Alessandro Roncone, Ph.D.

ROBOTICS RESEARCHER · COMPUTER SCIENTIST · INTERACTION DESIGNER

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PERSONAL SUMMARY

The central motivating theme of my research is to **develop robot technologies that enable close, natural, and extended cooperation with humans**. I envision mixed human-robot ecologies where complex control commands can be instructed through natural language, and robots are able to anticipate people's needs, provide the best support to them, and even influence their intents and behaviors. My work focuses on the design of human-aware robot control systems that allow robots to **embrace** the interaction with the human *and* the external world **by design**. This will allow for humans and robots to accomplish together what neither of them can do alone.

My research bridges the gap between Robotics, Human Robot Interaction, and Artificial Intelligence. Over the years, I have worked on i) exploring the breadths of how tactile systems can improve perception in the nearby space [**2014**, **2015**, **2016**], ii) implementing state of the art control systems for humanoid robots [**2014**, **2016**, **2018**], and iii) investigating how non-verbal [**2016**, **2017**] and contextual [**2017**, **2018**] communication can advance human-robot interaction and manufacturing.

RELEVANT EXPERIENCE

Assistant Professor COMPUTER SCIENCE DEPT, UNIVERSITY OF COLORADO BOULDER   BOULDER, CO, USA 2018 – PRESENT

• I joined CU Boulder in Fall 2018, where I lead the **H**uman **I**nteraction and **RO**botics Group [**HIRO**]. We work at the intersection of Robotics, Artificial Intelligence and Control to develop intuitive, human-centered technologies for the next generation of robot workers, assistants and collaborators. The scope of our research is within the larger field of Human-Robot Collaboration [HRC] and advanced manufacturing, and it revolves around the idea that shared knowledge and transparent commitment to the task are central for collaborative behaviors [**2017**].

Post-Doc SOCIAL ROBOTICS LAB, COMPUTER SCIENCE DEPT, YALE UNIVERSITY   NEW HAVEN, CT, USA 2015 – 2018

• I incorporate natural language into classical task planning algorithms [**2018**], with the goal of developing robots that are able to: i) provide effective support to the human when she needs it the most [**2017**]; ii) learn complex hierarchical representations from single instructions; iii) proactively ask questions and provide contextual information to query and share internal states and intents [**2017**].

Post-Doc ICUB FACILITY, ITALIAN INSTITUTE OF TECHNOLOGY [IIT]   GENOA, IT 2015

• I continued the work started during my Ph.D. fellowship at the iCub Facility. Specifically, I was interested in the exploitation of the peripersonal space model I implemented during my Ph.D., by focusing toward two types of applications: i) *rich body representations* [**2014**, **2015**]; ii) *distributed motor control via whole-body awareness* [**2016**, **2018**].

• I also made contributions to the field of optimization-based approaches to inverse kinematics and robot control. I implemented a state of the art *gaze stabilization* framework [**2014**]—later integrated with an existing *gaze controller* [**2016**]. My work in the topic formally solved the problem of controlling a binocular head to foveate toward an arbitrary 3D point in space, and concurrently exploiting redundancy to stabilize gaze at the same time.

Roboticist ROBOTICS, BRAIN AND COGNITIVE SCIENCE DEPT, ITALIAN INSTITUTE OF TECHNOLOGY [IIT]   GENOA, IT 2010 – 2014

• Multiple positions: *Research Fellow* (2010-2011), *Ph.D. Student* (2012-2014). Involved in the **XPERIENCE FP7-ICT-270273** and **WYSIWYD FP7-ICT-61239** projects, funded by the European Union Seventh Framework Program with a funding of € 7.634.000 and € 4.583.016 respectively.

EDUCATION

Ph.D. in Robotics ITALIAN INSTITUTE OF TECHNOLOGY [IIT]   GENOA, IT 2012 – 2015

• Thesis title: *"Expanding sensorimotor capabilities of humanoid robots through multisensory integration. A study on the implementation of peripersonal space on the iCub"* [**2015**].

• Supervisors: Giorgio Metta, Luciano Fadiga, Ugo Pattacini, Matej Hoffmann.

• I focused on improving the sensorimotor capabilities of the **iCub** humanoid, by implementing a bio-inspired system able to learn a multisensory representation of the space around the robot's body (or *peripersonal space*) [**2016**]. The robot, equipped with a whole-body artificial skin, learns the consequences of its interaction with the self and the environment by means of a multisensory (tactile-motor and tactile-visual) representation. This results in the *extension of the robot's tactile domain toward the nearby space*, in such a way that it implicitly copes with modeling or calibration errors.

