Projection onto a 1-dimensional subspace

5/5 points (100%)

Quiz, 3 questions

✔ Congratulations! You passed!

Next Item

✔ 2 / 2 points

1.

Compute the projection matrix that allows us to project any vector $\mathbf{x} \in \mathbb{R}^3$ onto the subspace spanned by the basis vector $\mathbf{b} = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}$.

Do the exercise using pen and paper. You can use the formula slide that comes with the corresponding lecture.

- ○ $\frac{1}{9}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 4 & 4 \\ 2 & 4 & 4 \end{bmatrix}$

Correct
Well done!

- ○ $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 4 & 4 \\ 2 & 4 & 4 \end{bmatrix}$
- ○ $\begin{bmatrix} \frac{1}{9} \end{bmatrix}$

✔ 2 / 2 points

2.

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5/5 points (100%)

Given the projection matrix

$$\begin{bmatrix} 1 & 2 & 2 \\ 2 & 4 & 4 \\ 2 & 4 & 4 \end{bmatrix}$$

project $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ onto the corresponding subspace, which is spanned by $\mathbf{b} = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}$.

Do the exercise using pen and paper.

- [x] $\begin{bmatrix} 5 \\ 10 \\ 10 \end{bmatrix}$

Correct
Good job!

- [ ] $\frac{1}{9}\begin{bmatrix} 5 \\ 10 \\ 10 \end{bmatrix}$
- [ ] $\begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}$

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1 / 1 points

3.
Now, we compute the **reconstruction error**, i.e., the distance between the original data point and its projection onto a lower-dimensional subspace.

Assume our original data point is $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ and its projection $\frac{1}{9}\begin{bmatrix} 5 \\ 10 \\ 10 \end{bmatrix}$. What is the reconstruction error?

0.4714045

Correct Response

Well done!

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