

Seminar 6

1. We will work with the data sample describing the screws produced on the production line. We randomly selected 30 screws and measured them: their lengths in mm are available in the R script. Assume that our data sample is normally distributed. The producer claims, that the mean length of the screw is 20 mm, is he right?
 - (a) Estimate parameters μ and σ of the normal distribution $N(\mu, \sigma)$ using the maximum likelihood method. Then construct a **two-sided** 95% confidence interval for parameter μ . Create a visualization of all informations you have computed (plot the histogram together with the density of the estimated normal distribution and with CI for μ).
 - (b) Test the null hypothesis $H_0 : \mu = 20$, against the **two-sided** alternative $H_1 : \mu \neq 20$ at the significance level $\alpha = 0.05$. Compute the value of the test statistic and find the critical region. What is your conclusion?
 - (c) Create a density plot of a theoretical distribution of the test statistic (student t-distribution), visualize the critical region and the test statistic.
 - (d) Find the p-value of the previous test and use it for decision about the null hypothesis.
 - (e) Create a density plot of a theoretical distribution of the test statistic (student t-distribution), visualize the test statistic and p-value.
2. Use the data from the previous task. Solve the same tasks as before, but now for the **left-sided** confidence interval and the **right-sided** alternative hypothesis.
3. Use the data from the previous task. Solve the same tasks as before, but now for the **right-sided** confidence interval and the **left-sided** alternative hypothesis.