Social Robotics

Albert-Ludwigs-Universität Freiburg

Felix Lindner, Laura Wächter, Bernhard Nebel

SoSe 2019

Lecturer

Dr. Felix Lindner Room 52-00-043

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Brief CV

- 2002-2009: Student of Computer Science at University of Hamburg
- 2009: Diploma Thesis on robots using natural-language route instructions for navigation.
- 2009-2015: Research Assistant at University of Hamburg
- 2015: Dissertation on robot social navigation
- Since 2015: Lecturer at University of Freiburg
  - Research Interest: Robot Companions, Machine Ethics (`http://www.hera-project.com/`)

Teaching Assistant

Laura Wächter

email: waechtel@tf.uni-freiburg.de

Lectures

Where

HS 00 006, Building 82

When

Lecture: Monday 14:00 – 16:00

Web page

`http://gki.informatik.uni-freiburg.de/teaching/ss19/socrob/`

Classroom Training

Where

HS 00 006, Building 82

When

Wednesday 12:00 – 14:00

Exercises: Procedure

- Exercise sheets will be handed out and posted on the web page on Monday.
  - Exercise sheets contain in-class exercises and homework exercises.
  - In-class exercises are solved live on Wednesday.
  - Homework exercises are solved at home and handed in for grading.
- For the homework exercises you work in groups of size 2–3. Form groups until **May 5th**.
- Each group hands in one solution (in English or in German).
- Solutions have to be handed in until Monday a week after via email to Laura Wächter *waechtel@tf.uni-freiburg.de*.

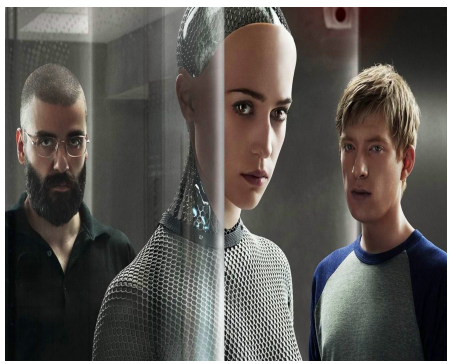
Examination

- Studienleistung Necessary to have reached at least 50% of the points on homework exercises.
- Exams An oral or written examination takes place in the semester break.
- The examination is obligatory for all Bachelor students (oral) and Master students (oral or written).

Course Outline

Termin	Thema
24.04.	L: Organization & Intro
29.04.	L: Video-Session: Social Robots in Pop Culture
06.05.	L: Robo Ethics
08.05.	Reading Group
13.05.	L: Introduction to Social Robotics as an Empirical Science
15.05.	R Tutorial
20.05.	L: Empirical Methods & Descriptive Statistics
22.05.	Classroom training
27.05.	L: Inferential Statistics
29.05.	Classroom training
03.06.	L: Chi-Square & Fisher's Exact Test
05.06.	Classroom training
17.06.	L: Comparing means using t-Test
19.06.	Classroom training
24.06.	L: Comparing means using ANOVA
26.06.	Reading Group
01.07.	L: Non-parametric tests
03.07.	Classroom training
08.07.	L: Correlations
10.07.	Classroom training
15.07.	L: (Linear) Regression
17.07.	Classroom training
22.07.	Recap & Evaluation
24.07.	Exam Preparation

Social Robots in Pop Culture



- How robots are portrayed in pop culture.
- Reproduction of cultural stereotypes.
- What is a human?

Robo Ethics

- Machine Ethics
  - How should robots behave?
  - How can we build robots that behave according to ethical principles?
- Meta-Ethics
  - Can/Should robots have rights?
  - Can robots be persons?
  - Are robots just tools?
  - Do robots really interact with humans?

Social Robotics as an Empirical Science

- How do people actually perceive / interact with / conceptualize social robots? E.g.,
  - How does a robot's outer appearance / voice / etc. affect human acceptance of that robot?
  - Do people assign blame and responsibility to robots just as they assign blame and responsibility to humans?
- Empirical Research Method
  - Initial Observation, Theory, Hypothesis, Data Collection, Data Analysis

Inferential Statistics

- Infer relationships between features of members in a population from a sample drawn from that population. E.g.
  - Cultural background influences acceptance of a robot's social behavior.
- Mathematical tool: Hypothesis testing
  - χ^2: Difference between groups regarding some categorical variable.
  - $t-Test, ANOVA$: Difference between group means.
  - *Correlation*, *Regression*: (Linear) relationships between two interval variables.
  - $Rank-based\ tests$: Differences / Relationships regarding ordinal variables.

