



## Kognitionspsychologische Vertiefung

### Empirical Practicum on Human-Robot Interaction

#### Sommersemester 2021

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Class Time: Mondays 14:15 – 17:45 PM (virtual)  
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#### Course Objectives

The goal of the seminar is to introduce students to contemporary approaches in social robotics, that is: how to design and evaluate robots that are intuitive to interact with and trigger human-like social interaction patterns. The course is designed for master students in psychology, neuroscience, computer science and/or engineering and consists of theoretical and practical parts: The first part of the course outlines psychological and neuroscientific aspects underlying Human-Robot Interaction (HRI) with a focus on mentalizing, action understanding, and joint action execution. The course also covers common application areas for social robots, such as health care, education and home assistance. The second part of the course is devoted to a research project involving pictures or videos of social robots presented in an online study. Students will develop a research question and investigate it small groups: they will plan and conduct a behavioral experiment, analyze and interpret data and write a research report. The report can be submitted as proceedings paper (pending the quality of results). Due to the additional challenges associated with Covid-19 (in terms of collecting data), the project will consist of modifications of established research paradigms. It is beneficial to have experience with administering online studies (e.g., Qualtrics) and data analysis (e.g., R or SPSS).

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#### Reading Assignments

No textbook is required for this course. Reading assignments include current peer-reviewed journal articles. Due dates for the reading assignments are listed below. Students are encouraged to schedule regular times during the week for reading, and to discuss them with their classmates prior to class. Students are always encouraged to attend my office hours to discuss any of the topics related to the course, including reading assignments. All reading assignments should be completed before class. Students are also encouraged to search for additional readings to supplement the listed articles. Papers that are listed as “student presentation” in the reading list below constitute regular reading assignments and need to be prepared by all students (not just the presenting student) for the respective session.

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#### Course Assignments and Grading

*Student Presentation:* Each student will present and discuss one paper on social robotics during this course. There will be two presentations per session and the available papers are listed below. The paper presentation counts **30%** towards the student's course grade.

*Semester Project:* Students will conduct a research project on a social robotics topic (in small groups). The project will be documented in form of a written report and an oral presentation to the class. More details regarding the project will be provided in class. The semester project counts **60%** towards the student's course grade.

*Participation / Discussion of Reading Assignments:* Class participation is essential. Students are encouraged to actively participate in class. Students are also encouraged to engage with the classmates and the professor outside of class and take full advantage of opportunities that will arise during the semester to participate in activities related to the course. Participation in class contributes **10%** to the student's course grade.

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## Communication and Technology

*Official Communication:* TU Berlin uses electronic mail to provide official information to students. Examples include communications from course instructors, notices from the library, notices about academic standing, class materials, assignments, questions, and instructor feedback. Students are responsible for the content of university communication sent to their TUB email account, are required to activate that account and check it regularly.

*Technology:* The course will be administered “live” via zoom. The link will be sent to attending students in the week before classes start. Students should familiarize themselves with the tool in advance of the semester start to assure a smooth process. Zoom will also be used for the student presentations. The software tools that will be used for the empirical part will be announced in class and a tutor will be available to help the students to familiarize themselves with the tools.

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## Honor Code

This code is consistent with APA’s ethical principles for working professionals, and it is required that each student adhere to the Honor Code. For this course, collaboration (e.g., during a group project or discussions of reading assignments) is expected and encouraged, but all students are required to produce original work on all assignments unless otherwise noted. Plagiarism, academic dishonesty, and other failures to follow the honor code will result in disciplinary actions that are likely to include receiving a failing grade for this course. I encourage the students to review the code for themselves at <https://www.apa.org/ethics/code>

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## Weekly Schedule and Assignments

A detailed schedule of reading assignments can be found in the table below. Changes to the assignments will be announced in advance. There is one general assignment (first reference) which is usually a review article introducing the topic of the respective session. The discussion of this paper will be led by the course instructor. The other listed papers are discussed in form of student presentations: the paper is assigned in advance to a specific student during the first session of the semester and the student will lead the discussion of the paper. For this purpose, it is expected that the student summarizes the paper in form of a power point (or equivalent) presentation and prepares questions they want to discuss in class. Each paper discussion is supposed to take about 30 minutes. If more than 12 students sign up for this course, I will update this course description and add additional papers for student presentations.

The focus of the second part of the class is on the empirical project, which will be administered online. There are four sessions (“Semester Project”; see below) dedicated to data analysis, interpretation and paper writing. We are not meeting in class during these three sessions; the students should rather use this time to work on their semester project within their research team. The instructor / tutor will be available during that time to meet with students to discuss issues specific to their research projects. The instructor reserves the right to make changes to the schedule (will be announced in class).

