

Workshop: Robotics for InterAction Technology

Organizers: Bruno Siciliano & Antonio Bicchi

Confirmed Speakers:

Giovanni Berselli, University of Genoa

Antonio Bicchi, University of Pisa

Cristina Piazza, Technical University of Munich

Bruno Siciliano, University of Naples Federico II

Overview

A recent breakthrough in robotics marks a significant milestone as Figure, a leading robotics company, has unveiled Figure 01, a humanoid robot capable of engaging in full-fledged conversations with humans. This remarkable feat is made possible by integrating OpenAI's cutting-edge technology in Figure 01, showcasing the potential of robotics to bridge the gap between humans and machines. Figure 01's integration of OpenAI's sophisticated visual and language models empowers it to comprehend language and interpret visual information seamlessly. The collaboration between Figure and OpenAI represents a convergence of Robotics and AI, promising to transform industries across the board. By enhancing robots' ability to interact naturally with humans and perform complex tasks, this interdisciplinary approach opens doors to diverse applications in manufacturing, healthcare, and personal assistance sectors, among others. As humanoid robots become more advanced and autonomous, they hold the potential to redefine societal norms and expectations. This workshop is aimed at addressing the challenges of novel paradigms for human-machine interaction in the context of InterAction Technology (IAT).

More Info

The media often throw the terms AI and Robotics together in a confusing way. Even in scientific circles, given that there is so much overlap of scope and methods, it is not always evident whether the differences of research problems grant sufficient specificity for two distinct disciplines, or either one is part of the other. Several existing definitions of AI, or machine intelligence, converge toward the concept of implementing the essential features of human cognition on a computer. The goal of AI is the ultimate understanding of intelligence, with obvious practical applications in the creation of intelligent devices or even robots. Colloquially today, the term AI describes machines that mimic cognitive functions of the human mind, such as learning and problem solving, which fundamentally amount to processing information from data. In contrast, in the crisp and commonly accepted definition of Robotics as the intelligent connection of perception to action, robots are used to process interaction with the physical world – not only brains (intelligence) and sensors (perception) but bodies (action) as well.

The fact that AI focuses more on replicating cognitive abilities which reside in the central nervous system, such as image and language processing, while Robotics focuses on physical abilities which involve other body parts, such as manipulation and locomotion, is all but the tip of the iceberg. The differences in the two types of intelligence involved have been well-known since at least the 1980s, and best exemplified by Moravec's paradox that "it is comparatively easy to make computers exhibit adult level performance on intelligence tests or playing checkers, and difficult or impossible to give them the skills of a one-year-old when it comes to perception and mobility".

More evidence of the gap between information and interaction processing comes from contrasting vision and hearing with touch. AI has made great progress in processing images and sounds, but tactile information remains a much bigger challenge. To humans, the sense of touch is of fundamental importance. A child starts interacting with the world by touching all objects and intuitively learns how to grasp and manipulate them thanks to the intelligence embodied in its hands, in association with, but beyond, the visual memory of the objects. To solve unstructured, highly interactive tasks in the real world, data cannot be taken for granted – the system must itself obtain them from the environment through interaction. This is the fundamental challenge Robotics poses to the future of AI, one that makes the two disciplines inseparable.

In a recent comment on Nature Italy, Bicchi & Siciliano introduced the neologism InterAction Technology (IAT) as the mission of the Italian Institute of Robotics & Intelligent Machines (I-RIM) – where the ‘A’ is deliberately capitalised to emphasise the importance of the physical action. By addressing the problem of learning interaction, Robotics and AI will produce a new generation of intelligent devices capable of collaborating with people and interacting with the environment, thus providing the missing link between the digital and physical world in which we live. In this sense, IAT represents the natural evolution of Information Technology (IT) towards a real symbiosis between human and machine. IAT, as the technology that fleshes out Artificial Intelligence, will play a key role in the near future, implementing a gradual transition from Internet-of-Things (IoT) to Internet-of-Skills (IoS). It is already today the engine of competitiveness and flexibility of the manufacturing industry with the advent of the Industry 5.0 program. Robotics for services is showing even more disruptive effects on sectors such as agriculture, health care, environmental monitoring, security, transport, infrastructure and public services.

The workshop intends to focus on various aspects of IAT towards the realization of intelligent robots operating in different domains, such as driving, flying, assistive technologies, teleoperation, medical applications, logistics, and manufacturing. How to shape human–robot interaction is a question to be answered by focusing on the integrated “phygital” aspects concerning sensors, design and materials, control and artificial intelligence.

Goal

The expected outcomes of the workshop are:

- To understand the importance of InterAction Technology for the development of future AI-empowered robots
- To study the relationship between human and machine towards a resilient and sustainable ecosystem
- To identify new emerging areas for scientific collaboration with new communities of users and developers of robotics technology

Intended Audience

The workshop is addressed to:

- Graduate students new to the fields of robotics, AI and shared control
- Experienced researchers in aforementioned fields looking to expand the complexity and relevance of case studies used to demonstrate their techniques
- Industry practitioners interested in and working on problems related to Industry 5.0 and autonomous systems may also benefit from the workshop and be able to contribute valuable insights to academic participants

Schedule

The plan is to have a brief introduction by the organizers, to be followed by four technical presentations of the invited speakers who will address different aspects, application scenarios and use cases of IAT. The detailed agenda will be finalized depending on the participation of additional speakers following the call for contributions we are about to launch.

Reference

A. Bicchi, B. Siciliano, “Robotics for InterAction Technology: Italy's key role in the next revolution”, Nature Italy, Oct. 2021, <https://www.nature.com/articles/d43978-021-00124-4>