Exercises
Multivariate Statistics

Knut Conradsen
Anders Nymark Christensen
Allan Aasbjerg Nielsen
Bjarne Kjær Ersbøll

2018 Autumn, v. 0.1

Chapter 1

Exercise 1.1

Consider the matrix

$$\boldsymbol{\rho} = \begin{bmatrix} 1 & \rho & \rho \\ \rho & 1 & \rho \\ \rho & \rho & 1 \end{bmatrix}$$

a) For which values of ρ is this a valid dispersion matrix? (Hint: Both dispersion and correlation matrices must be positive semi-definite)

Assume that $\boldsymbol{\rho}$ is a valid dispersion matrix. Let furthermore the 3-dimensional random variable $\boldsymbol{X}$ be normally distributed

$$X \sim \mathrm{N}(0, \boldsymbol{\rho})$$

b) Determine the axes in the contour ellipsoid for the probability density function of $\boldsymbol{X}$