Communication in Human-AI Interaction - CHAI (preface)

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Abstract

As Artificially Intelligent systems are becoming more and more present in our surroundings, our ways of interacting with them are also changing. From commercial chatbots to home assistants and robot companions, machines are progressively taking up the role of "communicators", provided with their own agency, and able to interact with their human counterparts in new ways. This workshop aimed at gathering experts in fields relevant to the study of AI systems as communicators, including but not limited to Human-Computer Interaction, Artificial Intelligence, Human-Robot and Human-AI Interaction. It was organized in order to discuss new challenges brought by this recent shift, compare methods and perspectives between different fields, and foster long-term collaborations.

Keywords

Human-AI Communication, AI Communicators, Multimodal Interaction, Embodied AI, Human-Centered Design

1. Introduction

Human Interactions with Artificial Intelligence (AI) systems are becoming part of our everyday life. Generating text and images from prompts, asking for help from a website chatbot, or asking a voice assistant to play our favorite playlists are only a few of the possibilities that interaction with AI systems provide. If designed well, these interactions have the potential to enhance human work, abilities, and well-being. In this workshop, we decided to take the particular viewpoint in which AI systems are not merely a tool for expression or communication, but in which they take the role of "communicators", meaning system *with* which humans create meaning [1]. This shift creates many new challenges and opportunities to design new ways for humans and AI systems to interact. For instance, such AI communicators may have the agency to initiate communication interactions, and should contribute to such interactions efficiently.

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From the AI-development side, the concept of "machines as communicators" have been greatly explored albeit mostly between AI systems, as a way to reduce complexity [2] or coordinate a team of robots [3]. Humans have recently entered the picture [4], especially through the rise of Human-Robot Interaction (HRI) and social robotics, and more recently through the development and fast expansion of Large Language Models. With the perspective of having social robots and conversational agents entering our households or workplaces, developing effective models of interpersonal and human-machine communication becomes a priority [5]. For this reason, the need for a deeper connection between communication theory, HRI and social robotics is more and more acknowledged by the community. Embodied communicators (through social robots or virtual avatars) also present both challenges and opportunities in the broader field of communication, as their embodiment provides room to explore a more complex multi-modality of the interaction [6]. Multi-modality can be used to better convey a concept, to meet the needs of a diverse pool of users who might have difficulties interacting via a uni-modal channel, and to try and recover from a failure happening in one of the different channels. However, it is a challenge in itself and an interdisciplinary effort is needed to direct the design of a multi-modal communication medium [7].

The study of AI communicators should also include a Human-Computer Interaction (HCI) perspective. Indeed, the study of communication as a facet of human-technology interaction have a long history in HCI and semiotic theories informed the engineering of human-computer interaction [8]. The HCI field is making use of advanced user research methods and concepts, design approaches, and conceptual frameworks for analyzing UX and social contexts, which are necessary for the study of human-AI communication.

The primary goal of this workshop was to bridge disciplinary boundaries between various fields, included but not limited to AI, HRI, and HCI, in order to gather a multi-perspective view on the topic of Communication in Human-AI Interaction. In particular, we are interested in exploring the core characteristics of AI communicators and human-AI communication, exchanging research methods, and fostering long-term collaboration between practitioners of different fields. As the study of communication in human-AI interaction is by essence a multidisciplinary approach, we aimed for this workshop to be a multidisciplinary platform where researchers can learn to work together and pave the way to impacting research. We also wished to use this opportunity to draw a tentative disciplinary map of the topic of Communication in Human-AI Interaction, describing different perspectives, research directions, methods, and how these perspectives can be related to one another within the research area as a whole.

The workshop's topics of interests included but were not limited to:

- Concepts and theories of communication in human-AI interaction
- Human-AI communication design
- Blended social contexts [9], comprising both human and technological communication
- Communication in multi-user interaction with intelligent agents
- Embodied multi-modal human-AI communication (including physical robots)
- Verbal and non-verbal human-AI communication
- Communication for human-AI collaboration
- Establishing common ground in human-AI communication
- Inclusion and Diversity in Human-AI Communication

2. Organization

2.1. Workshop Chairs

Jennifer Renoux is a senior researcher in Human-Machine Communication and Collaboration at the Center for Applied Autonomous Sensor Systems, Örebro University, Sweden. Her main research interest is adaptive communication planning, or how automated systems can create and adapt their communication strategies to various users, respecting their skills, expertise, individuality, and preferences, to enable efficient and comfortable collaboration. She is also interested in critical approaches on Human-AI Communication, and inclusive Human-AI Interaction. She was part of the organizing committee of the first edition of the CHAI workshop, held during IJCAI 2022.

Jasmin Grosinger is a researcher at the Cognitive Robotic Systems lab at the Center for Applied Autonomous Sensor Systems, Örebro University, Sweden. Her field of research is AI, specifically the investigation of how to make autonomous (robotic) agents proactive, that is, able to autonomously initiate actions, including learning actions, that are anticipatory. Such reasoning spans multiple cognitive abilities such as context awareness, prediction, preference reasoning, mental simulations of actions, epistemic reasoning, and more. Her methods are primarily based on formal methods. She was part of the organizing committee of first edition of the CHAI workshop, at IJCAI 2022.

