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

2 / 2 puntos

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

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

Correcto

Well done!

2. Given the projection matrix

2 / 2 puntos

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

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.

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

Correcto
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 punto

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?

0.47

Correcto
Well done!