

Social Robotics

B. Nebel, F. Lindner, L. Wächter
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University of Freiburg
Department of Computer Science

Classwork Sheet 4

Exercise 4.1 (Basics of t-test)

Explain the the basic assumptions of the t-test.

Exercise 4.2 (t-test: Basics)

A computer scientist believes that students remember details from their lecture about social robots better when they are rewarded for correct answers. In order to confirm his hypothesis he conducts an experiment with his 40 students: One half of the sample ($n_1 = 20$) is promised one piece of chocolate for every correct answer (out of 30), the other half does not receive a reward. The results are planned to be compared using the t-test for independent samples.

- Does the hypothesis require a one- or two-tailed test?
- Write down the H_1 and the H_0 formally.
- Would the empirical difference of the means ($\bar{X}_1 - \bar{X}_2$) be more positive, negative or zero, in case the researcher's expectation is correct?

Exercise 4.3 (t-test: Between-subject design)

An experiment is conducted to compare the influence of different tutors on the time to complete a task. The first group interacts with a human tutor while trying to solve a mathematical equation. The second group is supported by a robotic tutor. The time for task-completion is measured in seconds for each participant. The table depicts the data. We want to find out whether the data imply a significant difference between the conditions. Please use a $\alpha = 1\%$ in this case.

Group 1		Group 2	
128		42	
160		24	
53		68	
101		35	
94		47	
Σ		Σ	

Exercise 4.4 (t-test: Within-subject design)

Today, most smartphones are equipped with a voice assistant. However, some elderly users still are concerned about using it. The manufacturer of an expensive new phone wants to find out whether people use their voice assistant more, when they are informed about the way it works. Therefore a sample of elderly smartphone-owners is asked how often they have used the voice assistant for support on the day before: 0, 0, 3, 3, 2, 0, 0. Afterwards they are informed how the voice assistant works and that their data are only transferred anonymized. After 7 days of habituation the same sample is asked again to tell how often they used their voice assistant the day before: 4, 0, 14, 23, 9, 8, 6. Does the information have a significant effect on the usage of the voice assistant ($\alpha = 5\%$)?

Exercise 4.5 (t-test: One sample)

In a long-term experiment it was determined that participants that learned from a human take $\mu_0 = 170s$ on average to complete a task. It is hypothesized that humans who learned from robots are faster in solving the task. Twenty participants who learned the task from robots accomplished it in a mean time of $163s$ and a standard deviation of $s = 12$. Hence, the following values are given: $\bar{x} = 163, \mu_0 = 170, s = 12$. Check the hypothesis using a t-test.