Social Robotics

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Classwork Sheet 3

Exercise 3.1 (Assumptions of Chi-Square Testing)

The students in a small chemistry tutoring class are additionally supported by a teaching robot. The robot can explain the topic either showing plain graphics or animations on the display in his belly. The null hypothesis states that the success in the exam is independent of the mode of explanation. Are the assumptions of Pearson's χ^2 fulfilled in the following table?

	Graphics	Animations	Total
Pass	2	7	9
Fail	5	4	9
Total	7	11	18

Exercise 3.2 (Pearson's Test of Independence)

Computer Science and Linguistic students were asked to interact with a robot and afterwards rate if they perceived it as *smart* or *stupid*. Our hypothesis is that students of the different subjects rate the robot differently. Is the hypothesis supported by the data ($\alpha = 0.05$)?

	Smart	Stupid	Total
Computer Scientists	102	234	336
Linguists	89	170	259
Total	191	404	595

Exercise 3.3 (Pearson's Goodness of Fit I)

We want to test the hypothesis that our three Robots differ in the number of interactions they produce. Therefore, Robo-1, Robo-2, and Robo-3 are deployed in the mall. During one week we record 150 interactions with Robo-1, 110 interactions with Robo-2, and 130 interactions with Robo-3. Is the hypothesis supported by the data ($\alpha = 0.05$)?

Exercise 3.4 (Pearson's Goodness of Fit II)

Lotta and Ben are in the same kindergarden group. Lotta loves dinosaurs, whereas Ben likes to play with electric toys. The kindergarden teacher hypothesizes that Lotta will more often play with the toy robot Pleo compared to Ben. Over a week it was observed that Lotta played with Pleo 45 times and Ben 30 times. Is the kindergarden teacher's hypothesis supported by the data ($\alpha = 0.05$)?

Exercise 3.5 (McNemar)

A sample of 40 participants is employed to evaluate the influence of an interaction with a robot on their opinion. The participants are first asked whether they *like* or *dislike* robots in general. Afterwards they interact with a robot and then are asked again if they like or dislike robots. Test whether the data supports a change in the overall opinion about robots before and after the interaction (with $\alpha = 0.05$).

	Likes	Dislikes
Likes	8	16
Dislikes	5	11

Row labels: Before, Column labels: Afterwards

Exercise 3.6 (Reflections)

(a) Which types of hypotheses were at play in the exercises above? (difference, relationship, directional, undirectional)?

(b) For each exercise above, name the dependent and independent variables and their levels of measurement.