SARCHA: Socially-Assistive Robots in Clinical and Healthcare Applications~ Special Session Proposal for RO-MAN 2023

Socially-Assistive robots (SARs) continue to be a promising, emerging tool as part of therapeutic and clinical health care applications, though widespread adoption of these robots in day-to-day health care is yet to be realised. Nevertheless, SARs can be used periodically with other approaches: such as for the delivery of digitised memory training tasks (for persons with cognitive-related health issues) (e.g. Andriella et al., 2020), physical movement instruction (for persons undergoing physical rehabilitation) (see: Mohebbi 2020 for a review), and as assistive learning partners (for (social) skill acquisition or learning) (e.g. Gighlino et al., 2021). These social robots may provide a motivational, complementary tool to traditional (non-digitised) interventions (either in home-based or clinical settings) to improve engagement with (and efficacy of) therapies. Additionally, through personalised interactions and therapies (i.e. adapting the level of therapy provided to individual users), SARs can be an excellent approach towards person-centred care, to improve (mental and physical) health-related outcomes for both pre-clinical and clinical populations.

However, working with these target populations - (pre-)clinical persons with existing or potential vulnerabilities and risk factors (such as elderly citizens with Mild Cognitive Impairments or dementia, or children with neurodivergence, e.g. ASD) - introduces a set of niche theoretical and methodological constraints and challenges. Existing HRI research in healthy human populations may not necessarily generalise to these clinical and therapy-based contexts. These contexts are also confounded by an often under-considered set of ethical issues (such as issues of selfhood, agency, and privacy), as well as factors related to cultural norms and expectations, socio-economic status, race, and gender.

Therefore, researchers interested in clinical, therapy-based or health-related applications of SARs should carefully consider the research that their work is grounded in. We should develop (and build on) a relevant body of scientific literature that helps us refine our understanding of these niche applications and target audiences, in a way that allows ongoing research in these healthcare-related domains to become more ecologically valid; thus increasing the viability of SARs in the long-term.

Extending on the theme of this year's conference, we focus on **[H]uman Health** and propose a special session that will bring together theoretical and empirical work for socially-assistive robots that are (or can be) employed as part of (pre-)clinical and therapy-based applications, interventions, and/or with (pre-)clinical populations. These include the design (of both agent and study), applications, and outcomes of the use of SARs in both pre-clinical and clinical contexts. We particularly welcome contributions that describe empirical work with (pre-)clinical populations: including applications for mental health, age-related cognitive health, neurodivergence, or underrepresented populations with respect to age, culture, gender identity, or socio-economic status, in the contexts of (pre-)clinical or healthcare environments.

Themes include, but are not limited to:

- **Empirical studies:** socially-assistive robots in pre-clinical/clinical quantitative or qualitative interaction studies - such as using SARs for cognitive task delivery or as teachers/assistants to promote skill acquisition.
- **Health outcomes in target populations:** Socially-assistive robots working with target populations (pre-clinical and clinical persons) that focus on improving health-related outcomes: including mental and physical health outcomes.
- **(Multimodal) Social signal processing**: including both verbal and non-verbal signals in interactions with (pre-)clinical persons.
- **Real-time adaptability:** Adaptive socially-assistive robots for the *human-in-the-loop* with (pre-)clinical persons.

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- **Participatory design:** co-development/co-design of human-robot interaction contexts (including agent(s) and study design) with (pre-)clinical populations and/or caregivers (such as family members and/or occupational therapists).
- **Novel measures of socio-affective interaction and attitudes:** Work utilising novel quantitative and qualitative measures of socio-affective engagement or interactions, perceptions, or attitudes towards social robots - such as the use of biometric technologies, approaches to qualitative evaluations, on-going data monitoring, or mixed-methods design.
- **Methodological challenges:** Issues, challenges, and/or constraints associated with working with socially-assistive robots and (pre-)clinical populations, and approaches to address or overcome such challenges.
- **Ethical frameworks:** work that discusses the ethical considerations for applications of socially-assistive robots as part of pre-clinical or clinical interventions, such as on-going patient monitoring, sensitive data collection and data usage.
- **Cultural/societal considerations:** work that focuses on the cultural or societal factors (including race, gender, age, socio-economic status) that must be considered in the adoption and/or (non-)consensual application of socially-assistive robots in clinical and home-based interventions.

Tentative Speakers:

- Invited Speaker from Human Factors Psychology Lab, e.g. Hahn. S., Lee. Y. K., College of Social Sciences, Seoul National University.
- Khan, I., Lowe, R., Markelius, A., DICE Lab, University of Gothenburg
- Barakova. E. (Eindhoven University of Technology)
- Shibata, T. (Human and Social Intelligence Systems Lab, Kyushu Institute of Technology)
- Open slots

Further papers will be solicited through existing research and professional networks, mailing lists (robotics-worldwide, hri-announcement, SoRoS), social media (Twitter/Mastodon), and our own special session website hosted on GitHub.

Biographies:

Imran Khan is a MSCA Fellow postdoctoral researcher at the University of Gothenburg (Sweden) on the project **"SARP-DCI (Socially-Assistive Robot Partners for Digitized Cognitive Interventions)".** He completed his PhD at the University of Hertfordshire (UK) and specialises in areas of affective computing, (embodied) social cognition, affect, and interaction, and socially-adaptive systems.

Alva Markelius is a MSt student and research assistant at the Leverhulme Centre for the Future of Intelligence at University of Cambridge (UK). Her research interests are currently in AI Ethics and socially-affective robotics. Her background is in cognitive science at University of Gothenburg (Sweden) and Seoul National University (Republic of Korea). She has previously been a research assistant at Human Factors Psychology Lab at Seoul National University as well as at DICE Lab at University of Gothenburg.

Robert Lowe is a PhD (docent/Associate Professor) at the University of Gothenburg (Sweden), and also works at RISE (Research Institutes of Sweden). His areas of research interest include Computerized Cognitive Training for non-clinical/clinical populations, Human-Robot Interaction and more generally Human-Technology Interaction including more recently Advanced Driver-Assistance Systems (ADAS). He is working on and coordinator/PI of a number of related projects where the focus has been on memory training and affective engagement monitoring. He also lectures in Artificial Intelligence.

References:

[1] Andriella, A., Torras, C., & Alenya, G. (2020). Cognitive system framework for brain-training exercise based on human-robot interaction. Cognitive Computation, 12(4), 793-810.

[2] Mohebbi, A. Human-Robot Interaction in Rehabilitation and Assistance: a Review. Curr Robot Rep 1, 131–144 (2020). https://doi.org/10.1007/s43154-020-00015-4

[3] Ghiglino, D., Chevalier, P., Floris, F., Priolo, T., & Wykowska, A. (2021). Follow the white robot: Efficacy of robot-assistive training for children with autism spectrum disorder. Research in Autism Spectrum Disorders. https://doi.org/10.1016/j.rasd.2021.101822