $||w||_2 = 1$). What is the solution to $\arg\min_z ||x - zw||_2^2$?

$z^* = 5$

$z^* = 10$

$z^* = 11$

None of the above / Many possible solutions

Q10
1 Point

Suppose $X_c \in \mathbb{R}^{100 \times 10}$ and X_c has a rank of 8. If we run PCA with $k = 8$ latent dimensions, what will be the PCA reconstruction error?

Greater than 0

0

Less than 0

Q11
1 Point

Assume that A is a 3 x 3 real matrix. What is the correct matrix multiplication for permuting the columns of the A matrix like the example below?

Example: $A = \begin{bmatrix} a & d & g \\ b & e & h \\ c & f & i \end{bmatrix} \xrightarrow{\text{permute}} \begin{bmatrix} d & g & a \\ e & h & b \\ f & i & c \end{bmatrix}$

$$AB, \text{ where } B = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$BA, \text{ where } B = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$AB, \text{ where } B = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

$$BA, \text{ where } B = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

Quiz 2

● Graded

Student
Paloma Arellano

Total Points
11 / 15 pts

Question 1
Instructions — 5 / 5 pts

Question 2
(no title) — 0 / 1 pt

Question 3
(no title) — 1 / 1 pt

Question 4
(no title) — 0 / 1 pt

Question 5
(no title) — 0 / 1 pt

Question 6
(no title) 1 / 1 pt

Question 7
(no title) 1 / 1 pt

Question 8
(no title) 1 / 1 pt

Question 9
(no title) 1 / 1 pt

Question 10
(no title) 0 / 1 pt

Question 11
(no title) 1 / 1 pt