

“Co-shaping the social human-robot relation”

Yes please, but how?

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About me

PhD in Social Sciences/ HCI (2010)

- Human-Robot Interaction
- ICT&S Center University Salzburg



Postdoc ICT&S Center (→ 2012)



Visiting Researcher University Amsterdam/ Twente (2011)



Postdoc TU Wien

- V4Robotics, Faculty for Electrical Engineering (2013-2016)
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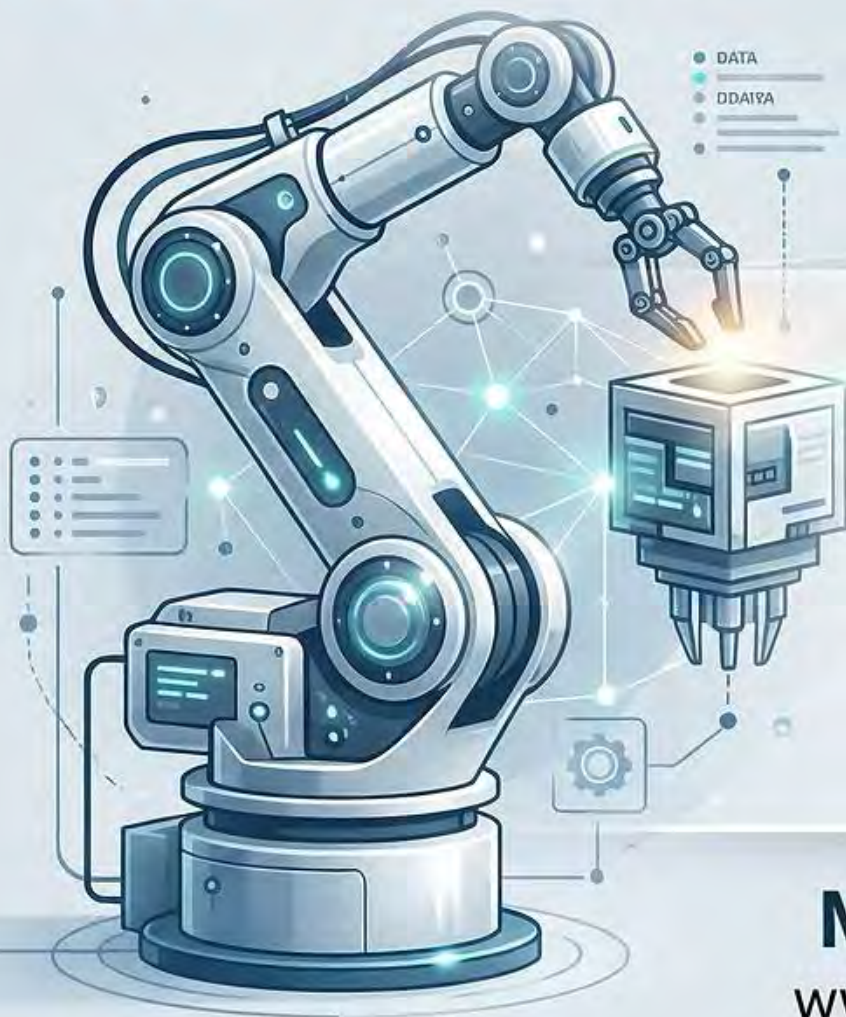
Young Academy of the ÖAW (2018-2026)



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Human-Computer vs. Human-Robot Interaction



people seem to perceive autonomous **robots differently** than they do most **other computer technologies**

-Kiesler and Hinds (2004)



human-robot interaction **is very different** from human-human interaction, human-computer interaction, and human-animal interaction

-Dautenhahn (2018)



The HRI problem is to **understand and design the interactions** between one or more humans and one or more robots

-Goodrich and Schulz (2008)



wicked problems

(i.e., problems that resist complete definition and resolution)

Human-Robot Interaction

- Social robotics growing quickly [Lambert et al., 2021]
- Core vision: Robots interact naturally with humans [Brandão et al., 2021]

Softbank Robotics Pepper



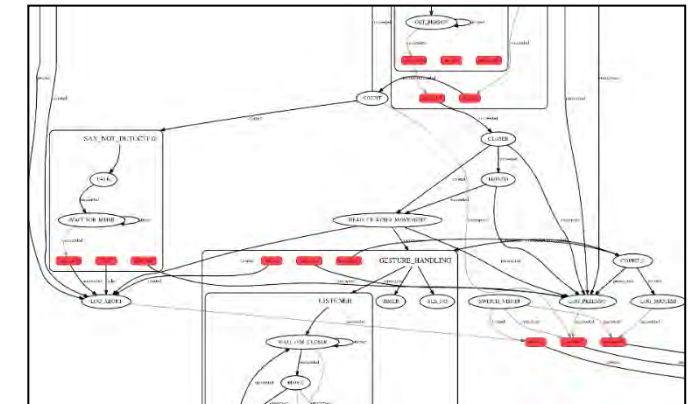
[pri.org/stories/2019-08-21/will-next-wave-humanoid-robots-make-our-lives-better-or-steal-our-jobs](https://www.pri.org/stories/2019-08-21/will-next-wave-humanoid-robots-make-our-lives-better-or-steal-our-jobs)



