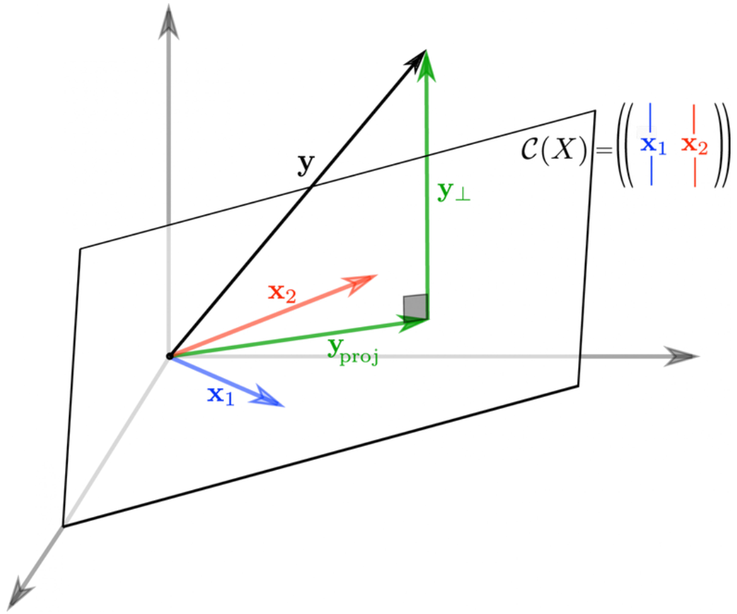
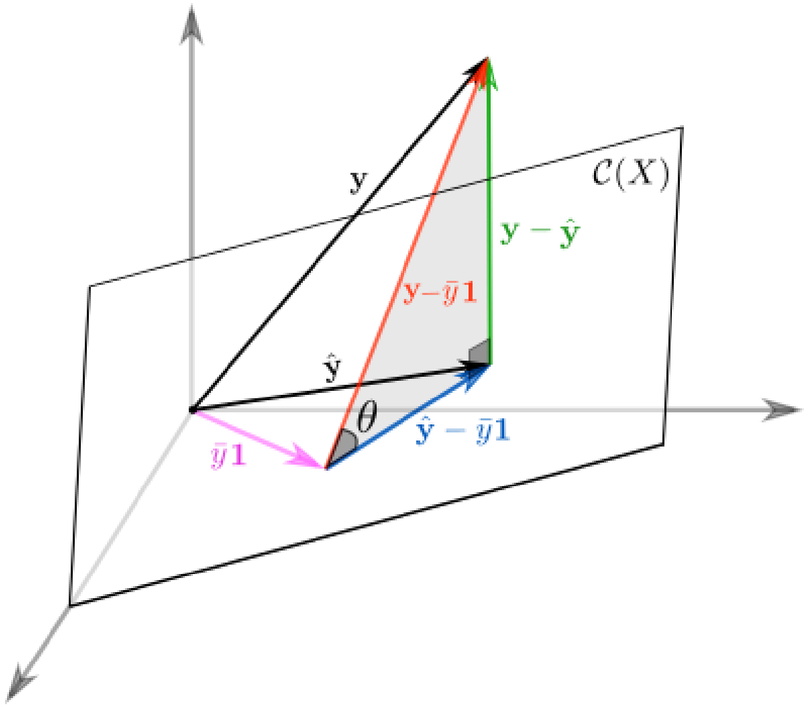
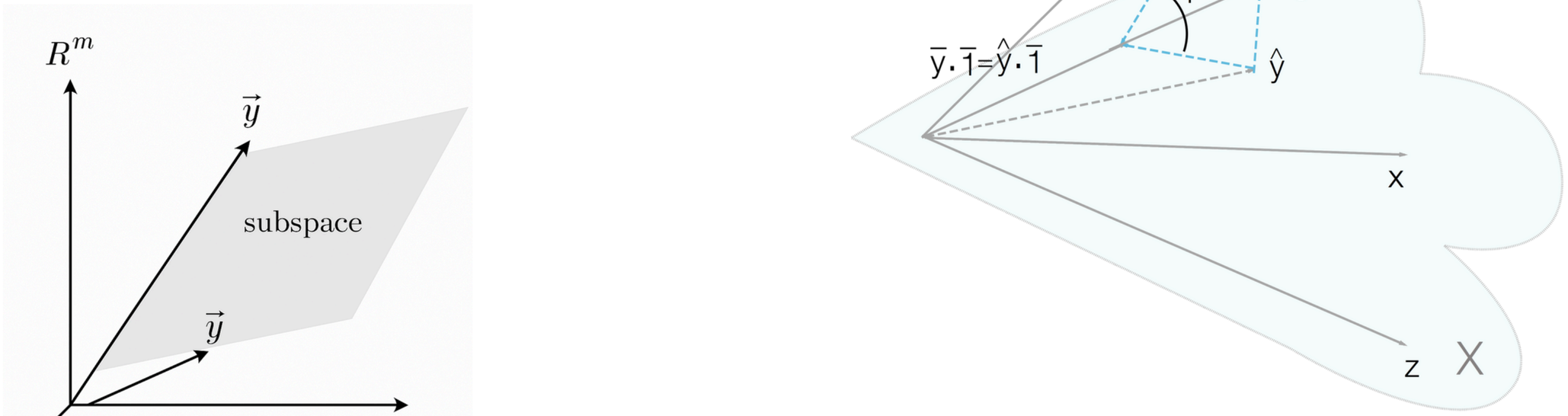