Objectives of this Course

- You have an idea about how to conduct your own empirical research in social robotics (or on some other HCI related topics) as your BA/MA project and/or BA/MA thesis:
  - You can read and understand scientific publications on social robotics.
  - You can formulate your own research questions.
  - You are able to operationalize these research questions.
  - You know how to report your own research results.

6.1 Results

We recruited 20 participants (8 female) from the local university population. The mode age (collected in ranges) was 26-30, at 35%.

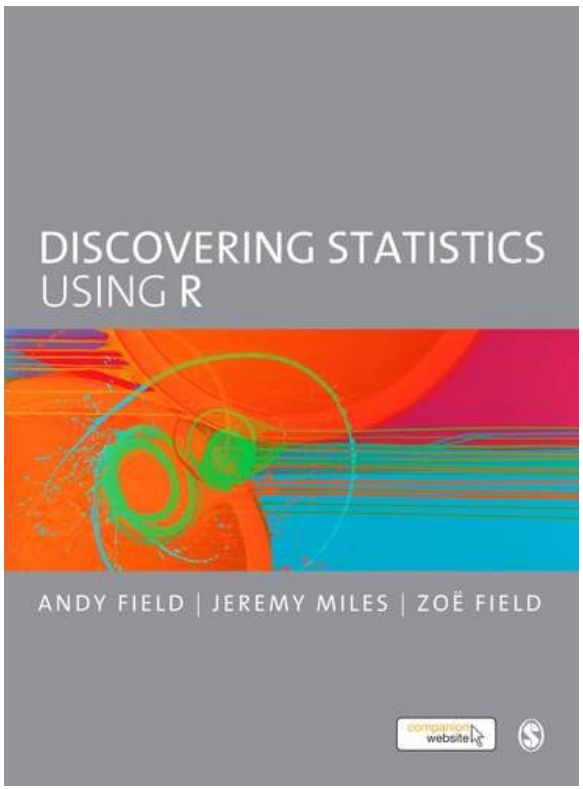
Repeated-measures ANOVA comparing all cue against the no-cue case) showed an effect of cue type on response time (Figure 4b, $F_{2.8,52.3}$=41.9, η^2=.69, p<.001, Greenhouse-Geisser correction), accuracy (Figure 4c, $F_{2.0,38.3}$=30.8, η^2=.62, p<.001, Greenhouse-Geisser correction), and cognitive load (Figure 4a, $F_{2.2,41.8}$=6.5, η^2=.26, p=.003, Greenhouse-Geisser correction). Planned contrasts against no cue showed all others to be more accurate and to have lower cognitive load (p<.002), while circle, bounce, and dark had faster response time; no response-time difference was found against target (p<.01). While Figure 4 shows overall means and confidence intervals, the within-participants statistics uses relational scores.

A Wilcoxon signed-rank test (one-tailed) confirms hypothesis H.1A predicting that Immanuel is perceived as more moral after the interaction than the participants' a-priori attribution of morality to robots in general ($Z(20) = -3.4, p < .001$). Further exploration of the semantic differential using two-tailed Wilcox signed-rank tests indicate that Immanuel appears more talkative ($Z(20) = -3.23, p = .001$), more

What the Social Robotics lecture is not

- It's not a robotics course
- It's not an AI course
- It's not a machine learning course

Literature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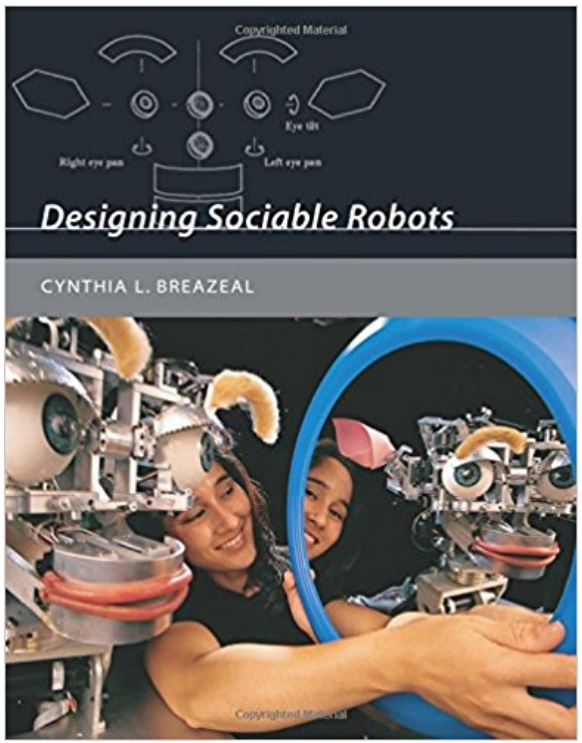
Designing Sociable Robots
CYNTHIA L. BREAZEAL