Robot-centered



Human-centered

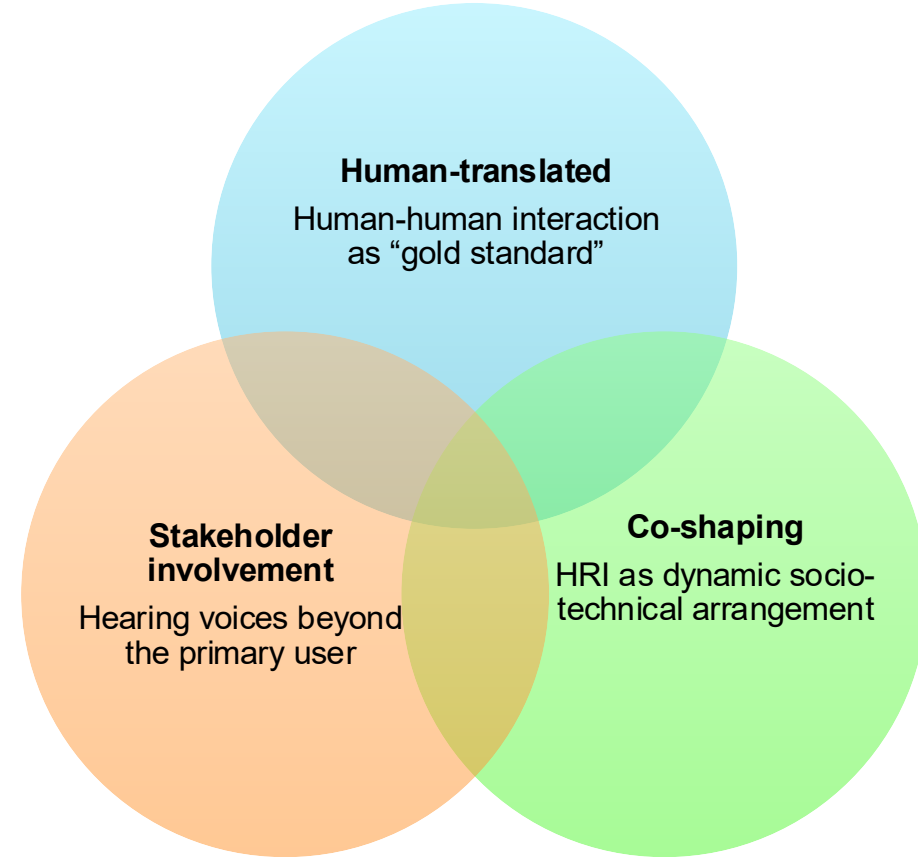


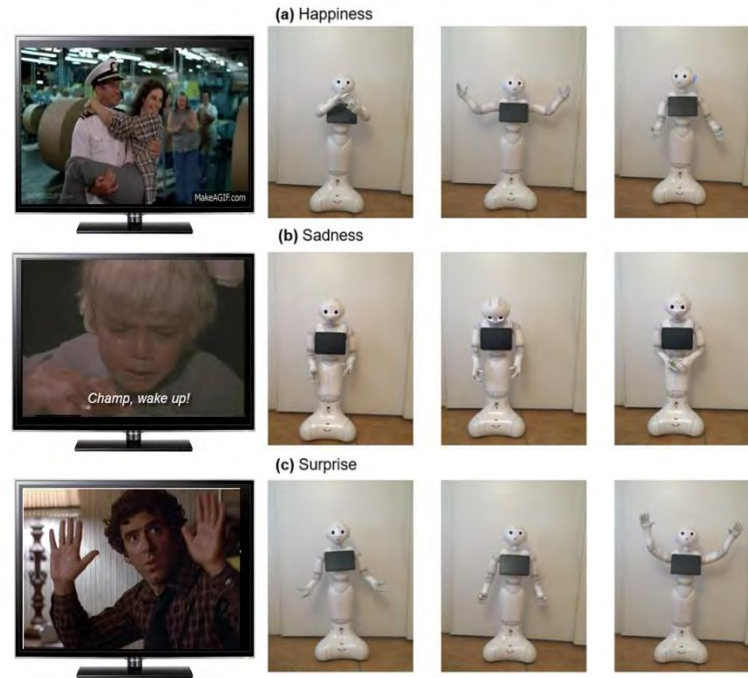
Cognition-centered

How can we consider the Human in HRI?

Research Aims

- Learning about the relationship among people, data, and technology **beyond learning about the system itself**
- not only to **derive specific design features for robots from empirical user research** but also to **construct knowledge through critical reasoning** based on the gathered data and in relation to the backdrop of existing knowledge





Christiana Tsiourti, **Astrid Weiss**, Katarzyna Wac, and Markus Vincze. “Multimodal Integration of Emotional Signals from Voice, Body, and Context: Effects of (In)Congruence on Emotion Recognition and Attitudes Towards Robots”. In: International Journal of Social Robotics 11.4 (Aug. 1, 2019), pp. 555–573.

