## Project 3D data onto a 2D subspace

Practice Quiz, 3 questions

6/6 points (100%)



## **Congratulations! You passed!**

Next Item



4/4 points

1.

For a vector  $\mathbf{x} = \begin{bmatrix} 6 \\ 0 \\ 0 \end{bmatrix}$  and the subspace U spanned by the basis vectors  $\mathbf{b}_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$  and  $\mathbf{b}_2 = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$ , which of

the following statements are true?

You can use the formula slide that comes with the corresponding lecture.

The projection matrix is  $\frac{1}{6}\begin{bmatrix} 5 & 2 & -1 \\ 2 & 2 & 2 \\ -1 & 2 & 5 \end{bmatrix}$ 



#### Correct

Well done!

The projection of **x** onto U is  $\begin{bmatrix} 5 \\ 2 \\ -1 \end{bmatrix}$ 



#### Correct

Well done.

The projection matrix is  $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 2 & 4 \end{bmatrix}$ 



The rank of the projection matrix is 1.

## Project 3D data office a 2D subspace

6/6 points (100%)

Practice Quiz, 3 questions

	The projection	matrix is symmetric.
	, ,	3



Projection matrices are always symmetric.

The coordinates of the projected point with respect to  $\mathbf{b}_1, \mathbf{b}_2$  are  $\begin{bmatrix} 0 \\ 0 \end{bmatrix}$ .

**Un-selected is correct** 

The projection of  $\mathbf{x}$  onto U is  $\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$ 

**Un-selected is correct** 

The projection matrix is not symmetric.

**Un-selected** is correct

The coordinates of the projected point with respect to  $\mathbf{b}_1$ ,  $\mathbf{b}_2$  are  $\begin{bmatrix} 5 \\ -3 \end{bmatrix}$ .

## Correct

Excellent job!



1 / 1

2.

Project 
$$\begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix}$$
 onto the subspace spanned by  $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$  and  $\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$ .

You can use the formula slide that comes with the corresponding lecture.

# Project 3D4 data onto a 2D subspace Practice Quiz, 3 questions

6/6 points (100%)

- $\begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}$
- $\begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix}$

#### Correct

Absolutely! The original vector is already in the subspace, so the projection has no effect.



1/1 point

3

- 1. Project  $\begin{bmatrix} 12\\0\\0 \end{bmatrix}$  onto the subspace  $U_1$  spanned by  $\begin{bmatrix} 1\\1\\1 \end{bmatrix}$ ,  $\begin{bmatrix} 0\\1\\2 \end{bmatrix}$ .
- 2. Project the result from 1. onto the subspace spanned by  $\begin{bmatrix} -10\sqrt{6} \\ -4\sqrt{6} \\ 2\sqrt{6} \end{bmatrix}$ . What is the final projection?

Hint: For step 2. you do not necessarily need to compute anything.

You can use the formula slide that comes with the corresponding lecture.

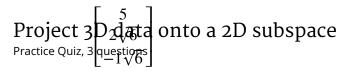


10 4 -2

### Correct

Good job! The first projection already lies in the second subspace. Therefore, the second projection does not do anything.





6/6 points (100%)

$$\begin{bmatrix} 5 \\ 2\sqrt{6} + 1 \\ -\sqrt{6} + 2 \end{bmatrix}$$



