Practical 11: Choosing t-tests for different conditions

ADS2

Semester 1, 2023/24

Work through this guide alone or in groups. Facilitators are here to help. The time it takes to complete this practical can vary between individuals - this is OK. Do not worry if you do not finish within the session.

Learning Objectives

- Describe variants of the t-test
- Choose an appropriate type of t-test for a given problem
- Describe and use non-parametric alternatives to the t-test

You have learned three types of t-tests:

1) One sample t-test. The input includes a numeric vector X and a theoretical mean.

2) Two-sample independent t-test of two numeric vectors X and Y.

3) Paired sample t-test of two numeric vectors X and Y.

Today, you will use them. There are specialized commands to perform each type of test, but it would be good if you write your own function that performs the t-test and calculates the p-value. It will help you to understand the mechanism of the test better.

Now, you will analyse some pieces of data. Identify the right t-test on the following occasions, test assumptions, and run the test. After you perform the test, compare the p-value derived by the code with the p-value derived using the pt function. Try one-sided and two-sided tests.

1) The "ToothGrowth" dataset comes with R. Please read the instructions for the dataset. (?ToothGrowth) and import the data using the function **data**

   a. Let us assume that the average tooth length of normal guinea pigs is 8.5, then do you think vitamin C has a significant effect on tooth growth? Which t-test do you perform?

   b. We want to know if the delivery methods could lead to significant differences. Please perform t-tests to support your conclusions. Does the dosage level matter?

2) Import another dataset "iris". Apply a t-test to see if the average sepal length of setosa and versicolor is significantly different. How do you set the argument var.equal? Why?

3) The blood pressure data record the blood pressure of patients before and after a treatment (https://github.com/Opensourcefordatascience). You can import the dataset from the CSV file. Now you can apply t-tests to see if the treatment is useful. Which t-test do you use?

4) Try non-parametric analogues of the t-tests. What is the principle behind the tests? Are the results different compared with the t-test? How can you explain it? What is the outcome?

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