Int J of Soc Robotics (2016) 8:125–143
DOI 10.1007/s12369-015-0325-8



Synchrony and Reciprocity: Key Mechanisms for Social Companion Robots in Therapy and Care

Tamara Lorenz^{1,2,3,4} · Astrid Weiss⁵ · Sandra Hirche¹

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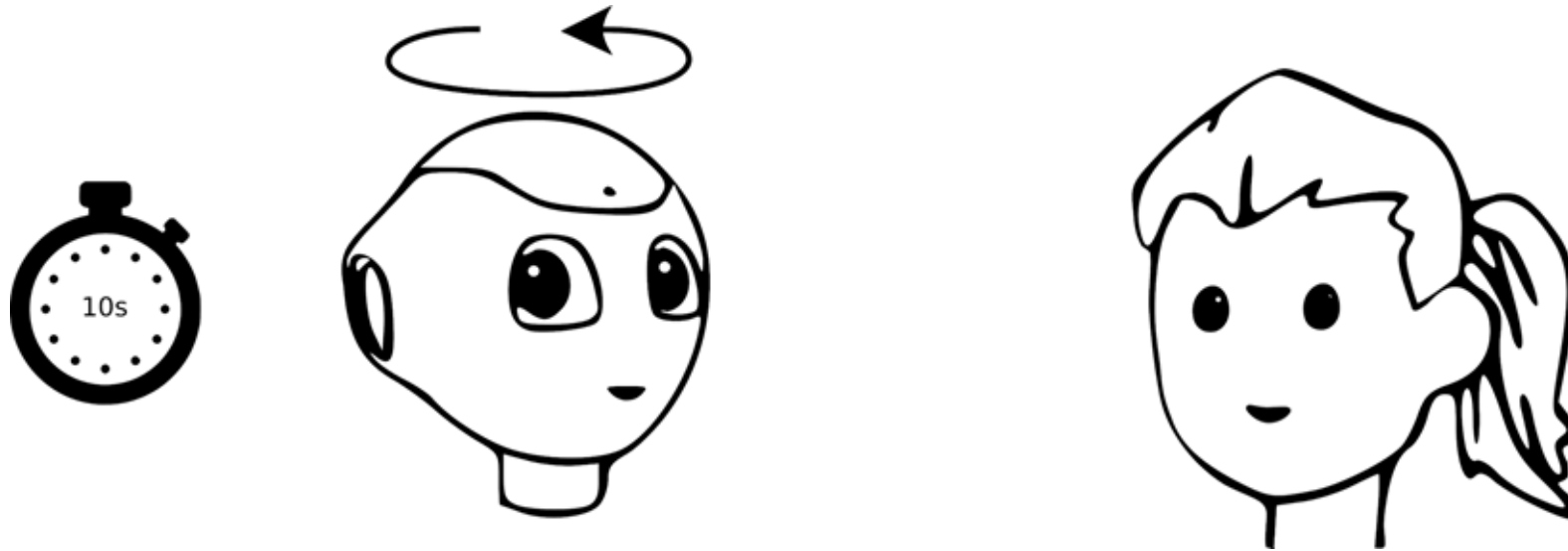
Abstract Studies and concepts for social companion robots in therapy and care exist, however, they often lack the integration of convincing behavioral and social key mechanisms which enable a positive and successful interaction experience. In this article we argue that synchrony and reciprocity are two key mechanisms of human interaction which affect both in the behavioral level (movements) and in the social level (relationships). Given that both a change in movement behavior and social behavior are an objective in the contexts of aging-in-place, neurocognitive and neurophysical rehabilitation, and depression, these key mechanisms should also be included in the interaction with social com-

To support this claim, we provide a survey on existing social companion robots for aging-in-place (pet robots and household robots), neurocognitive impairments (autism and dementia), neurophysical impairments (brain injury, cerebral palsy, and Parkinson’s disease), and depression. We emphasize to what extent synchrony and reciprocity are already included into the respective applications. Finally, based on the survey and the previous argumentation on the importance of synchrony and reciprocity, we provide a discussion about potential future steps for the inclusion of these concepts to social companion robots in therapy and care.

Tamara Lorenz, **Astrid Weiss**, and Sandra Hirche. “Synchrony and Reciprocity: Key Mechanisms for Social Companion Robots in Therapy and Care”. In: International Journal of Social Robotics 8.1 (Jan. 1, 2016), pp. 125–143.

