

# Projective transformations

Linear Algebra Essentials



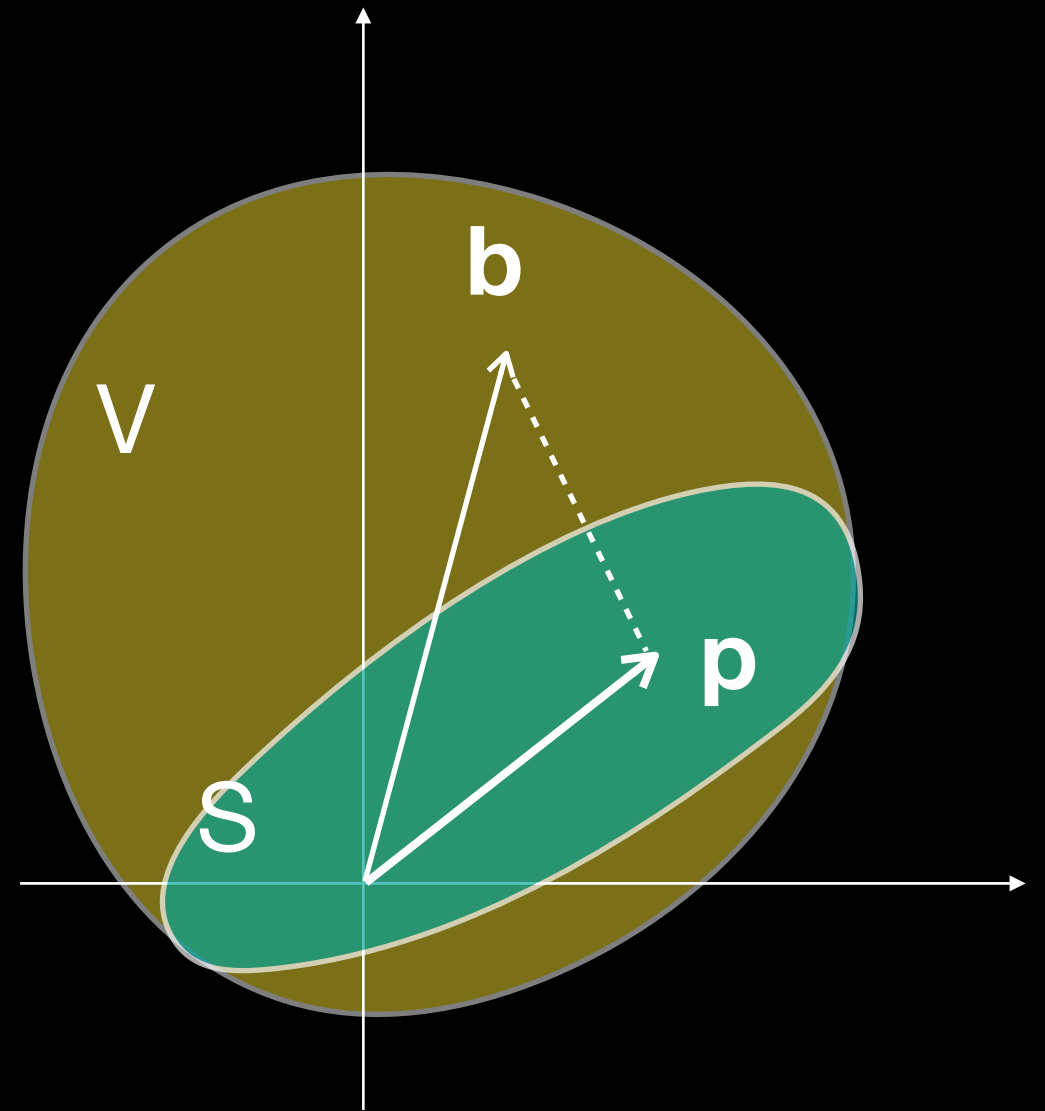
# Vector projection

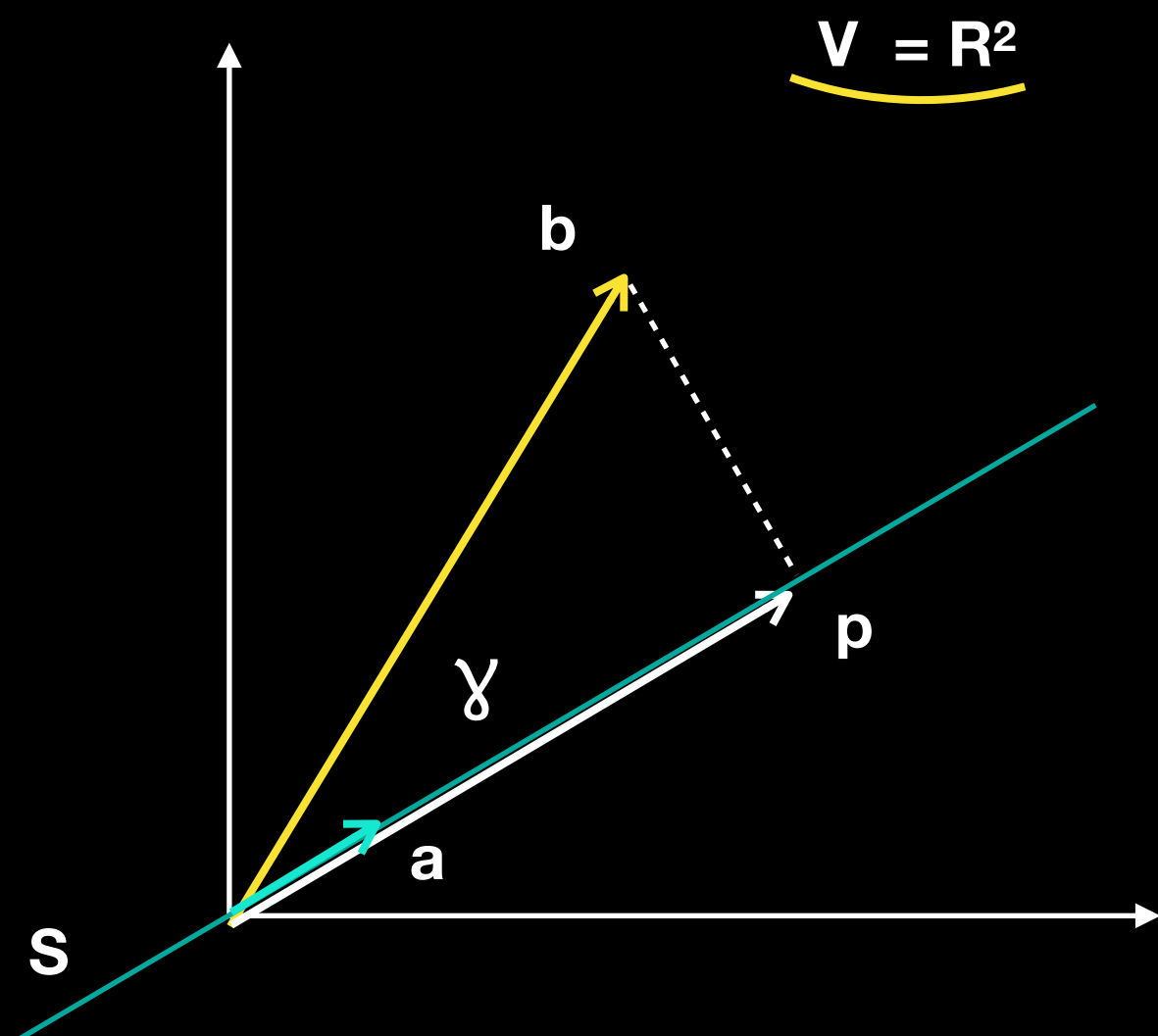
$\mathbf{b} \in V$ , a vector space

$S$  is a subspace of  $V$

$\mathbf{p} \in S$ ,  $\mathbf{p}$  is closest to  $\mathbf{b}$

$\|\mathbf{b} - \mathbf{p}\| \rightarrow \min$





Find the projection  
of vector **b** onto **S**

$$(a, b) = \|a\| \|b\| \cos(\gamma)$$

$$\|p\| = \|b\| |\cos(\gamma)|$$

$$\|p\| = |(a, b)| / \|a\|$$

$$p = t a$$

$$p = a \cdot \frac{(a, b)}{(a, a)}$$

$$(p, b - p) = 0$$

$$(ta, b - ta) = 0$$

$$t(a, b) - t^2(a, a) = 0$$

$$t = \frac{(a, b)}{(a, a)}$$