y
$\mathcal{C}(X)=\left(\left(\mathbf{x}_1 \;\; \mathbf{x}_2\right)\right)$
$\mathbf{y}_\perp$
$\mathbf{x}_2$
$\mathbf{y}_{\text{proj}}$
$\mathbf{x}_1$


y
$\mathcal{C}(X)$
$\mathbf{y}-\hat{\mathbf{y}}$
$\mathbf{y}-\bar{y}\mathbf{1}$
$\hat{\mathbf{y}}$
θ
$\hat{\mathbf{y}}-\bar{y}\mathbf{1}$
$\bar{y}\mathbf{1}$


y
$\hat{\varepsilon}$
ρ
e
$\bar{y}\cdot\bar{1}=\hat{y}\cdot\bar{1}$
$\hat{y}$
x
z
X

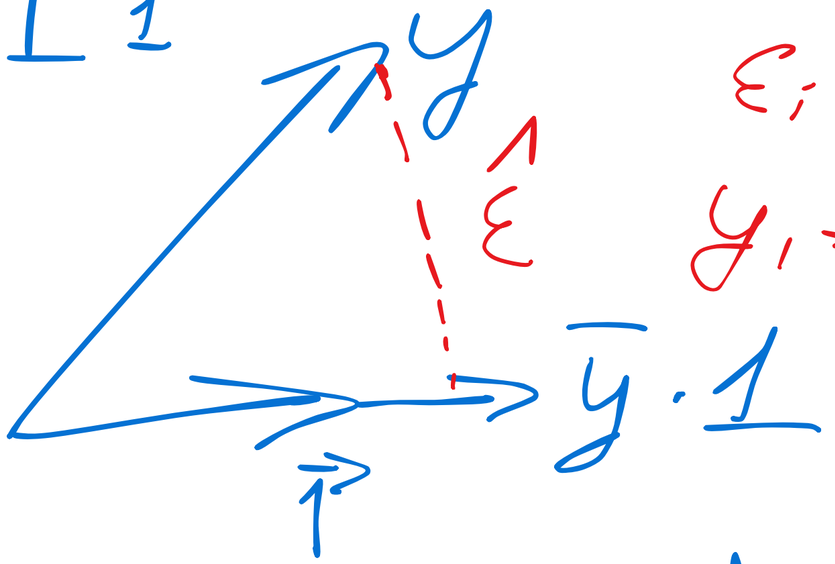
R^m
$\vec{y}$
subspace
$\vec{y}$