Gaze Aversion

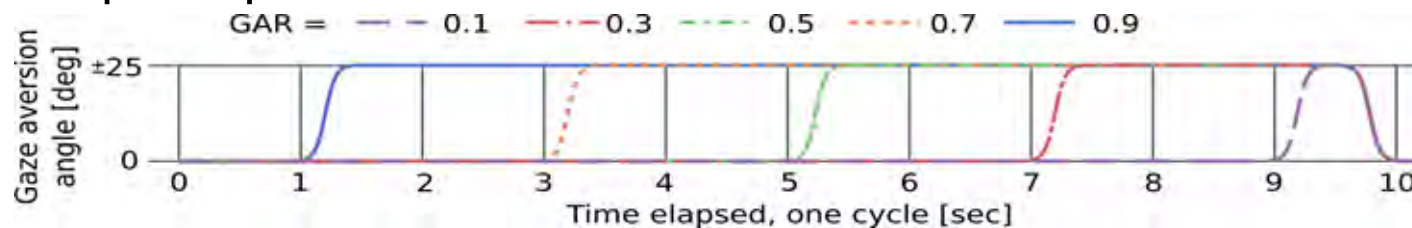
Human-translated
Human-human interaction
as “gold standard”



Gaze Aversion

Human-translated
Human-human interaction
as "gold standard"

- Conversational setting
 - Robot asks about movie and then listens
- Different degrees of gaze aversion ratio (GAR) between participants



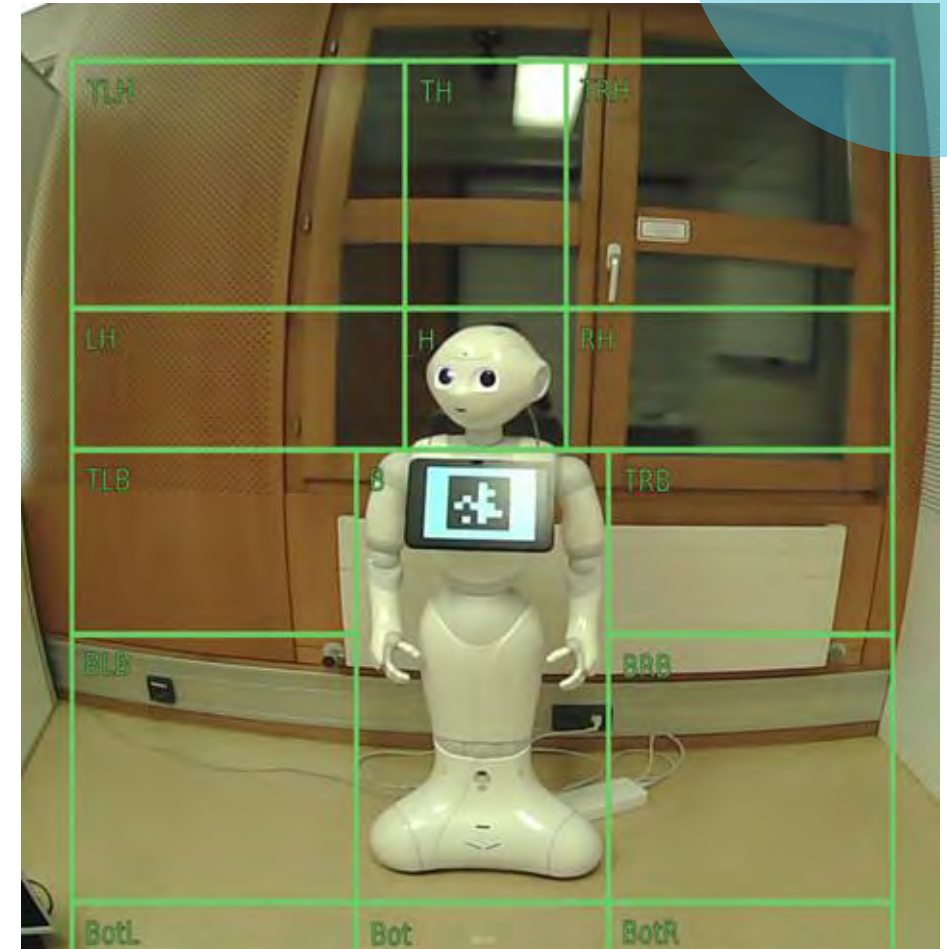
- Measure participants'
 - Eye gaze behavior [Kassner et al., 2014 (PupilLabs)]
 - Interaction duration
 - Attitudes towards the robot [Joosse et al., 2013 (Behave II); Bartneck et al, 2009 (Godspeed)]



Gaze Aversion

Human-translated
Human-human interaction
as “gold standard”

- Robotic gaze behavior influences human gaze behavior and interaction duration
 - **Humans mimic robot gaze aversion** except when the robot is staring at them
 - Over time rapport effect stronger
 - High **robot staring leads to shorter interactions**
- Robotic gaze has **no significant effect on the interaction experience**
- Argument for deviation from HHI when necessary

