## 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  $\mathbf{x} \in R^3$  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.

$$\begin{bmatrix} \frac{1}{9} \\ \frac{1}{9} \end{bmatrix}$$

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

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



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

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



## ✓ 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

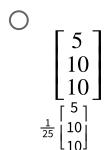
$$\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

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

Do the exercise using pen and paper.



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



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

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

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

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

$$\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \text{ and its projection } \frac{1}{9} \begin{bmatrix} 5 \\ 10 \\ 10 \end{bmatrix}. \text{ What is the reconstruction error?}$$

0.4714



**⊘** Correct

Well done!