Date	Topics	Reading & Assignments
19.04.21	<b>Introduction: What is Social Robotics?</b> <i>Semester Overview, Lecture and Discussion</i>	Baraka et al., 2019 Yang et al., 2018
26.04.21	<b>Psychology of Social Interactions</b> <i>Lecture, Presentations and Discussion</i>	Thompson & Fine, 1999 <b>Student Presentation 1:</b> Fraune, 2020 <b>Student Presentation 2:</b> Hugenberg et al., 2016

03.05.21	<b>Neuroscience of Social Interactions</b> <i>Lecture, Presentations and Discussion</i>	Pelphrey & Carter, 2010 <b>Student Presentation 3:</b> Wang & Quadflieg, 2015 <b>Student Presentation 4:</b> Sanfey et al., 2003
10.05.21	<b>Understanding Intentions and Actions</b> <i>Lecture, Presentations and Discussion</i>	Scasselatti, 2000; Frith et al., 2006 <b>Student Presentation 5:</b> Kupferberg et al., 2013 <b>Student Presentation 6:</b> Short et al., 2013
17.05.21	<b>Performing Actions Together</b> <i>Lecture, Presentations and Discussion</i>	Knoblich et al., 2011 <b>Student Presentation 7:</b> Kupferberg et al., 2012 <b>Student Presentation 8:</b> Schneider et al., 2018
24.05.21	<b>Application: Design for Long-Term Use</b> <i>Lecture and Discussion</i>	Belpaeme et al., 2018 <b>Student Presentation 9:</b> de Graaf et al., 2017 <b>Student Presentation 10:</b> Reich-Stiebert et al., 2019
31.05.21	<b>Application: Health and Elderly Care</b> <i>Lecture, Presentation and Discussion</i>	Robinson et al., 2019 <b>Student Presentation 11:</b> von Straten et al., 2019 <b>Student Presentation 12:</b> Scasselatti et al., 2018
07.06.21	<b>Mid Term Presentation</b> <i>Student Presentations of Research Proposal</i>	<i>Oral Presentation of Research Idea and Background</i>
14.06.21	<b>Semester Project</b> <i>Introduction, Programming</i>	<b>Group Work:</b> Individual meetings but <u>no class</u> <i>Manuscript:</i> Introduction 1. Draft <i>Experiment:</i> Programming online experiment
21.06.21	<b>Semester Project</b> <i>Introduction, Methods, Piloting</i>	<b>Group Work:</b> Individual meetings but <u>no class</u> <i>Manuscript:</i> Methods 1. Draft <i>Experiment:</i> Running online experiment
28.06.21	<b>Semester Project</b> <i>Methods, Data collection and analysis</i>	<b>Group Work:</b> Individual meetings but <u>no class</u> <i>Manuscript:</i> Introduction & Methods Revised <i>Experiment:</i> Data analysis
05.07.21	<b>Semester Project</b> <i>Paper Writing</i>	<b>Group Work:</b> Individual meetings but <u>no class</u> <i>Manuscript:</i> Results and Discussion 1. Draft <i>Manuscript:</i> Figures and Tables
12.07.21	<b>Final Presentation</b> <i>Student Presentations of Final Results</i>	<i>Oral Presentation of Research Idea and Background</i> <i>Written report in proceedings form</i>

## Reference List

- Baraka, K. et al. (2019). An extended framework for characterizing social robots. *Human-Robot Interaction. Springer Series on Bio- and Neurosystems*, vol. 12, 21-64.
- Belpaeme, T. et al. (2018). Social robots for education: A review. *Science Robotics*, 3, eaat5954.
- De Graaf, M. et al. (2017). Why do they refuse to use my robot? Reasons for non-use derived from a long-term home study. *Proceedings of HRI 2017*, p. 224-233.
- Fraune, M. (2020). Our robots, our team: robot anthropomorphism moderates group effects in human-robot teams. *Frontiers in Psychology*, 11:1275.
- Frith, C.D. & Frith, U. (2006). How we predict what other people are going to do. *Brain Research*, 1079, 36-46.
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- Knoblich, G. et al. (2011). Psychological research on joint action: theory and data. In B. Ross (ed.) *The Psychology of Learning and Motivation*, vol. 54, p. 59-101.
- Kupferberg, A. et al. (2012). Moving just like you: motor interference depends on similar motility of agent and observer. *Plos One*, 7(6), e39637.
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- Reich-Stiebert, N. et al. (2019). Involve the user: Changing attitudes towards robots by user participation in a robot prototyping process. *Computers in Human Behaviors*, 91, 290-296.
- Robinson, N.L. et al. (2019). Psychosocial health interventions by social robots: Systematic review of randomized controlled trials. *Journal of Medical Internet Research*, 21(5), e132031.
- Sanfey, A.C. et al. (2003). The neural basis of economic decision-making in the ultimatum game. *Science*, 300, 1755-1758.
- Scasselatti, B. (2000). Theory of Mind for a humanoid robot. *MIT Artificial Intelligence Lab*
- Scasselati, B. et al. (2018). Improving social skills in children with ASD using a long-term, in-home social robot. *Science Robotics*, 3, eaat7544.
- Schneider, S. & Kummert, F. (2018). Comparing the effects of social robots and virtual agents on exercising motivation
- Short, E. et al. (2013). No Fair!! An interaction with a cheating robot.
- Thompson, L. & Fine, G.A. (1999). Socially shared cognition, affect and behavior: a review and integration. *Personality and Social Psychology Review*, 3(4), 278-302.
- Von Straten, C.L. et al. (2019). Child-robot relationship formation: a narrative review of empirical research. *International Journal of Social Robotics*, 12, 325-344.

Wang, Y. & Quadflieg, S. (2015). In our own image? Emotional and neural processing differences when observing human-human vs. human-robot interactions. *SCAN*, 10, 1515-1524.

Yang, G.-Z. et al. (2018). The grand challenges of science robotics. *Science Robotics*, 3, eaar7650.

### **Recommended Literature**

Wiese, E. et al. (2017). Robots as intentional agents: Using neuroscientific methods to make robots appear more social. *Frontiers in Psychology*, 8:1663.