

✔ 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

2 / 2 points

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.

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

☐ $\begin{bmatrix} 1 \\ 5 \end{bmatrix}$

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

✔ Correct
Well done!

2. Given the projection matrix

2 / 2 points

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

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

Do the exercise using pen and paper.

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

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

☐ $\begin{bmatrix} 3 \\ 0 \\ 4 \end{bmatrix}$

☐ $\frac{1}{25} \begin{bmatrix} 5 \\ 10 \\ 10 \end{bmatrix}$

✔ 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 $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ and its projection $\frac{1}{5} \begin{bmatrix} 5 \\ 10 \\ 10 \end{bmatrix}$. What is the reconstruction error?

0.47

✔ Correct
Well done!