$$y = \beta + \varepsilon$$

$$y = \begin{pmatrix} y_1 \\ \vdots \\ y_{10} \end{pmatrix}$$

$$\vec{1} = \begin{pmatrix} 1 \\ \vdots \\ 1 \end{pmatrix}$$

$\hat{\xi} \perp \vec{1}$



$\varepsilon_i = y_i - \hat{y}$

$y_i = \hat{y} + \hat{\varepsilon}_i$

$\hat{b} = \bar{y}$

$\hat{y}_i = \bar{y}$

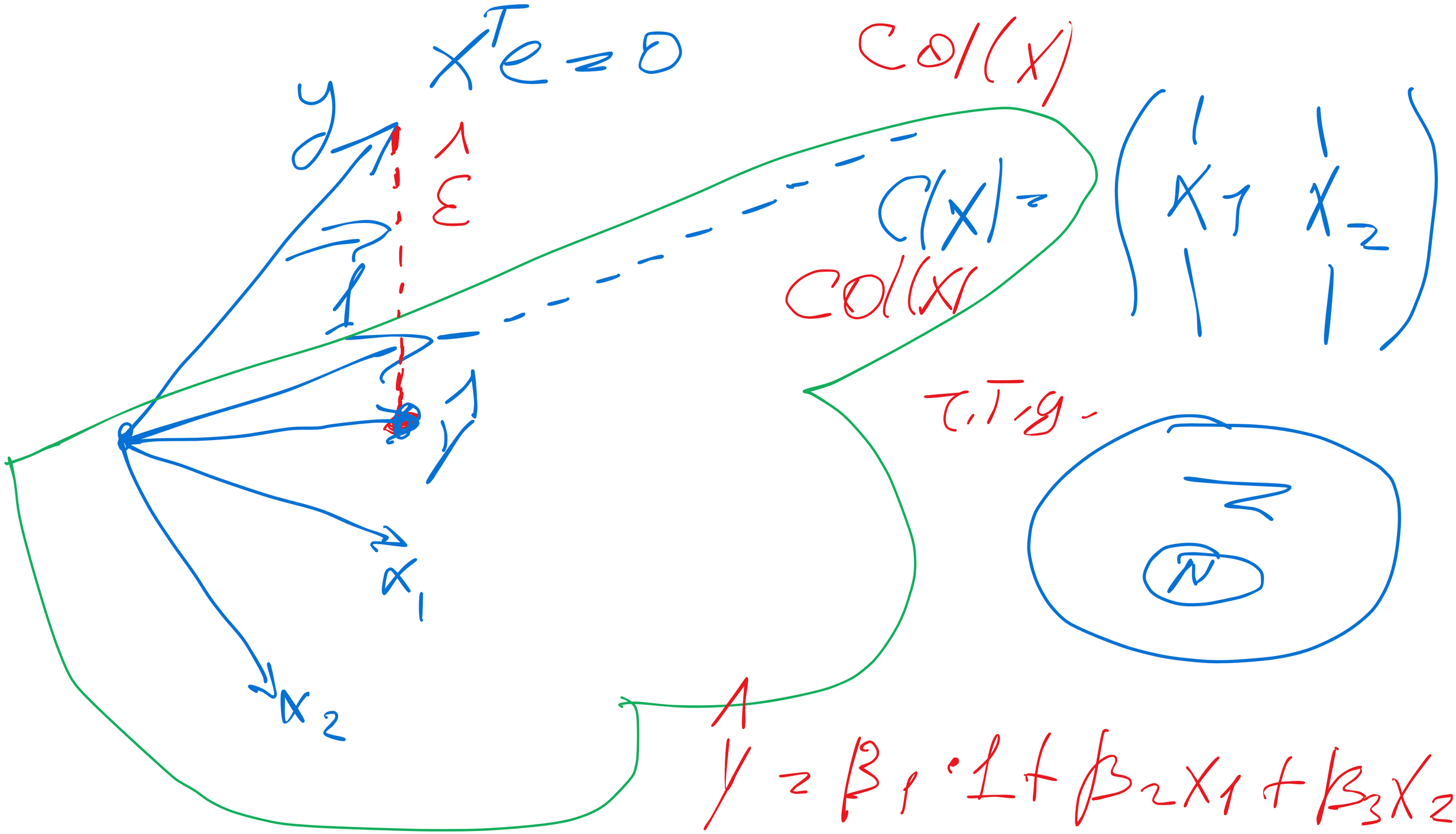
$$\hat{y} = \begin{pmatrix} \hat{y}_1 \\ \vdots \\ \hat{y}_n \end{pmatrix} = \begin{pmatrix} \bar{y}_1 \\ \vdots \\ \bar{y}_n \end{pmatrix}$$

