

Homework 1

Lecturer: Hang Zhou

Due date: 4:00pm, April 11

Homework is a crucial step in your learning journey for this course, enriching your understanding of mathematical statistics. I strongly suggest you spend time on it and complete it independently.

Question 1: Consider the multivariate normal distribution $\mathcal{N}(\boldsymbol{\mu}, \Sigma)$, where $\boldsymbol{\mu}$ is a p -dimensional vector and Σ is a $p \times p$ covariance matrix. What is the parameter space for $\boldsymbol{\mu}$ and Σ ?

Question 2: $X_1, \dots, X_n \sim_{i.i.d.} \mathcal{N}(\mu, 1)$. Find the MLE of μ .

Question 3: $X_1, \dots, X_n \sim_{i.i.d.} \mathcal{N}(0, \sigma^2)$. Find the MLE of σ^2 .

Question 4: A certain type of electronic component has a lifetime Y (in hours) with probability density function given by

$$f(y|\theta) = \begin{cases} \left(\frac{1}{\theta^2}\right) ye^{-y/\theta}, & y > 0, \\ 0, & \text{otherwise.} \end{cases}$$

That is, Y has a gamma distribution with parameters $\alpha = 2$ and θ . Find the MLE of θ .