4.8.32

AI25BTECH11017-BALU

Question:
Find the projection of vector $(\mathbf{b}+\mathbf{c})$ on vector $\mathbf{a}$, where

$$\mathbf{a} = 2\hat{i} + 2\hat{j} + \hat{k}, \quad \mathbf{b} = \hat{i} + 3\hat{j} + \hat{k}, \quad \mathbf{c} = \hat{i} + \hat{k}. \tag{0.1}$$

.
Solution:
Let us solve the given equation theoretically and then verify the solution computationally
According to the question,
Given three vectors

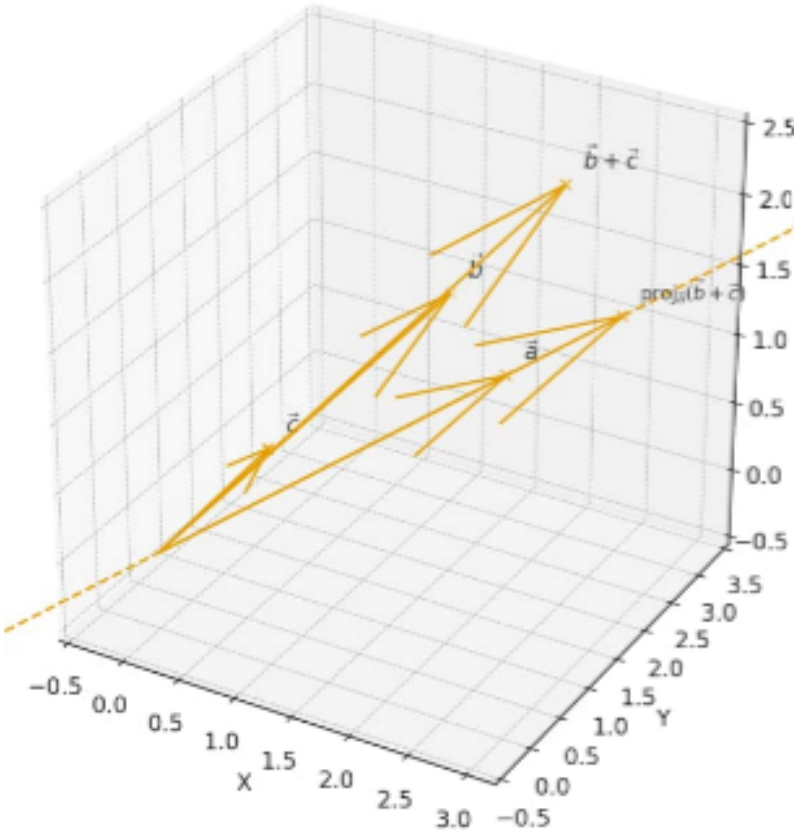
$$\mathbf{a} = \begin{pmatrix} 2 \\ 2 \\ 1 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} 1 \\ 3 \\ 1 \end{pmatrix} \quad \mathbf{c} = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix} \tag{0.2}$$

$$\mathbf{b} + \mathbf{c} = \begin{pmatrix} 2 \\ 3 \\ 2 \end{pmatrix} \tag{0.3}$$

Projection of vector $(\mathbf{b}+\mathbf{c})$ is k$\frac{\mathbf{a}}{\|\mathbf{a}\|}$

$$K = \frac{(\mathbf{b}+\mathbf{c})^T \mathbf{a}}{\|\mathbf{a}\|} = 4 \tag{0.4}$$

$$\text{Projection of vector } (\mathbf{b}+\mathbf{c}) = \begin{pmatrix} 2.67 \\ 2.67 \\ 1.33 \end{pmatrix} \tag{0.5}$$


$\vec{b}+\vec{c}$
$\vec{b}$
$\vec{a}$
$\vec{c}$
$\text{proj}_{\vec{a}}(\vec{b}+\vec{c})$
X
Y
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0