Proposal for a Special Session at IEEE RO-MAN 2023

Cognitive Architectures for Personalized Assistive Robots

Aim and Scope of the Special Session

Assistive robots are becoming an integral part of our daily lives in a variety of roles, such as caretakers, cleaning robots, home assistants, and autonomous vehicles. However, developing general purpose assistive robots is challenging, as it requires cognitive architectures that integrate multiple knowledge sources and reasoning elements to perform necessary tasks in the real world. For example, consider a household assistive robot setting up a breakfast table. This task requires a cognitive architecture with integrated knowledge about household objects (e.g. cereal box), relations between different objects (e.g. cereal can be poured from cereal box into a bowl), relations between objects and household contexts (e.g. cereal box can be found in the kitchen), and a reasoning framework on how to use the learned knowledge to perform household tasks (e.g. setting up a table for breakfast requires a cereal box). Creating such integrated cognitive architectures may result in breakthroughs in artificial intelligence and assistive robotics.

Another challenge in developing cognitive architectures for assistive robots is that these architectures must be personalized to their users' needs and environments. For example, for the household assistive robot, each user might have personal preferences about the kind of breakfast they like and might have a particular set of utensils in their home. In such cases, it is imperative for the assistive robot to learn the user preferences and the environment, through interaction with the user. Although extensive research has been conducted for developing cognitive architectures for social companion robots, home assistant robots, cognitive assistance robots, etc., many of these architectures are not developed to be personalized to their users. Therefore, in this special session, we focus on cognitive architectures for personalized assistive robots that could interact with and learn from their users to effectively assist the users with the necessary tasks. Our goal is to bring together researchers in multidisciplinary fields (e.g. Human-Robot Interaction (HRI), Artificial Intelligence (AI), Machine Learning (ML), cognitive science) to present and discuss theoretical foundations, real-world applications, and HRI studies with assistive robots.

We believe that our proposed topic is novel as our goal is to bring together learning, knowledge representation, and HRI for developing personalized assistive robots. Although research has been conducted in these fields separately, we are interested in the unique combination of these techniques for real-world applications, which is relevant to ROMAN. Finally, this year's theme of ROMAN is "Design a New Bridge for H-R-I", with [H] for Human Health, Happiness, and Hope, [R] for Robotic Recovery and Reconnection, and [I] for Intelligent Interface and Interaction. Towards this theme, the development of personalized assistive robots has direct applications in health care and home assistance for older adults. Such robots can be intelligent social companions and assist with daily tasks. Further, the design of intelligent interfaces for interaction with and learning from robot users is another important aspect of the proposed topic.

Organizers

Ali Ayub, Postdoctoral Fellow

[Social and Intelligent Robotics Research Lab, University of Waterloo, Canada]
E-mail: a9ayub@uwaterloo.ca
Phone: +1 – 6476576156
Short Bio: Dr. Ali Ayub is a Postdoctoral Research Fellow at University of Waterloo, Canada researching in cognitive architectures and human-robot interaction, a natural continuation of his PhD dissertation titled, ``Few-Shot Continual Learning of Visual Concepts''. His research interests include cognitive architectures, lifelong learning, assistive robotics and human-robot interaction, which reflect his desire to develop robots that can be deployed in real-world environments. Ali is experienced in conference/workshop organization, having been the lead organizer of a workshop at HRI'22, and a special issue in Paladyn Journal of Behavioral Robotics. He has also reviewed over 70 conference and journal articles at prestigious robotics and machine learning venues.

Patrick Holthaus, Senior Research Fellow

[Adaptive Systems Research Group, University of Hertfordshire, UK]
E-mail: p.holthaus@herts.ac.uk
Phone: +44 – 1707 28 9383
Short Bio: Patrick Holthaus is a Senior Research Fellow at the University of Hertfordshire (UK) and an advisory board member of the HIRo project. His research focus is social robotics, including a robot's nonverbal robot signaling, social credibility, and trust in assistive robots. As manager of the Robot House research facility, a unique research facility for human-robot interaction, his research brings together real-world applications and fundamental robotics research. Patrick is experienced in conference organization, having been general chair (UKRAS'21), publication chair (HAI'17), co-organizer of eight international workshops, frequent session chair, and co-organizer of special sessions. He is further experienced in editing and reviewing in his role as associate editor of three international journals, having co-edited more than five special issues and reviewed over 50 conference and journal articles.

…

Paper titles have not yet been decided by the potential authors.

Tentative Speakers

1. Kerstin Dautenhahn, Chrystopher Nehaniv, Steven Lawrence, University of Waterloo, Canada
2. Alan R. Wagner, The Pennsylvania State University, USA
3. Alessandra Sciutti, Italian Institute of Technology, Genoa, Italy
4. Goldie Nejat, University of Toronto, Canada