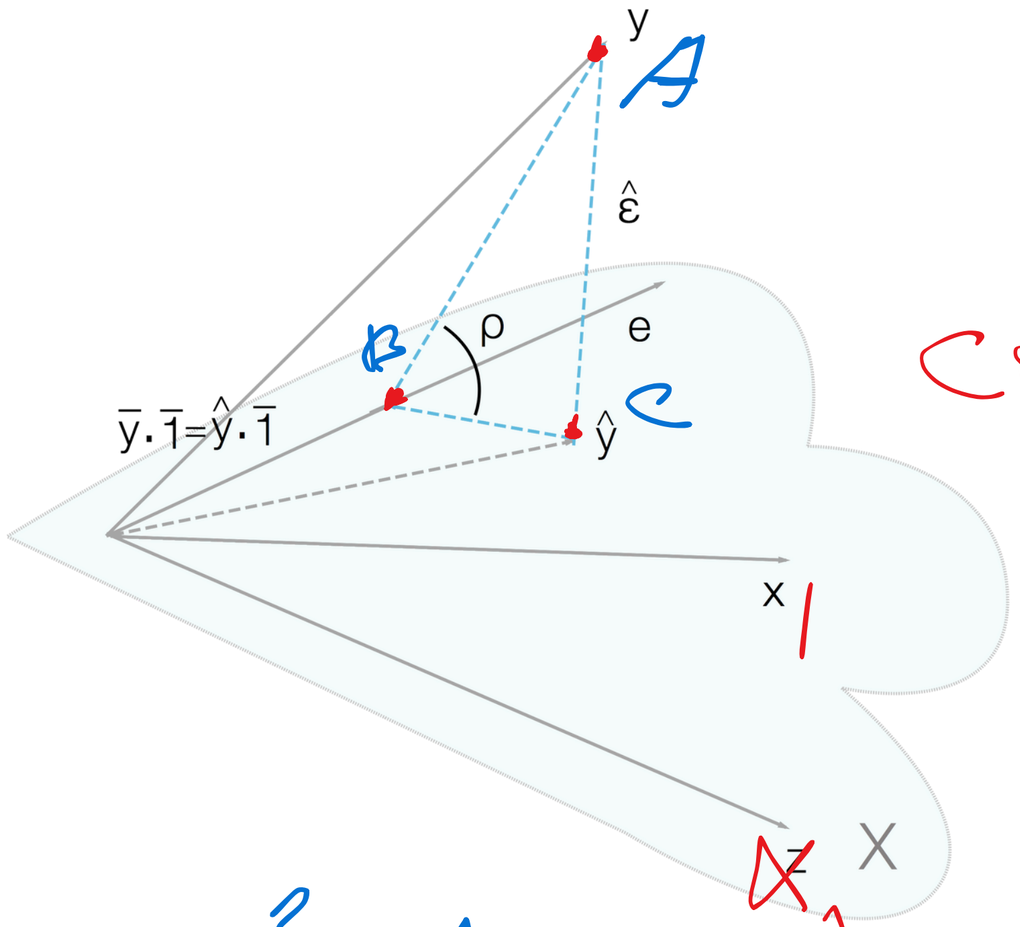
$$\hat{y} = \overline{y} \cdot \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix}$$

$$y_i = \beta_1 + \beta_2 x_1 + \beta_3 x_2 + \varepsilon$$

$$\begin{cases} \hat{\varepsilon} \perp \vec{1} \\ \hat{\varepsilon} \perp x_1 \\ \hat{\varepsilon} \perp x_2 \end{cases} \Longrightarrow \hat{\beta}_1, \hat{\beta}_2, \hat{\beta}_3$$

$$\hat{y} = \beta_1 \cdot 1 + \beta_2 x_1 + \beta_3 x_2$$


$X^T e = 0$
y
ε
1
β_1
x_1
x_2
$Col(X)$
$C(X) =$
$Col(X)$
$\begin{pmatrix} 1 & 1 \\ x_1 & x_2 \end{pmatrix}$
T.T.g.
$\mathbb{R}^n$
$\hat{y} = \beta_1 \cdot 1 + \beta_2 x_1 + \beta_3 x_2$



