

first and second principal components of  $\vec{v}_1$

$$\vec{v}_1 = (3.38, 2.07)$$

$$\text{proj}_2 \vec{v}_1 = (-0.10, 0.18)$$

$$\text{proj}_1 \vec{v}_1 = (3.47, 1.89)$$

$$|\vec{v}_1|^2 = |\text{proj}_1 \vec{v}_1|^2 + |\text{proj}_2 \vec{v}_1|^2 = 3.47^2 + 1.89^2 + (-0.10)^2 + 0.18^2$$

