

Exercises Serie N02. Data Analysis, Statistics, and Applications

Exercise 1:

Let $T: \mathbb{R}^2 \to \mathbb{R}^2$ be the linear transformation represented by the matrix

$$A = \begin{pmatrix} 4 & 1 \\ 2 & 3 \end{pmatrix}$$

- 1. Find the matrix of the linear transformation T.
- 2. Find the eigenvectors associated with each eigenvalue.

3. Calculate the image of the vector
$$v = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
 under T

Exercise 2:

The variances and covariances are given as follows:

$$V(X) = 4$$
, $V(Y) = 2$, $V(Z) = 4$, $COV(X, Y) = 1$, $COV(X, Z) = 0$, $COV(Y, Z) = 1$

1. From the given informations, form the covariance matrix.

Exercise 3:

Let the data matrix be given by:

$$X = \left(\begin{array}{rrr} 4 & 5\\ 6 & 7\\ 8 & 0 \end{array}\right).$$

- 1. Let C_1 and C_2 be the column vectors of X.
- 2. Calculate the statistics of the data.
- 3. Center and normalize the variables $C_1 \, \mbox{and} \, C_2.$
- 4. Find the variance-covariance matrix Σ and the correlation matrix R.
- 5. Denote by λ_i the eigenvalues of the matrix R.
- 6. Determine the eigenvectors F_i associated with the eigenvalues λ_i .
- 7. Diagonalize the matrix Σ .