



7/5/20

Lab 10
Principal Component Analysis

Given the data in table, reduce dimension from 2 to 1 using PCA

Feature	Eu 1	Eu 2	Eu 3	Eu 4
X_1	9	8	13	7
X_2	11	9	5	17

$$\lambda_1 = 20.38$$

$$\lambda_2 = 6.61$$

$$e_1 = \begin{bmatrix} -0.5574 \\ -0.8502 \end{bmatrix}$$

$$e_2 = \begin{bmatrix} 0.8303 \\ 0.5527 \end{bmatrix}$$

$$\text{mean of } X_1 = 9$$

$$\text{mean of } X_2 = 8.5$$

$$X_{\text{centered}} = \begin{bmatrix} 4-9 & 8-9 & 13-9 & 7-9 \\ 11-8.5 & 9-8.5 & 5-8.5 & 17-8.5 \end{bmatrix}$$

$$= \begin{bmatrix} -5 & -1 & 4 & -2 \\ 2.5 & 0.5 & -3.5 & 8.5 \end{bmatrix}$$

We find eigen values & eigenvectors. The largest eigen value

$$Z = e_1^T X_{\text{centered}}$$

$$= \begin{bmatrix} -0.5574 & -0.8502 \end{bmatrix} \begin{bmatrix} -5 & -1 & 4 & -2 \\ 2.5 & 0.5 & -3.5 & 8.5 \end{bmatrix}$$

$$Z_1 = 0.1383, Z_2 = 3.736, Z_3 = 0.11905$$

$$Z_4 = -4.009$$