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Bridging Human–AI Interaction and Human–Robot Interaction: Shared Challenges, Converging Futures

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Abstract

This panel examines the growing convergence of human–AI interaction (HAI) and human–robot interaction (HRI) as intelligent systems become more autonomous, embodied, and embedded in everyday settings such as healthcare, education, homes, and workplaces. Although HAI and HRI have evolved as distinct fields, the panel argues that shared human factors concerns—such as trust, safety, autonomy, teamwork, situation awareness, evaluation, and responsible deployment—now require greater integration across both domains. Drawing on perspectives from leading researchers and doctoral students, the session explores how embodiment, motion, social cues, and system transparency shape human interaction with AI and robots. It also addresses methodological tensions, including laboratory versus field evaluation and short-term versus longitudinal study, while highlighting implications for ethics, training, and design. Overall, the panel aims to identify common challenges, foster cross-disciplinary collaboration, and outline a research roadmap for human-centered intelligent systems that improve performance, well-being, and quality of life across diverse contexts and sectors.

Keywords

human-AI interaction, human-robot interaction, human-autonomy teaming, human-centered design, trust in intelligent systems, interaction design, responsible deployment, systematic evaluation

Introduction

Advances in artificial intelligence (AI) are rapidly reshaping the systems with which humans interact, ranging from physically embodied robots operating in homes, hospitals, and workplaces to disembodied AI agents embedded in decision-support tools, collaborative teammates, and adaptive automation (Chung et al., 2026; O'Neill et al., 2022; Onnasch et al., 2025; Steckman et al., 2025). Traditionally, human–robot interaction (HRI) and human–AI interaction (HAI) have evolved as related, but distinct research communities, with different assumptions about embodiment, autonomy, interaction modalities, and evaluation methods (Zhang et al., 2024). However, recent technological and societal developments suggest that these boundaries are becoming increasingly blurred (Obrenovic et al., 2025). From a human factors perspective, both HRI and HAI address fundamental questions about human performance, safety, trust, workload, situation awareness, and adaptation of intelligent systems (Lyons et al., 2024; Oliff et al., 2020; Schelble et al., 2022). As AI systems and robots become more autonomous and embedded in various contexts, there is a growing need to examine whether existing human factors principles apply consistently across embodied and non-embodied AI, and where new frameworks may be required (Esterwood et al., 2025; Flathmann et al., 2023; Gruber et al., 2024; Masterson et al., 2025; Olatunji et al., 2025; Rogers & Mitzner, 2026).

Panelists

This panel features researchers from HRI and HAI discussing their convergence and divergence, as well as implications for future human-centered system design. It includes two doctoral student panelists, one from each field, to represent diverse career stages and perspectives.

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Overview of the Invited Panelists

Joseph Lyons, Ph.D., Air Force Research Laboratory. Dr. Lyons is the Senior Scientist for Human-Machine Teaming for the US Air Force. He serves as the principal scientific authority and independent researcher in the research, development, adaptation, and application of Human-Machine Teaming. His work has emphasized design features such as transparency, trust in applied intelligent technologies, and responsible use of AI. He is a Fellow of the Air Force Research Laboratory (AFRL), the American Psychological Association, and the Society for Military Psychologists.

Wendy A. Rogers, Ph.D., is the Khan Professor of Applied Health Sciences at the University of Illinois Urbana-Champaign. She is a Certified Human Factors Professional (BCPE Certificate #1539). Her research is focused on understanding the fundamentals of human behavior in the context of technology interactions. Her research interests include design for aging, technology acceptance, human-automation interaction, aging-in-place, human-robot interaction, aging with disabilities, cognitive aging, and skill acquisition and training. Her research is funded by the National Institute on Aging, the National Institute on Nursing Research, and the National Institute on Disability, Independent Living, and Rehabilitation Research.

Jessie X. Yang, PhD., is an Associate Professor in the Department of Industrial and Operations Engineering at the University of Michigan. She also holds a courtesy appointment at the School of Information and an affiliated position at the Robotics Institute. Her research focuses on interactions among human-human, human-autonomy, and human-robot. She seeks to understand the underlying mechanisms governing these interactions and to propose design solutions that facilitate them. Her research interests include Trust-driven Human-Autonomy/Robot Interaction; Human Factors in Healthcare; User Experience Design and Sentiment Analysis; Takeover Transitions in Highly Automated Driving; and Human Performance in Teleoperation of Unmanned Vehicles.

Lionel P. Robert, PhD., is a Professor of Information and Robotics, School of Information, at the College of Engineering, Robotics Department, University of Michigan. He is also an Affiliate Faculty member at the National Center for Institutional Diversity and at the IU Center for Computer-Mediated Communication. His research focuses on technology-enabled collaboration. His research interests include Online Collaboration for Virtual Teams, Crowd work, and Technology Mediated Teams; Human Robot Collaboration involving Teamwork with Robots, Human Autonomous Vehicle Interaction; and Sharing Economy involving Coordination and Cooperation through Digital Platforms, and Trust in Digital Platforms.

Panel Chair and Moderator

Beau Schelble, Ph.D., is an Assistant Professor of Industrial & Systems Engineering and the Founding Director of the AI & Robotics for Collaborative Systems (ARCS) Lab in the Tickle College of Engineering at the University of Tennessee, Knoxville. His research interests and expertise lie in human-AI/autonomy teaming, and intelligent systems engineering, with an emphasis on trust, shared knowledge, information sharing, and situation awareness.

Samuel Olatunji, Ph.D., is an Assistant Professor in the Industrial and Systems Engineering department at the University of Tennessee, Knoxville. He focuses on interaction design for robots supporting individuals in daily activities. His expertise in human-robot interaction informs the development of robot-based projects through theoretically sound approaches, enhancing knowledge and practice in human-systems integration.

Doctoral Students

Yayun Tian (Doctoral student in HAI) and *Bethany Moss* (Doctoral student in HRI) will share their expectations and experiences on training, mentorship, and workforce development in human-centered systems.

Format

The panel will be structured to promote discussion and audience engagement starting with brief remarks to set the context. Each panelist will share a position statement addressing how their work in HRI or HAI intersects with core human factors of intelligent systems. This will lead to a moderated discussion on the main objectives: (1) identify shared human factors challenges across HRI and HAI; (2) examine the role of embodiment, asking how physical presence, motion, and social cues influence human interaction compared to software-based AI systems; (3) discuss methodological tensions, and opportunities, including laboratory versus field studies, short-term evaluations versus longitudinal deployments, and the balance between experimental control and ecological validity; (4) explore implications for safety, ethics, and responsibility, particularly in domains such as healthcare, education, and work systems; (5) articulate future research directions and opportunities for collaboration between HRI, HAI, within and beyond the human factors community; and (6) highlight how users are engaged in design and interactions, and how best to introduce systems and provide training/instructions.

Outcome

This panel will explore the intersection of HRI and HAI from a human factors perspective. This is expected to enhance our understanding of common challenges, share design principles, offer practical considerations for the responsible evaluation and deployment of intelligent systems, and provide a collaborative research roadmap. This panel is highly relevant to a broad range of HFES technical groups and conference attendees, such as Aging and

Ability; Cognitive Engineering and Decision Making; Health Care Systems; Human-AI/Robot Teaming; Surface Transportation; and User Experience.

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