

Proposal for a Special Session at IEEE RO-MAN 2023

Human-mediated Robot Autonomy

Aim and Scope of the Special Session

The purposely combination of the skills and computational capabilities of robotics platforms with human expertise and know-how is crucial to realize effective robotic services in real-world ecological environments. In these scenarios, it emerges the necessity to create human-mediated systems where the robot is in charge of performing (some) tasks autonomously under the human's supervision and/or by requiring the (occasional) intervention of the users during the interaction. Human knowledge is expected to directly (e.g., through shared control and shared autonomy) and/or indirectly (e.g., through requisite specification) guide robot autonomy in order to realize behaviors that are in line with the desired domain objectives, safe and acceptable by involved human users. However, designing the robot's behaviors mediated by the humans as well as defining how and when to merge human knowledge with the robot's capabilities is still an opening challenge that requires collaboration and dialogue among different figures. In this respect, research should push the design and development of novel technologies, methodologies, and models that facilitate communication, and sharing of knowledge among the different stakeholders (e.g., roboticists, domain experts, and end-users) as well as facilitate the integration of the resulting (potentially conflicting) requirements. This special session, therefore, aims at fostering the dialogue among the different stakeholders involved in the design and deployment of novel human-mediated robotic services in real-world scenarios with particular attention to the following topics: a) co-design and definition of requirements; b) methods and algorithms; c) metrics and common benchmarks; d) ethical regulations; e) hybrid approaches to improve legibility of robot behaviors and communication with humans in general. Given the multidisciplinary nature of the proposed Special Session and the scientific, technological and ethical impact of such emerging human-robot interaction paradigms, it perfectly fits with the audience of RO-MAN and with the theme of the current edition based on the design of a new bridge for H-R-I as well as the Intelligent interface and Interaction sub-theme.

Organizers

Gloria Beraldo, Dr. National Research Council of Italy, Rome (e-mail: gloria.beraldo@istc.cnr.it, phone: +39- 3299786287).

Short Bio: Gloria Beraldo received the M.Sc. degree cum laude in computer science engineering and the Ph.D. in information engineering with Doctor Europaeus mention from the University of Padova, Padua, Italy, in 2017 and 2021, respectively. She was a visiting researcher at École polytechnique fédérale de Lausanne in 2019 and at Institut de Robòtica i Informàtica Industrial, Universitat Politècnica de Catalunya under the TERRINet (European Robotics Research Infrastructures) initiative. She is currently a postdoc at the Institute of Cognitive Sciences and Technologies, Italian National Research Council. She is involved in the SI-ROBOTICS (Social robotics for active and healthy ageing) project. She is also a contract professor at the University of Padova. Her research is focused on designing novel semi-autonomous human-robot interactions with particular attention to the case of brain-machine interface-driven robotics devices. She is investigating how to decode high-level user intention, for instance from his/her brain activity, through supervised machine learning techniques and fuse it with the perception of the robot to achieve advanced forms of human-robot interaction. Her research interests include human-robot interaction shared control and shared autonomy, telepresence robots, neurorobotics, socially assistive robotics, and intelligent systems.

Riccardo De Benedictis, Dr., National Research Council of Italy, Rome (e-mail: riccardo.debenedictis@istc.cnr.it, phone: +39-3355334405. **Short Bio:** Riccardo De Benedictis (MALE) [M.Sc. in Computer Engineering in 2010 at University of Rome 'La Sapienza'; Ph.D. in Computing, Electronics, and Mathematics in 2019 at the University of Plymouth] is a researcher in Artificial Intelligence at the Institute of Cognitive Sciences and Technologies of CNR. His research topics concern the development of automated reasoning solvers aimed at addressing real-world applications while keeping a strong consideration for the human component that must interact with intelligent applications. Special attention is given to the efficiency of the reasoning processes, obtained through the development of domain-independent heuristics which, in an integrated way, allow solving semantic inference problems, planning, and scheduling problems, as well as their execution and adaptation in dynamic environments. From September to December 2015 Riccardo has been part of the Artificial Intelligence and Machine Learning group of the Pompeu Fabra University of Barcelona under the supervision of Hector Geffner. Riccardo has worked since 2010 on several projects under the FP7, H2020, and AAL research and innovation framework programs. He is currently studying the integration of different AI techniques for executing plans in nondeterministic environments.

