

## Social Robotics

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

## Classwork Sheet 9

### Exercise 9.1 (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 9.2 (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) Draw a scatterplot of the given data.
- (b) Calculate the regression line that fits the data.
- (c) Which predicted value is expected for  $x = 22$  ?
- (d) 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		

### Exercise 9.3 (Regression for t-Test)

An experiment is conducted to compare the influence of different tutors on the time to complete a task. The first group interacts with a learning software 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. Calculate the regression model and use the test for significance of the slope coefficient to find out whether or not there is a significant difference between the two conditions. Report  $R^2$ ,  $F$ , and  $p$ .

Group 1	Group 2
128	42
160	23
52	68
101	35
94	47