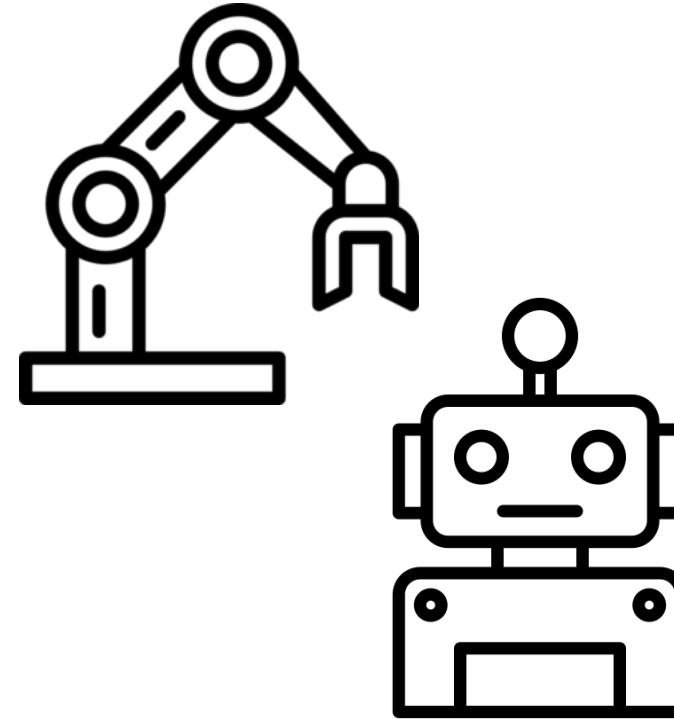


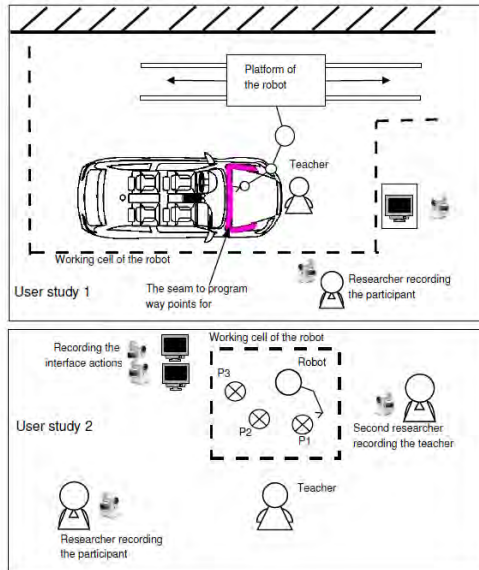
Participant view of the robot with gaze regions (head, body, different gaze aversion regions)

Stakeholder-Involvement Approach

Stakeholder involvement
Hearing voices beyond the
primary user

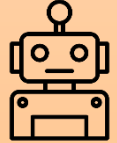
- Considering the identities (e.g., age, gender, cultural background, etc.) of **primary users and their surroundings**
- Two very different domains let me change my approach (1) human-robot collaboration for the **factory context** and (2) **care context**
 - Affected people are not only primary users, but various different stakeholders





Roland Buchner, Nicole Mirnig, **Astrid Weiss**, and Manfred Tscheligi. "Evaluating in real life robotic environment: Bringing together research and practice". In: 2012 IEEE RO-MAN: The 21st IEEE International Conference on Robot and Human Interactive Communication. Sept. 1, 2012, pp. 602–607.

Astrid Weiss, Andreas Huber, Jürgen Minichberger, and Markus Ikeda. "First Application of Robot Teaching in an Existing Industry 4.0 Environment: Does It Really Work?" In: Societies 6.3 (Jan. 1, 2016), p. 20.



- Iterative development of a service robot **enabling independent living** at home
- Mutual care paradigm: **robot helps owner, owner helps robot**



Andreas Huber, Lara Lammer, **Astrid Weiss**, and Markus Vincze. “Designing Adaptive Roles for Socially Assistive Robots: A New Method to Reduce Technological Determinism and Role Stereotypes”. In: Journal of Human-Robot Interaction 3.2 (Jan. 1, 2014).

Markus Bajones, David Fischinger, **Astrid Weiss**, Paloma De La Puente, Daniel Wolf, Markus Vincze, Tobias Körtner, Markus Weninger, Konstantinos Papoutsakis, Damien Michel, and et al. “Results of Field Trials with a Mobile Service Robot for Older Adults in 16 Private Households”. In: Journal of Human-Robot Interaction 9.2 (Dec. 1, 2019).

