
Theoretical Exercises

Exercise 9.1: (Theoretical) One-sample test

The price of a product was surveyed in seven randomly selected grocery stores:

4.50, 3.90, 4.20, 4.30, 4.00, 4.30, 4.20

We assume that the price is a normally distributed random variable and that the pricing in the individual shops is independent of each other.

The manufacturer of the product is interested in whether the average price in shops deviates from its recommendation of 4 (with $\alpha = 0.1$). Perform a proper statistical test. Especially, perform all the components of the test.

Exercise 9.2: (Theoretical) Two-sample test

In two facilities (A and B) a specific electronic element is produced in the same way.

It is assumed, that the survival time of the elements produced in facility B is larger than the ones in facility A.

A sample with the following properties is taken:

- Facility A: $n_A = 100$, $\bar{x}_A = 1540$, $s_A = 142$
- Facility B: $n_B = 120$, $\bar{x}_B = 1600$, $s_B = 150$

Assume that a normal distribution is given and perform a test with $\alpha = 0.01$ to check if the elements produced in facility B have a larger survival time than the ones produced in facility A.

Practical Exercises

Excercise 9.3: (Practical) Machine Learning model in production

A machine learning model is designed to improve the performance (time needed) of a process. To show that the model has a positive impact, a sample of the process times with activated model (A) and without activated model (B) was taken.

The results are given in two csv file (see Ilias: results_A.csv and results_B.csv). We assume that the results are normally distributed with the same, but unknown, variance. Perform a t-test with significance level $\alpha = 0.01$ to check if the machine learning model has an impact.

Hint: In python you can use the function `ttest_ind` of the scipy module. Unfortunately, this function only compute the results for the case $\mu_A = \mu_B$. Think about how you can derive the results for $\mu_A < \mu_B$ from this function.