Congratulations! You passed!

Grade received 100%
Latest Submission Grade 100%
To pass 80% or higher

Go to next item

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

2 / 2 points

$$\mathbf{b} = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}.$$

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

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

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

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

Correct

Well done!

2. Given the projection matrix

2 / 2 points

$$\begin{bmatrix} 9 & 0 & 12 \\ 0 & 0 & 0 \\ 12 & 0 & 16 \end{bmatrix}$$

$\frac{1}{25}\begin{bmatrix} 9 & 0 & 12 \\ 0 & 0 & 0 \\ 12 & 0 & 16 \end{bmatrix}$

project

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

$\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ onto the corresponding subspace, which is spanned by $\mathbf{b} = \begin{bmatrix} 3 \\ 0 \\ 4 \end{bmatrix}$.

Do the exercise using pen and paper.

$$\begin{bmatrix} 21 \\ 0 \\ 28 \end{bmatrix}$$

$\frac{1}{25}\begin{bmatrix} 21 \\ 0 \\ 28 \end{bmatrix}$

- $\begin{bmatrix} 5 \\ 10 \\ 10 \end{bmatrix}$ $\frac{1}{25}\begin{bmatrix} 5 \\ 10 \\ 10 \end{bmatrix}$
- $\begin{bmatrix} 21 \\ 0 \\ 28 \end{bmatrix}$ $\begin{bmatrix} 21 \\ 0 \\ 28 \end{bmatrix}$
- $\begin{bmatrix} 3 \\ 0 \\ 4 \end{bmatrix}$ $\begin{bmatrix} 3 \\ 0 \\ 4 \end{bmatrix}$

Correct
Good job!

3. Now, we compute the **reconstruction error**, i.e., the distance between the original data point and its projection onto a lower-dimensional subspace. **1 / 1 point**

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

0.4714

Correct

Well done!