

Exercises on Determining Interval Estimators

Exercise 0.1. Given a random sample X_1, X_2, \dots, X_n from a normal distribution with an unknown mean μ and known variance σ^2 , construct a 95% confidence interval for μ based on the sample.

Exercise 0.2. Suppose you have a random sample of size $n = 50$ from a normal distribution with an unknown mean μ and known variance $\sigma^2 = 25$. Calculate a 99% confidence interval for μ .

Exercise 0.3. Consider a random sample of size $n = 20$ from a normal population with an unknown mean μ and unknown variance σ^2 . Calculate a 90% confidence interval for μ and provide the general formula for the confidence interval.

Exercise 0.4. Given a random sample of size $n = 25$ from a normal population with an unknown mean μ and an unknown variance σ^2 , construct a 98% confidence interval for the population variance σ^2 .

Exercise 0.5. For a random sample of size $n = 30$ from a normal population with an unknown mean μ and an unknown variance σ^2 , determine the 95% confidence interval for the ratio of two variances, $\frac{\sigma_1^2}{\sigma_2^2}$.

Exercise 0.6. In an industrial process, the time (in minutes) required to complete a task follows a normal distribution with an unknown mean μ and a known variance of $\sigma^2 = 16$ minutes. A random sample of size $n = 15$ is taken, and a 90% confidence interval for the mean time μ is needed. Calculate the confidence interval and interpret the result.