Singular Value Decomposition

8 questions

1 point

1.
If $U\Sigma V^T$ is an SVD for a given matrix A then which if the following statements are true?

- [ ] U and V are orthogonal matrices
- [ ] U and S are orthogonal matrices
- [ ] U is orthogonal and V is diagonal
- [ ] U is orthogonal and S is diagonal

1 point

2.
A symmetric real matrix has real eigenvalues and real singular values. Which of the following is true?

- [ ] All eigenvalues are nonnegative.
- [ ] Singular values are equal to the eigenvalues.
- [ ] All singular values are nonnegative.

1 point

3.

The largest singular value of $\begin{bmatrix} -2 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$ is

2 Enter answer here

1 point

4.

Which of the following are valid SVD's of the form $U\Sigma V^T$ for the matrix

$$A = \begin{bmatrix} 0 & 0 & 3 \\ 0 & -1 & 0 \\ 2 & 0 & 0 \end{bmatrix}$$

☑ $U = \begin{bmatrix} -1 & 0 & 0 \\ 0 & 0 & -1 \\ 0 & -1 & 0 \end{bmatrix}$,

$\Sigma = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$V = \begin{bmatrix} 0 & 0 & -1 \\ -1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}^T$

☑ $U = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & -1 \\ 0 & -1 & 0 \end{bmatrix}$,

$\Sigma = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$V = \begin{bmatrix} 0 & 0 & 1 \\ -1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}^T$

☐ $U = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$,

$$\Sigma = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$V = \begin{bmatrix} 0 & 0 & -1 \\ -1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}^T$$

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1 point

Find the rank of the matrix

5. $A = \begin{bmatrix} 3 & 4 & 5 & 7 \\ 2 & 3 & 8 & 4 \\ 3 & 7 & 3 & 5 \\ 5 & 5 & 7 & 1 \end{bmatrix}$

Preview

4 Enter math expression here

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1 point

6.

Which of the following is true?

- The rank of matrix is equal to its largest singular value.
- The rank of a matrix is equal to the number of nonzero singular values.
- The rank of matrix has nothing to do with its singular values.

1

point

7.

The minimizer of the fitting cost $\|Ax\|_2^2$ with $A \in \mathbb{R}^{m \times n}$, $\text{rank}(A) > n$ subject to $\|x\|_2 = 1$ is

- The eigenvector of $A^T A$ corresponding to the smallest eigenvalue.
- The eigenvector of $A^T A$ corresponding to the largest eigenvalue.
- $\mathbf{1}_n$

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1 point

8.

Consider the points $(0, -0.8), (1, 0), (2.2, 0.9), (2.9, 2.1)$. Which of the following lines best fits the given points?

- $0.59x - 0.57y = 0.58$
- $0.58x - 0.59y = 0.57$
- $x - y = 1$

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5 questions unanswered

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