Francesca Fracasso, Dr., National Research Council of Italy, Rome (e-mail: francesca.fracasso@istc.cnr.it, phone: +39-3498277559). Short Bio: Francesca Fracasso (Female) [M.S. 2011 in Psychology, Ph.D. 2015 in Psychology and Cognitive Science] is a research scientist at the Institute of Cognitive Sciences and Technologies of CNR. Her research activities focus on applying a co-design approach in technology development, also by studying usability, acceptance, the satisfaction of users, and the impact of technology on the quality of life. Her expertise spans psychophysiological evaluation, qualitative and quantitative methods for user evaluation, and long-term assessment of user interaction with innovative technologies. She was involved in the user modeling in the EU PANDORA project and has been a major contributor to the user requirements elicitation and design and implementation of the user evaluation for several national and international projects like the EU GiraffPlus project, the AAL TV-AssistDEM project, SI-Robotics (Italian MIUR project) and SmarSatCare (ESA funding for Covid-19 management) where she was as responsible for the experimental design and data analysis. She is currently involved in the EU PRE-ACT project where she leads the WP on Stakeholders' co-design and communication package. Since 2020 she is co-chair of the workshop AIXAS (conjunction with the AIXIA conference) and chair of the workshop Altruist (sociAL roboTs for pERsonalized, continUous, and adaptIve aSsisTance) held in conjunction with ICSR.

Alessandra Sciutti, Dr. Istituto Italiano di Tecnologia, Genova (e-mail: alessandra.sciutti@iit.it, phone: +39-010 2897327). Short Bio: Alessandra Sciutti is the head of the CONTACT (COgNiTive Architecture for Collaborative Technologies) Unit of the Italian Institute of Technology (IIT). After a master's degree in Bioengineering from the University of Genova and a Ph.D. in Humanoid Technologies, she spent two research periods abroad, first at the Robotics Lab of the Rehabilitation Institute of Chicago (USA) and then at the Emergent Robotics Laboratory of Osaka University (Japan). In 2018 she was awarded an ERC Starting Grant, for the project wHiSPER (www.whisperproject.eu), focused on the investigation of shared perception between humans and robots. She published more than 100 papers in international journals and conferences and is currently Associate Editor for several journals on Cognitive Robotics and Human-Robot Interaction. She is the corresponding co-chair of the Technical Committee on Cognitive Robotics of the IEEE Robotics and Automation Society and a Scholar of the ELLIS Society. The scientific aim of her research is to investigate the sensory, motor, and cognitive mechanisms underlying human social interaction, with the technological goal of developing robots able to establish mutual understanding with humans.

Alessandro Umbrico, Dr. National Research Council of Italy, Rome (e-mail: alessandro.umbrico@istc.cnr.it, phone: +39-3387721391). Short Bio: Alessandro Umbrico (MALE) [M.S. Engineering Computer Science 2012, Ph.D. Computer Science and Automation, 2017] is a researcher at CNR-ISTC. His research topics cover the development of AI-based planning and execution techniques in Human-Robot Interaction (HRI) scenarios. He investigates the integration of knowledge representation and planning for the design of novel cognitive-inspired control approaches supporting contextualized and adaptive interactions between humans and robots. He contributed to a number of research projects addressing HRI issues for healthcare assistance and collaborative manufacturing. Concerning manufacturing, he participated in the H2020 research projects FourByThree and ShareWork (H2020 Factories of the Future). A parallel thread concerns the development of AI-based technologies for healthcare assistance. He participated in several projects e.g., AAL EU Projects EasyReach, MAESTRO, TV-AssistDem, and the ESA Project SmartSatCare. These projects represented valuable experience in gathering requirements from different stakeholders (e.g., end-users, and healthcare professionals) and designing AI-based services taking into account the different perspectives and needs.

Tentative Speakers

1. "Variable Autonomy Paradigms for Telepresence Robots", G. Beraldo, A. Cesta, R. De Benedictis, A. Umbrico, A. Orlandini, G. Cortellessa from the National Research Council of Italy, (ISTC-CNR).
2. "Planning Issues in Human-Robot Interaction", A. Favier, S. Shekhar, R. Alami from LAAS CNRS and A. Umbrico, A. Orlandini from the National Research Council of Italy, (ISTC-CNR).
3. "Spatial Mapping of Human Operational Commands for Designing Autonomous Mobile Robots Navigation", F. Onishi, Y. Kawasaki, M. Takahashi, from Keio University.
4. "Mixed-initiative task orchestration through hand-guided human-robot interaction in collaborative robotic assembly.", R. Caccavale, A. Finzi from DIETI, University of Naples Federico II.
5. "Can robots be persuasive: Insights from a real-world scenario". A. Andriella from PAL Robotics, and F. Vigni, S. Rossi from University of Naples Federico II.