Lab Week 9

Hypothesis testing

Let us consider following sample

$$x_i \in \{1.5, 3.0, 2.2, 2.5, 4.1, 3.7\}$$

1. Test the hypothesis

   $$H_A: \quad \mu > 2$$

   by performing a t-test without using the R function `t.test()`. Can the null-hypothesis be rejected at a type-I-error rate of $\alpha = 0.05$?

2. Modify the above code to test the alternative hypothesis

   $$H_A: \quad \mu \neq 2$$

   Compare with the previous one-sided hypothesis and test decision.

Permutation test

Generate two normally distributed random samples

$$X_i \sim Normal(\mu_X = 0, \sigma_X = 1) \quad \text{and} \quad Y_j \sim Normal(\mu_Y = 1.5, \sigma_Y = 2)$$

with sample sizes $n_X = n_Y = 4$

1. Perform a one-sided t-test ($\alpha = 0.05$) to test if $\mu_X < \mu_Y$ without using the function `t.test()`.
2. Perform a permutation test for the t-test statistic and compare the resulting p-value with the p-value of the t-test.
3. Compare the sampling distribution of the test statistic with the density of a t-distribution for different sample sizes n_X and n_Y, e.g. 5, 10, 25, 50, 100.