

Social Robotics

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Summer Semester 2019

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Classwork Sheet 6

Exercise 6.1 (Basics of correlations)

Which statements about correlations are valid?

- Life expectancy and alphabetization correlate highly positive. This means that people live longer because they can read.
- The number of lions and antilopes in a desert correlates highly positive. This means where you can find lions you can also find antilopes. It also means that where you can find antilopes you can find lions.
- In case the correlation coefficient of temperature and robots goes towards -1 it means: “The higher the temperature, the less robots are there.”
- A correlation coefficient of 0 states that there is no linear relation between the variables considered.
- You should not consider possible third variables when interpreting correlations.
- Pearson correlations can always be interpreted in both ways.

Exercise 6.2 (Correlation)

An experiment was conducted to investigate the relation of the number of Hexbugs in an waiting area and the duration until people seemed to be bored (rated by a professional psychologist). The hypothesis states that people are bored after a longer amount of time if there are more Hexbugs.

Amount of HexBugs	Time until Boredom
x_i	y_i
8	26
8	26
10	11
7	22
8	34
8	29
7	13

- (a) Which scale levels do the variables have?
- (b) Draw a scatterplot of the data.
- (c) Describe the plot in one sentence. What kind of correlation do you expect – (slightly, strongly) positive/ negative, etc. ?
- (d) Calculate the mean, covariance and standard deviation for both variables.
- (e) Calculate the Pearson correlation to find out if there is a relation between both variables.
- (f) Is the result significant with $\alpha = 0.05$?

Exercise 6.3 (Spearman's Correlation Coefficient)

A fashion store has started to use a shopping-assistance-robot to enrich their customers' experience. The supermarket asked some of their regular customers to evaluate their experience with the robots. The managers were especially interested in the correlation of the likeability of the robot and how much the customers like shopping in general. Both variables were measured on a 15-point scale ranging from 1 (low robot/shopping likabiliby) to 15 (high robot/shopping likability). The ratings are shown in the table below.

Like Robot	Like Shopping
1	13
1	12
11	14
8	8
7	7
2	8
5	8
12	11
4	13
9	6

- (a) Calculate the Spearman's correlation coefficient.
- (b) Is the relationship statistically significant with $\alpha = 0.05$?

Exercise 6.4 (Basics of Regression)

Which characteristics does the regression line have regarding the point cloud/cluster of points it describes?

- The sum of squared differences between the predicted and the actual values is as small as possible.
- The slope is always as high as the biggest distance between the measured values.
- The intersection with the y-axis is always the mean of the Y_i s.

Exercise 6.5 (Regression)

A company has developed an autonomous robot for carrying heavy objects over smaller distances in big factory halls, airports or other buildings without interrupting bystanding persons. An experiment was conducted to investigate the influence of the *number of "human obstacles"* in a hallway on the *time* the robot needed to arrive its goal in minutes. The test-hallway is about 450 meters long and located in a fairly unbusy part of a factory. The researchers want to use the data for predicting the time needed in more busy environments. The data of the ten trials is listed below.

- (a) Calculate the regression line that fits the data.
- (b) Which predicted value is expected for $x = 22$?
- (c) Calculate R^2 , F , and p , and report your results according to the APA guidelines (<https://de.slideshare.net/plummer48/reporting-a-single-linear-regression-in-apa>).

<i>Number of HO</i>			<i>Time</i>		
3			12		
0			6		
4			18		
2			12		
1			7		
4			20		
2			14		
7			23		
1			9		
6			19		