Marta Romeo is an Assistant Professor in Computer Science for the School of Mathematical and Computer Sciences at Heriot-Watt University. She got her PhD from the University of Manchester on human-robot interaction and deep learning for companionship in elderly care. She then stayed at the University of Manchester as a postdoc for the UKRI Node on Trust, working on how trust in human-robot interactions is built, maintained and recovered when lost. Her research focuses on developing social intelligent robots, adapting to their users for an increased acceptability and usability. She is interested in human-robot interaction, social robotics, failures and repairs in interactions between humans and robots, and healthcare technologies.

Kiran M. Sabu is a PhD student at the Center for Applied Autonomous Sensor Systems, Örebro University, Sweden. He has a Master's degree in Artificial Intelligence from Vrije University, Amsterdam, The Netherlands. In his PhD research, he is focusing on developing a general framework that allows AI agents to plan their communication actions to multiple users in a Human-Agent collaboration setting, satisfying communication and task-oriented goals.

Kim Baraka is a tenured assistant professor in the Computer Science Department at the Free University (VU) in Amsterdam, and member of the Social AI group. Before joining the VU, he was a postdoctoral fellow in the Socially Intelligent Machines Lab at UT Austin. He holds a dual Ph.D. in Robotics from Carnegie Mellon University (CMU) and the Instituto Superior Técnico in Lisbon, Portugal and a M.S. in Robotics from CMU. His research focuses on enabling robots and humans to teach and learn from each other through situated social interactions. As a professionally trained contemporary dancer, he is also interested in new frontiers in robotics that draw inspiration from the performing arts.

Victor Kaptelinin is professor of HCI at Umeå University, Sweden. His research interests include HCI theory, activity-centric computing, robotic telepresence, and social perception

of intelligent agents. His current research focuses on perceived politeness and fairness in multi-user interaction with embodied intelligent agents. Victor has organized workshops at CHI, DIS, and ECCE

3. Summary of the workshop

3.1. Submissions

The workshop received a total of 6 submissions. Each paper was peer-reviewed in a single-blind process by two members of the organizing committee without any conflict of interest with the authors. The reviewers were instructed to consider how relevant to the workshop the submission was as well as its potential to initiate interesting and fruitful discussions. The committee decided to accept 3 papers. Authors of these papers were asked to bring posters.

3.2. Detailed Program

The workshop was highly interdisciplinary and designed to encourage interaction and discussion. The morning started with a round of introduction from all participants. Then, Dr. Ilaria Torre, Assistant Professor in Human-Robot Interaction at Chalmers University of Technology, gave a keynote titled "Voices from the future: creating appropriate verbal and nonverbal communication methods for Human-Robot Interaction." The remaining of the morning was filled with a networking and poster session for participants to learn about each-other's research and interest and create connections.

Three posters were presented during this session:

1. Frédéric Elisei, Léa Haefflinger and Gérard Bailly, RoboTrio2: Annotated Interactions of a Teleoperated Robot and Human Dyads for Data-Driven Behavioral Models.
2. Alexander Berman, Argumentative Dialogue As Basis For Human-AI Collaboration.
3. Hadi Banaee, Franziska Klügl, Fjollë Novakazi and Stephanie Lowry, Intention Recognition and Communication for Human-Robot Collaboration.

The afternoon was organized as a World Café, with three tables and discussion points:

1. What is Human-AI Communication?
2. What are the problems encountered when studying Human-AI Communication?
3. What research methodologies could / should be applied to the study of Human-AI Communication?

3.3. Summary of the presentations

The first poster presented an annotated multimodal corpus of interactions between an autonomous-looking robot and two humans. The presenter also described the process to collect the data, which consisted in an immersive teleoperation system using Virtual Reality (VR). The human operator is equipped with a VR helmet that recreates the visual perception of the robot (cameras). The operator's head, chin, lips, and eye movement are transmitted to the robot in real-time through motion capture and eye tracking. The result is a more natural interaction

between the two human and the teleoperated robot. The present argued that such a method allows bringing the social know-how, language understanding, and sensory-motor abilities of a human to a robot, that can then learn by imitation.

The second poster argued that the use of argumentation is under-addressed in the field of Explainable AI (XAI). The author applied Tolmin's theory of argumentation to a machine learning model (logistic regression), for which he showed how to extract data (specific fact) and warrants (general) for claims (fact, specific). He presented a prototype called MindTone to showcase this approach for an argumentative AI communicator.

The third poster presented a conceptual framework for intent recognition in human-robot collaboration, and highlighted different aspects of this problem that need to be considered in the context of Industry 4.0 / 5.0 -relevant settings. This framework addresses three different aspects: the temporal sequence of actions (an intermediate intention may not be immediately observable by a single action), the granularity of intentions, and deviation from the predetermined tasks. The poster also presented the process required by the framework, namely observation and context analysis, intention recognition, deviation detection, adaptation and reaction, and communication.

4. Conclusion and Remarks

From the discussions held during the workshop, it appears that the study and design of AI communicators is indeed a blooming, multi-disciplinary research field. Many aspects need to be considered and human-AI communication encompasses human-side, technical, system-wide, and ethical and societal issues. The World Café also highlighted that many research methodologies applied in different fields may need to be considered and integrated, as a lot of them are usually absent from AI research practices. Examples of such are co-creation approaches or observational studies. The discussions also highlighted a strong interest in researchers focusing on human-AI communication for more interdisciplinary collaboration and widening of the practices. On the networking side, the workshop has been highly successful as all participants are involved in follow-up collaborations.

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