The Future of Human-Robot Synergy in Interactive Environments: The Role of Robots at the Workplace

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Abstract

The increasing integration of robots into workplaces raises critical questions about human-robot synergy in interactive environments. While robots are designed to enhance productivity and safety, their successful deployment depends on effective collaboration, trust, and seamless interaction with human workers. However, existing research has primarily focused on either technical capabilities or human-centered concerns in isolation, leaving a gap in understanding how robots can be meaningfully integrated into dynamic workspaces. In this workshop, we bring together experts from robotics, HCI, and work sciences to explore the future of human-robot collaboration at the workplace. This workshop aims to identify key design principles, ethical considerations, and practical challenges. The insights gained will inform future research and policy recommendations, shaping a future in which robots act not as mere tools but as cooperative agents that enhance workplace efficiency, well-being, and innovation.

CCS Concepts

• **Human-centered computing** → **Human computer interaction (HCI)**.

Keywords

human computer interaction

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1 Motivation

Integrating robots into workplaces is accelerating across various industries, transforming how humans and machines collaborate. From manufacturing and logistics to healthcare and service industries, robots are no longer confined to isolated automation but are increasingly becoming interactive partners in complex work environments. This shift raises fundamental questions about the nature of human-robot synergy: How can robots effectively support human workers rather than replace them? What design principles ensure seamless collaboration? And how do these changes impact productivity, well-being, and job satisfaction?

While significant advances have been made in robotics and human-computer interaction (HCI), the integration of robots into workplaces remains a challenge. An example of bringing automation into the workplace is automatically adjusting starting desks to support the well-being of the work [6]. Early systems built on a human-centered design approach [7], today we see a wide range of possibilities to sport workers with robots such as Busch et al. [4] envision robots in the workplace to address loneliness. Existing research [8, 12, 13, 25] has explored technical aspects such as robot autonomy, task allocation, safety mechanisms, and human-centered issues like trust, acceptance, and ethical considerations. However, the dynamics of human-robot collaboration in real-world interactive work environments are still not fully understood [5, 14, 28, 29]. There is a pressing need to bridge the gap between technical advancements and the socio-organizational factors that determine successful adoption [1, 15, 30].

This workshop aims to address these challenges by bringing together researchers and practitioners from robotics, HCI, work psychology, and ethics to discuss the future of human-robot synergy in the workplace. We take a broad perspective on both work, ranging from office settings and factories to home offices, and also robots, encompassing everything from humanoid assistants to robotic furniture. Our goal is to explore how robots can be designed, implemented, and evaluated to create meaningful and productive workplace interactions. In this workshop, we will:

- Examine emerging trends and challenges in human-robot collaboration at the workplace.

- Discuss design principles and interaction strategies for effective human-robot synergy.
- Explore ethical, psychological, and social implications of robotic integration in workplaces.
- Engage participants in hands-on activities and scenario-based discussions to envision future work environments.

By synthesizing insights from multiple disciplines, we aim to outline a roadmap for future research and practice in interactive robotics at the workplace. The outcomes of this workshop will contribute to shaping a future where robots are not just tools but cooperative agents that enhance human work experiences.

2 Workshop Mode

We will conduct a synchronous in-person workshop, allowing the workshop members to collaborate and learn from each other. This will allow us to form a community around this topic.

3 Workshop Activities

We will start with a Welcome, Introduction, and a Keynote to set the stage for the day. The workshop will then be organized into two main sessions (see Table 1), each dedicated to a key topic related to the role of LLMs in HRI. Each session will begin with presentations from participants offering different perspectives. The presentations will provide a foundation for the subsequent discussions and ensure that attendees are equipped with insights based on recent research, practical experiences, and future visions.

Afterward, participants will engage in group work designed to foster in-depth discussions around the session's theme. In small groups, attendees will explore the positions presented and discuss their implications for the broader topics of the session. This collaborative format will encourage active participation, the exchange of ideas, and the generation of new insights. Each group will summarize key points from their discussions and share their conclusions in a plenary session, facilitating cross-group knowledge synthesis and laying the groundwork for actionable takeaways.

