

Theory of Science – Experiments and Evaluation

Exercise 2

To be worked on in the exercise session March 18. Written solutions prepared individually during the following week(s). Combined solutions for all exercises due on March 29 in a single pdf document.

In this exercise we continue with the analysis of the `vitdata` data.

C. For hypotheses H3 and H4 from Exercise 1:

- Identify a statistical test that is suitable to test the hypothesis
- Apply the test to the `vitdata` and determine whether the hypothesis is rejected at a significance level of 0.01.

D. Define yourself 4 new hypotheses about the students and exam questions in `vitdata`, such that you have one hypothesis each with the following characteristics:

- the hypothesis is one sample, and can be tested with the Binomial test
- the hypothesis is one sample, and can be tested with the one sample t-test
- the hypothesis is two sample, and can be tested with the two sample t-test
- the hypothesis is two sample, and can be tested with the Wilcoxon test

For each hypothesis, perform a preliminary analysis using descriptive statistics, and based on this analysis, decide whether you think the hypothesis should be

A: not rejected, B: rejected, or C: very clearly rejected (with a p-value < 0.00001)

Apply a suitable statistical test to your hypotheses, and check whether the result of the test corresponds to your expectation.

Online Tools

The exercises are best done with tools like Python (Numpy, Scipy.stats), Maple, Matlab, R, etc. If you are not experienced with any of these tools, then there are a number of easy-to-use online tools. The functionality of these tools is sometimes a bit limited, but sufficient for our purpose.

Histograms (no overlays), Binomial test, t-test, Wilcoxon test:

<http://www.socscistatistics.com/Default.aspx>

Scatterplots:

<http://www.alcula.com/calculators/statistics/scatter-plot/>