Singular Value Decomposition

Cuestionario Calificado

Vencimiento 2 de jul. 23:59 PDT

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Ir al siguiente elemento

1. What is the direction of maximum dilation (direction of largest growth, relative to the input) for **1 / 1 punto**

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

Correcto

2. Which picture best represents the image of the unit circle under the mapping circle **1 / 1 punto**

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5. Q: **1 punto**

Given the SVD

$$A = U \cdot \Sigma \cdot V^T = \begin{bmatrix} \sqrt{1/2} & \sqrt{1/2} \\ -\sqrt{1/2} & \sqrt{1/2} \end{bmatrix} \cdot \begin{bmatrix} \sqrt{2} & 0 \\ 0 & \sqrt{2/9} \end{bmatrix} \cdot \begin{bmatrix} \sqrt{3}/2 & 1/2 \\ -1/2 & \sqrt{3}/2 \end{bmatrix},$$

where $\sqrt{1/2} = 0.707107\ldots$, and $\sqrt{3}/2 = 0.866025\ldots$.
Answer the following by reading it off this SVD (no arithmetic required)

What is the direction of maximum shrinkage?

◉ direction =

$$\begin{bmatrix} -1/2 \\ \sqrt{3}/2 \end{bmatrix}$$

○ direction =

$$\begin{bmatrix} \sqrt{3}/2 \\ 1/2 \end{bmatrix}$$

○ direction =

$$\begin{bmatrix} \sqrt{3}/2 \\ -1/2 \end{bmatrix}$$

○ direction =

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6. Q: **1 punto**

Given the SVD

$$A = U \cdot \Sigma \cdot V^T = \begin{bmatrix} \sqrt{1/2} & \sqrt{1/2} \\ -\sqrt{1/2} & \sqrt{1/2} \end{bmatrix} \cdot \begin{bmatrix} \sqrt{2} & 0 \\ 0 & \sqrt{2/9} \end{bmatrix} \cdot \begin{bmatrix} \sqrt{3}/2 & 1/2 \\ -1/2 & \sqrt{3}/2 \end{bmatrix},$$

where $\sqrt{1/2} = 0.707107\ldots$, and $\sqrt{3}/2 = 0.866025\ldots$.
Answer the following by reading it off this SVD (no arithmetic required)

What is the maximum amount of dilation possible (i.e., could the length of $A\mathbf{v}$ be twice the length of $\mathbf{v}$? if not, how much bigger could $A\mathbf{v}$ relative to the length of the input $\mathbf{v}$?) (Hint: look at the entries in Σ.)

- [x] answer = sqrt(2) = 1.41421....
- [ ] answer = 2.0
- [ ] answer = $\sqrt{2 + 2/9}$
- [ ] answer = $\sqrt{3}/2$

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4. Q: **1 punto**

Construct the rotation matrix R that accomplishes a clock-wise rotation by angle $\theta = 30°$ You can use $\cos 30° = \sqrt{3}/2 = .866\ldots$ & $\sin 30° = 1/2 = 0.5$.

○ R =

$$\begin{bmatrix} \sqrt{3}/2 & 1/2 \\ 1/2 & -\sqrt{3}/2 \end{bmatrix}$$

◉ R =

$$\begin{bmatrix} \sqrt{3}/2 & 1/2 \\ -1/2 & \sqrt{3}/2 \end{bmatrix}$$

○ R =

$$\begin{bmatrix} \sqrt{3}/2 & -1/2 \\ 1/2 & \sqrt{3}/2 \end{bmatrix}$$

○ R =

$$\begin{bmatrix} \sqrt{3}/2 & 1/2 \\ 1/2 & \sqrt{3}/2 \end{bmatrix}$$

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2. Which picture best represents the image of the unit circle under the mapping circle -> A * circle, where **1 punto**

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

- ○ Horizontal ellipse
- ◉ Circle
- ○ Ellipse at correct angle
- ○ Vertical ellipse
- ○ Ellipse at 45 degree angle (plus or minus)

3. **1 punto**

For a rotation matrix $A = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$, what is the image of the unit circle:

- ○ Ellipse
- ○ None of the above
- ◉ Circle

← Volver

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1. What is the direction of maximum dilation (direction of largest growth, relative to the input) for **1 punt**

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

○ direction:

$$\begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

○ direction:

$$\begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

◉ direction:

$$\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

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

○ answer:

$$\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$

○ answer:

$$\begin{bmatrix} \sqrt{1/2} & -\sqrt{1/2} \\ \sqrt{1/2} & \sqrt{1/2} \end{bmatrix}$$

○ None of the above

✓ **Correcto**

2. SVD is often used to expose major components **1 / 1 punto**

◉ True

○ False

✓ **Correcto**

← Volver

SVD as a Data Analytics Tool

Cuestionario Práctico • 30 min • 2 total de puntos

1. **1 / 1 punt**

What is the 2x2 matrix that represents rotation by 0 degrees ?

- (●) answer:

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

- ( ) answer:

$$\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$

- ( ) answer:

$$\begin{bmatrix} \sqrt{1/2} & -\sqrt{1/2} \\ \sqrt{1/2} & \sqrt{1/2} \end{bmatrix}$$

- ( ) None of the above

✓ **Correcto**

2. SVD is often used to expose major **1 / 1 punto**

SVD as a Decomposition

Cuestionario Práctico • 30 min • 2 total de puntos

Correcto

answer:

$$\begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

Correcto

2. **1 / 1 punto**

Suppose $A = \begin{bmatrix} c & -s \\ s & c \end{bmatrix}$

What are the values for c and s for a rotation by an angle of 90° degrees

- None of the above
- c = 1, s = 1
- c = 0, s = 1 or c = 0, s = -1
- c = 1, s = 0 or c = -1, s = 0

Se guardó la captura de pantalla

SVD as a Decomposition

Cuestionario Práctico • 30 min • 2 total de puntos

1. **1 / 1 punto**

Let $A = \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$. Which of the following vectors x satisfy Ax = x ?

(there may be more than one answer)

☐ answer:

$$\begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

☐ answer:

$$\begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

☑ answer:

$$\begin{bmatrix} 0 \\ -1 \end{bmatrix}$$

✓ **Correcto**

☑ answer: