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LAB-10

PCA

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

Feature	Example 1	Example 2	Example 3	Example 4
X1	4	8	13	7
X2	11	4	5	14

Eigen values $\lambda_1 = 30.3849$

$\lambda_2 = 6.6151$

Eigen vectors:- $e_1 = \begin{bmatrix} 0.5574 \\ -0.8303 \end{bmatrix}$

$e_2 = \begin{bmatrix} 0.8303 \\ 0.5574 \end{bmatrix}$

Mean of X1 = 8

Mean of X2 = 8.5

$$X_{\text{centered}} = \begin{bmatrix} 4-8 & 8-8 & 13-8 & 7-8 \\ 11-8.5 & 4-8.5 & 5-8.5 & 14-8.5 \end{bmatrix}$$

$$= \begin{bmatrix} -4 & 0 & 5 & -1 \\ 2.5 & -4.5 & -3.5 & 5.5 \end{bmatrix}$$

Largest E. value = λ_1

Corres. E. vector = $e_1 = \begin{bmatrix} 0.5574 \\ -0.8303 \end{bmatrix}$

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

$$= \begin{bmatrix} 0.5574 & -0.8303 \end{bmatrix} \begin{bmatrix} -4 & 0 & 5 & -1 \\ 2.5 & -4.5 & -3.5 & 5.5 \end{bmatrix}$$

$Z_1 = 1.5385$