Co-shaping Approach

Co-shaping
HRI as dynamic socio-technical arrangement

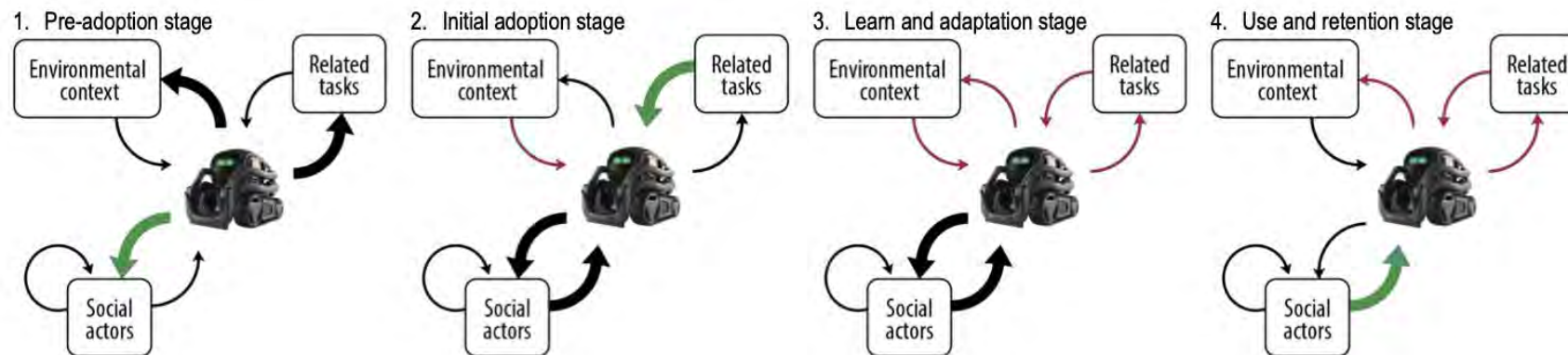
- human-robot interaction as a **complex socio-technical arrangement of human and non-human agents** such as robots, sensors, programs, and other devices embedded in their social context
- Why haven't we done that yet?
 - Technology-readiness
 - Increasing understanding of complexity

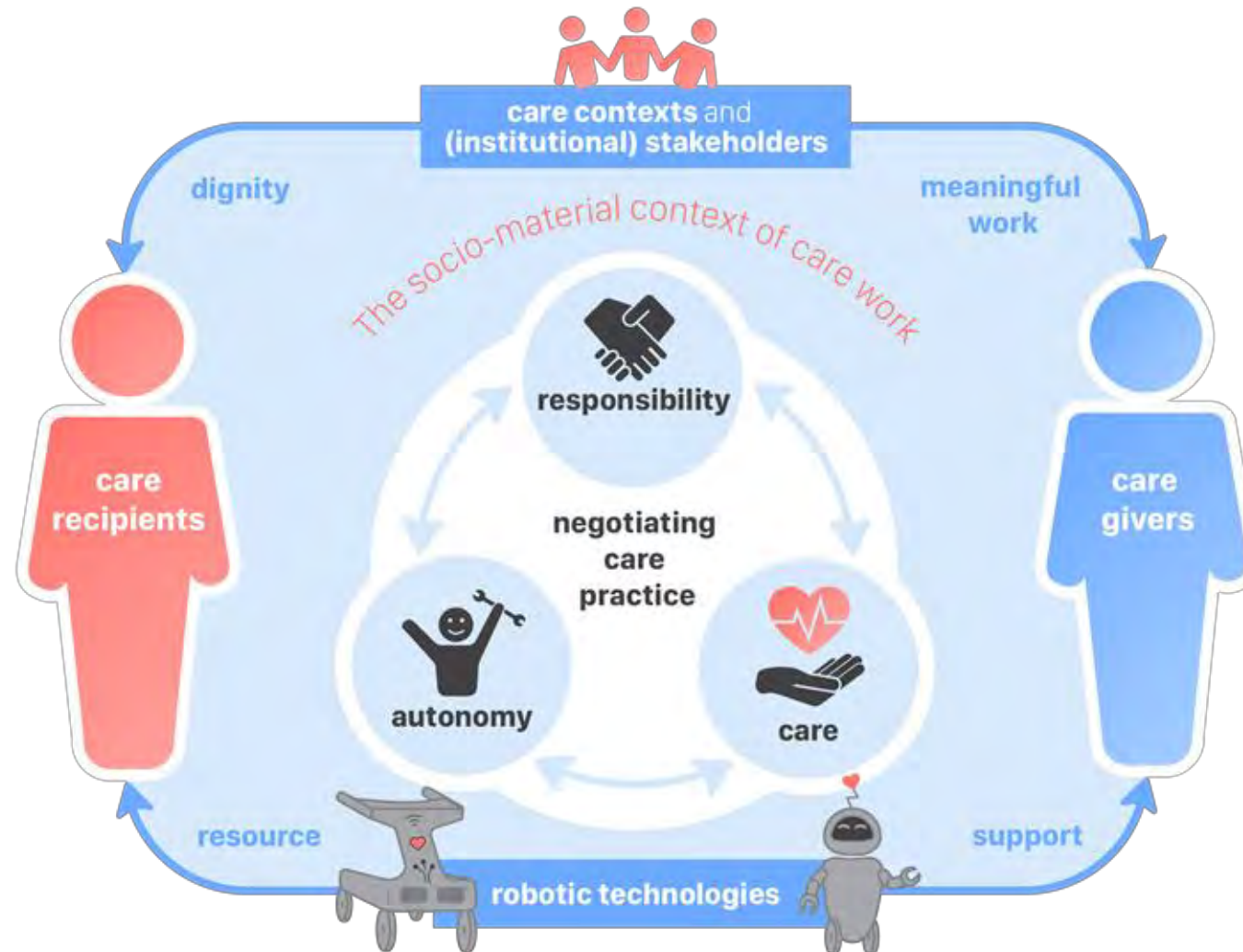


Astrid Weiss and Glenda Hannibal. "What Makes People Accept or Reject Companion Robots? A Research Agenda". In: PETRA2018: Proceedings of the 11th Pervasive Technologies Related to Assistive Environments Conference. PETRA '18. Corfu, Greece: Association for Computing Machinery, Jan. 1, 2018, pp. 397–404.

