
# LINEAR ALGEBRA AND ITS APPLICATIONS
# UE19MA251

## *Projection Matrices*

The matrix P that projects onto C(A) is given by

$$\textbf{Projection matrix} \qquad P = A(A^{\mathrm{T}}A)^{-1}A^{\mathrm{T}}.$$

Also , if P and Q are the matrices that project onto orthogonal subspaces then it is always true that PQ = 0 and P + Q = I

## *Least Squares Fitting Of Data*

Suppose we do a series of experiments and expect the output b to be a linear function of the input t. We look for a straight line

$$b = C + Dt$$

If there is no experimental error then two measurements of b will determine the line. But, if there is error, we minimize it by the method of least squares and find the optimal straight line.

## *Least Squares Fitting Of Data*

Consider the following system of equations:

$C + Dt_1 = b_1$

$C + Dt_2 = b_2 \ldots..$

$C + Dt_m = b_m$

In matrix form, $\begin{bmatrix} 1 & t_1 \\ 1 & t_2 \\ -- & \\ 1 & t_m \end{bmatrix} \begin{bmatrix} C \\ D \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ - \\ b_m \end{bmatrix}$ or $Ax = b$

The best solution $\hat{x}$ can be obtained by solving the normal equations.


# THANK YOU