
CSE 151A - Discussion 09

Problem 1.

Given a direction \vec{u} , calculate the projection of $\vec{x} = \begin{pmatrix} 3 \\ -1 \\ 2 \end{pmatrix}$ onto \vec{u} and the angle between \vec{x} and \vec{u} .

Note that in class we assumed \vec{u} to be a unit vector, but that may not necessarily be the case here!

1. \vec{u} is the x_1 axis

2. $\vec{u} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$

3. $\vec{u} = \begin{pmatrix} 1.5 \\ -0.5 \\ 1 \end{pmatrix}$

4. $\vec{u} = \begin{pmatrix} 3 \\ 1 \\ -4 \end{pmatrix}$

Problem 2.

Given the covariance matrix $C = \begin{pmatrix} 4 & 1.5 \\ 1.5 & 1 \end{pmatrix}$, calculate the variance in the direction of \vec{u} for each of the following settings : $\vec{u}^{(1)} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$, $\vec{u}^{(2)} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$, and $\vec{u}^{(3)} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$.

If we wanted to map each data point $\vec{x}^{(i)}$ to a single feature $z_i = \vec{x}^{(i)} \cdot \vec{u}$, what choice of $\vec{u}^{(i)}$ would be best?