Astrid Weiss, Anna Pillinger, Katta Spiel, and Sabine Zauchner-Studnicka. "Inconsequential Appearances: An Analysis of Anthropomorphic Language in Voice Assistant Forums". In: Extended Abstracts of CHI EA '20. Honolulu, HI, USA: Association for Computing Machinery, Jan. 1, 2020, pp. 1–7.

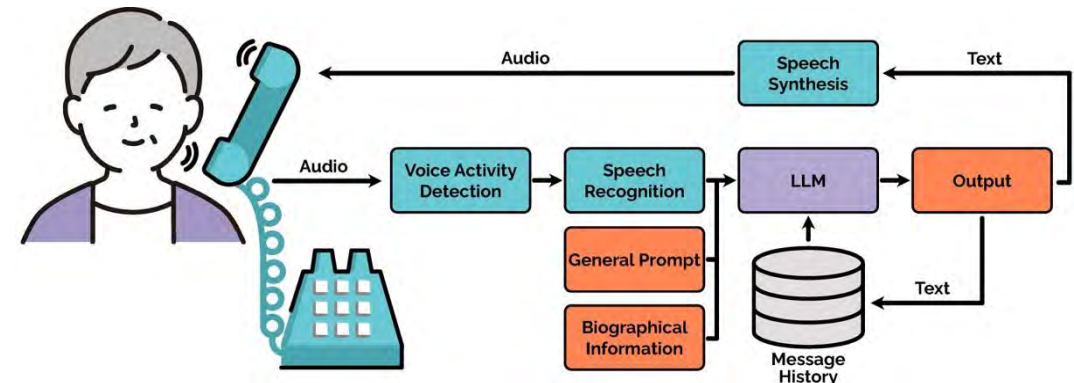
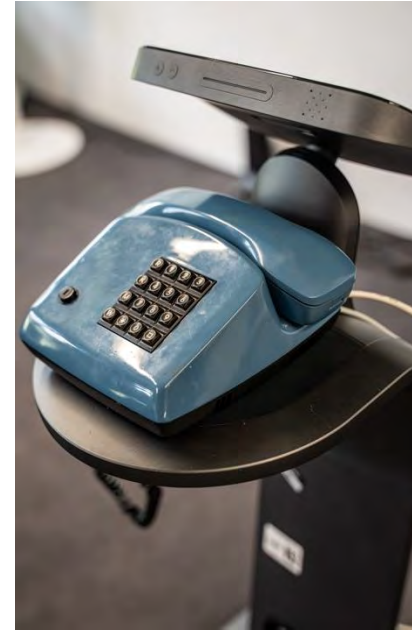
- What We Can Learn from Social Robots That Didn't Make It?
 - **social gains** (i.e. status and connecting to other people) are **more enduring** factors than hedonic ones (i.e. entertainment, fun, pleasure)
 - adoption process **slightly differs from vacuum cleaning robots** but not from other technological innovations → **Merely a conventional diffusion problem?**