$$col(X) = \begin{pmatrix} 1 & 1 \\ x_1 & x_2 \\ 1 & 1 \end{pmatrix}$$

$$AB^2 = AC^2 + BC^2$$

$$AB^2 = |y - \bar{y}\cdot\vec{1}|^2 = \sum (y-\bar{y})^2 = TSS$$

$$BC^2 = |\hat{y} - \bar{y}\cdot\vec{1}|^2 = \sum (\hat{y}-\bar{y})^2 = ESS$$

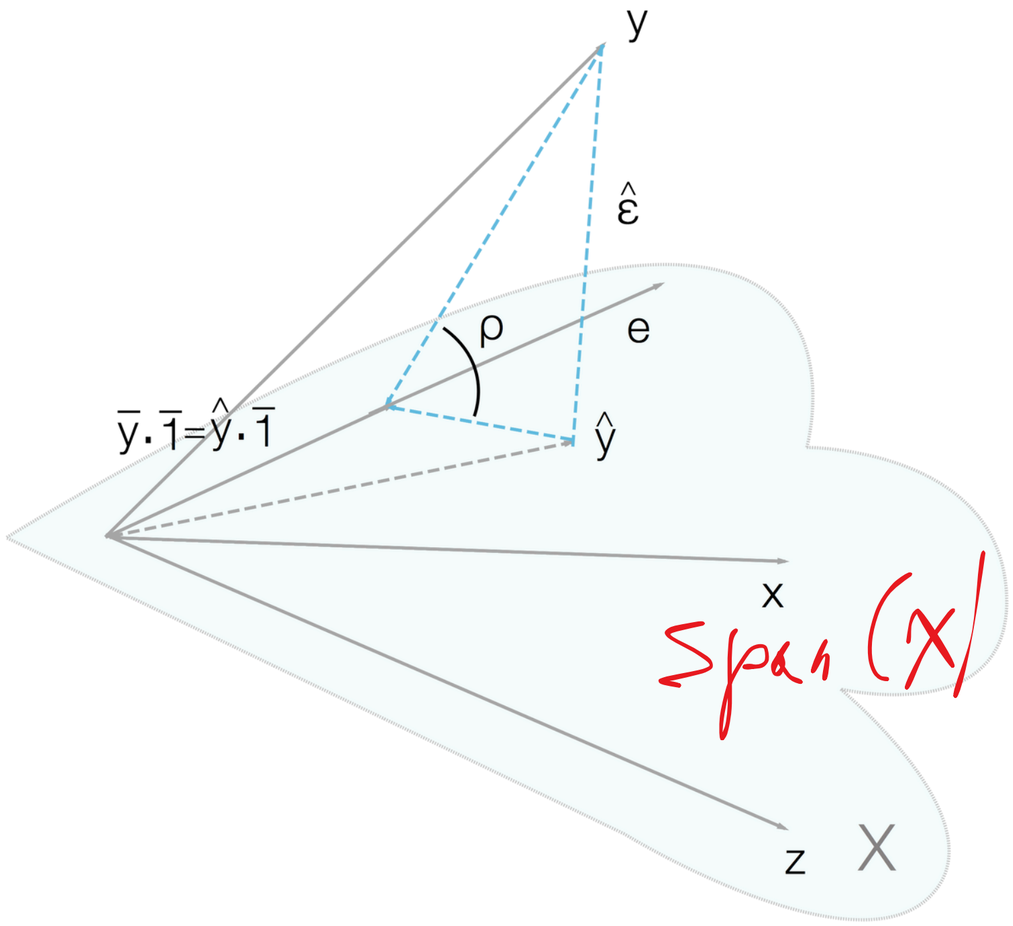
$$RSS = SSE = \sum (\hat{\varepsilon}_i)^2 = \sum |y - (\hat{\alpha} + \hat{\beta}x)|^2$$

$$AC^2 = |\hat{\varepsilon}|^2 = \sum \hat{\varepsilon}^2 = RSS$$

$$TSS = ESS + RSS$$

$$SST = SSR + SSE$$

$$SSE$$



$$\frac{ESS}{TSS} = \frac{b_2 c^2}{A b^2} = \left(\frac{bc}{Ab}\right)^2$$

$$= (\cos \rho)^2$$