3.1 Welcoming Session and Keynote

In the welcoming session, we will begin with an introduction of the day's goal and then do an interactive interaction round, where participants should get to know us and each other better to set the tone for the day. Here, we want to focus on all participants having the option to interact with others to foster connections and, thus, enable better group work during the day. We will then have a session in which participants will present their papers to introduce various research topics and enable participants to present their viewpoints.

3.2 Session 1

In the first session, we want to collect opportunities for HRI in the workplace. We will first collect as many free ideas from participants as possible and then, in the end, cluster these ideas into topics. After this, we will form groups around these topics for the group activities for the rest of the day. We plan to use posters and sticky notes for this exercise. For this task, we will present a set of challenges we know from using LLMs-based support for HRI at work and ask participants to develop potential solutions for these challenges.

Table 1: The schedule of the workshop.

09:00	Welcome and Introduction to the Workshop.
09:20	Paper Presentations.
10:00	Break.
10:30	Session I: Group Topic Ideation.
11:30	Break.
12:00	Session II: Presenting Group Ideas.
12:30	Wrap up, Conclusions, and Feedback.
13:00	End.

3.3 Session 2

In the second session, the previously founded groups will present their ideas to all workshop participants. We will then open a big discussion round. Here, we will use our expertise around the topic to enrich the discussion.

3.4 Closing

After the last session, we will start an open discussion and conclude the day. Here, we will first present our results of the day and then ask participants for feedback.

4 250-word Call for Participation

Integrating Human-Robot Interaction (HRI) into workplaces opens up new possibilities for support and trust between humans and robots. To explore these opportunities and challenges, we invite participants to join our half-day workshop at CHIWORK 2025. We welcome submissions from various fields, including HRI, HCI, Robotics, Machine Learning, Cognitive Science, and Ethics in the context of work. Participants are encouraged to submit 4-8 page position papers or case studies discussing ongoing projects, identifying challenges, or proposing future research directions related to the integration of robots in the workplace.

For publication in CEUR, the submissions must be submitted via EasyChair (www.online-once-accepted.xyz) using the CEUR Workshop Proceedings and must adhere to ACM accessibility guidelines. The organizing committee will select papers based on their relevance and contribution to the workshop themes, focusing on enhancing human-robot collaboration and adaptive behavior using LLMs. Our workshop will also provide opportunities for networking and collaboration, allowing participants to help shape the future of human-robot synergy in the work context. For more information, please visit our website (https://www.hcilab.org/human-robot-synergy-workplace-2025/).

5 Organizers

Jan Leusmann. (https://leusmann.io/) is a 3rd year PhD student at LMU Munich. His research is situated in the domain of HRI and

focuses on fostering understandable and intuitive communication between robots and humans, e.g., [10, 11]. Recently, he focused on creating and understanding curious robot behavior [9].

Alex Binh Vinh Duc Nguyen. (https://alexbvdnguyen.com/) is a postdoctoral researcher at the Research[x]Design group, KU Leuven. His research focuses on the integration of robotic technologies to physically actuate the architectural fabric of everyday built environments such as homes [18], offices [17, 19], or public spaces [16] in improving the experience, health, and well-being of occupants.

Pooja Prajod. is a postdoctoral researcher at Centrum Wiskunde & Informatica (CWI). Her experience lies in developing social agents [26, 27] and leveraging affective computing to create interactive, emotionally intelligent AI systems [2, 20]. In the context of Human-Robot Collaboration, she focuses on building human-centered solutions [3, 28, 29] that enhance the well-being of Industry 5.0 workers.

Max Pascher. (https://maxpascher.de/) is a postdoctoral researcher at TU Dortmund, working on democratizing methods in HRI. His research focuses on interaction designs (e.g., [22]), intervention strategies (e.g., [24]), and multi-modal input and feedback methods for AI-enhanced Human-Robot Collaboration (e.g., [23]).

Andrew Vande Moere. is a Professor in Design Informatics at the Department of Architecture at KU Leuven in Belgium. He conducts design-oriented research about the architectural potential of emerging technologies.

Sven Mayer. (https://sven-mayer.com) is an assistant professor of computer science at LMU Munich. His research sits at the intersection between HCI and AI, where he focuses on the next generation of computing systems, e.g., LLM-powered human-robot collaboration systems [21]. He designs, builds, and evaluates future AI-driven human-centered interfaces.

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