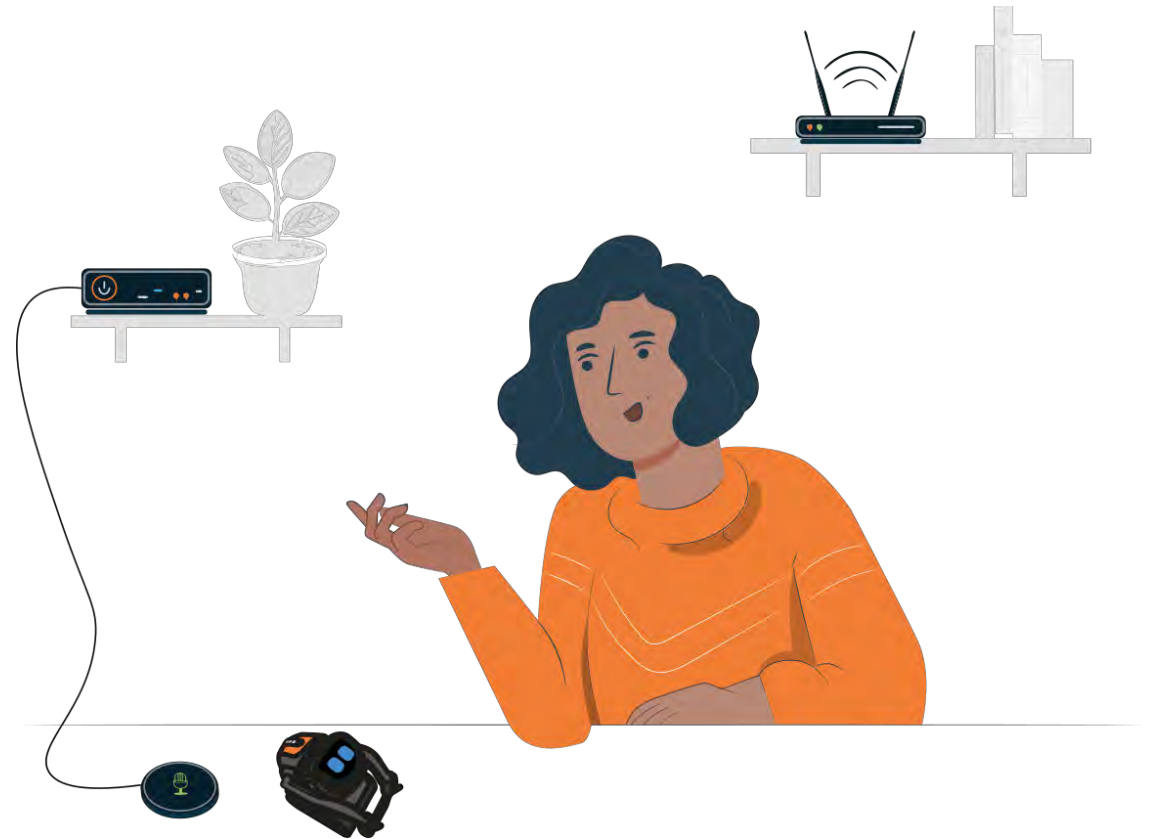
Caring Robots/Robotic Care

- AI phone-based prototype for people with dementia that supports conversations about daily life and personal memories.
- Uses dialogue and biographical storytelling to encourage engagement, reminiscence, and personalized interaction in care.



Caring Robots/Robotic Care

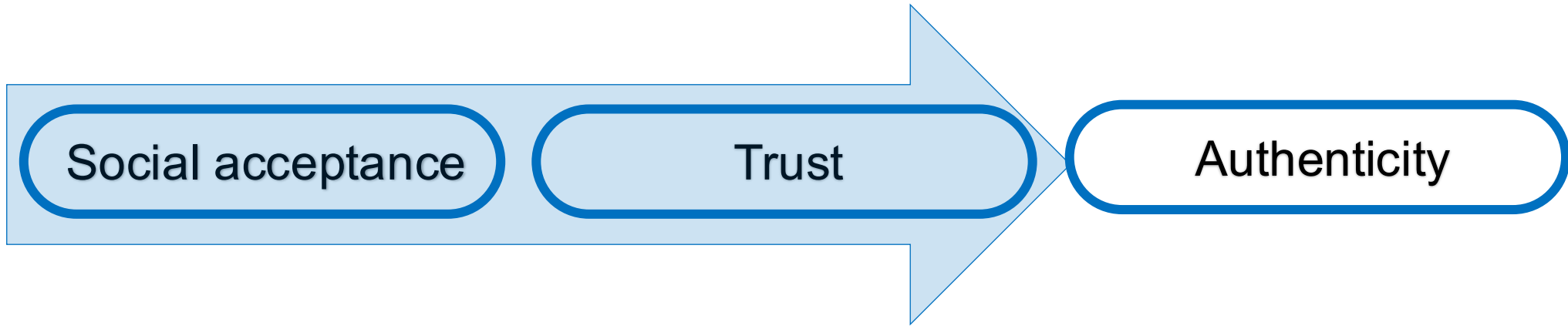
- Vector robot to support personalized dementia care through reminiscence (memory-based interaction).
- Develops methods to tailor robot interactions to individual patients using personal history and speech data.



Current HRI topics/challenges...

- Integrating **LLMs into social robots**
 - the key to flexible open domain dialogue, but HRI is not solved
 - open topic: **giving AI memory**, VLM will be key for that
- Approach to **HRI design is shifting**
 - 20 years of designing intuitive screens and interfaces
 - now: **Training foundation models** and understanding human intent, and assessing **collaboration performance**
- What does that mean for human-centered HRI?
 - **deep understanding of the user's context – physical and social!**
 - original goals such as user experience and trust stay the same

The next quality criterion aka the “holy grail”



Trustworthiness is a **judgment about the agent's performance** alone **established through its behavioural cues**, which does not require any perception of **genuineness**. In comparison, **authenticity** is a **judgment** about whether the agent's expressive or **relational behavior is coherent** and only becomes relevant when the interaction has an **affective or identity** component.

Concluding Thoughts...

Social human-robot relations are a **complex assemblage of components**, including

- how the robot is materialized through hardware, software and a set of design features and communicative behaviors
- the dynamic changes that some of the features undergo over time, and
- the stories that people construe about the robot that are enabled (but not determined) by the design features

Social human-robot relations are **not a property neither of the human nor the robot** – but they emerge

Thank you

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Questions?