M.sc. in NeuroEngineering (110/110 *Summa cum Laude*) UNIVERSITY OF GENOA   GENOA, IT 2008 – 2011
- Thesis title: *"Visuo-Haptic Integration for Object Characterization in an Unstructured Environment"*.
- Supervisors: Matteo Fumagalli, Francesco Nori.

B.sc. in Biomedical Engineering (110/110 *Summa cum Laude*) UNIVERSITY OF GENOA   GENOA, IT 2005 – 2008
- Thesis title: *"Support Vector Machine Analysis applied to a Manipulator in a Non-Structured Environment"*.
- Supervisors: Luca Pulina, Lorenzo Natale, Armando Tacchella.

Student (with scholarship) INSTITUTE FOR ADVANCED STUDIES IN ICT [ISICT]   GENOA, IT 2005 – 2008
- Successfully selected for scholarship—only three positions available out of hundreds of candidates. Attended a number of supplementary courses (e.g. *Marketing*, *Management*, *Effective Communication*, and more).

RESEARCH, TEACHING & SERVICE

- **LEAD PI**, *Programmable and reconfigurable soft robots for symbiotic soft/rigid robotic systems*, 2019 Research and Innovation Office Seed Grant [50k$]. Joint project with Jianliang Xiao and Emiliano Dall'Anese.
- **RESEARCH ADVISOR** and mentor of 6 Ph.D. students, 10 master students and 12 undergraduate students. During his post-doctoral training, co-advisor of 2 graduate and 4 undergraduate students.
- **EXTERNAL SERVICE**:
  ◦ *Vice Chair* and Educational Advisor of the IEEE Denver Computer, Information Theory and Robotics Society (2020, 2019).
  ◦ *Educational Advisor* for Artificial Intelligence Education, St. Vrain Valley School District, serving 37000 students in K-12 (2020, 2019).
- **INVITED TALKS**:
  ◦ *Colorado School of Mines* [2019]. Title: *"Robots working WITH and AROUND people."*.
  ◦ *iCub Facility*, Italian Institute of Technology [2017]. Title: *"Robots, inequality and you"*.
  ◦ *Computation and Cognitive Development Lab*, Yale University [2017]. Title: *"Humans, Robots and everything in between"*.
  ◦ *International Conference on Social Robotics* [ICSR 2016]. Title: *"Artificial Sociality in Human-Robot Collaboration"*.
  ◦ *Intelligent Robotics* class, Yale University [2015 and 2016]. Title: *"iCub – a shared platform for research in Robotics and AI"*.
- **TEACHING EXPERIENCE**:
  ◦ **CSCI 7000** Physical Human–Robot Interaction *Spring 2019*
  ◦ **CSCI 3302** Introduction to Robotics *Fall 2018, Spring 2020*
- **ASSOCIATE EDITOR** for the 2019 *IEEE International Conference on Robotics and Automation* (**ICRA**).
- **PROGRAM COMMITTEE** member for the following conferences:
  ◦ *ACM International Conference on Human–Robot Interaction* (**HRI**, 2018),
  ◦ *International Conference on Artificial Intelligence* (**AAAI**, 2019, 2018).
- **REVIEWER** for the following conferences and journals:
  ◦ *IEEE Transactions on Robotics* (**T-RO**, 2019, 2018),
  ◦ *IEEE International Conference on Robotics and Automation* (**ICRA**, 2018, 2017, 2016),
  ◦ *IEEE/RSJ International Conference on Intelligent Robots and Systems* (**IROS**, 2019, 2017, 2016, 2015),
  ◦ *Frontiers in Robotics and AI* (2019, 2018, 2017),
  ◦ *ACM International Conference on Human–Robot Interaction* (**HRI**, 2020),
  ◦ *ACM Transactions on Human–Robot Interaction* (**T-HRI**, 2018),
  ◦ *Robotics and Automation Letters* (**RA-L**, 2019, 2018),
  ◦ *Robotics: Science and Systems* (**RSS**, 2016),
  ◦ *Frontiers in NeuroRobotics* (2019, 2018),
  ◦ *IEEE/RAS International Conference on Humanoid Robots* (**HUMANOIDS**, 2017, 2016, 2014, 2012),
  ◦ *International Journal of Humanoid Robotics* (2014),
  ◦ *IEEE International Conference on Development and Learning and on Epigenetic Robotics* (**ICDL-EPIROB** 2017, 2016, 2015),
  ◦ *IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechatronics* (**BIOROB**, 2016),
  ◦ *IEEE International Symposium on Robot and Human Interactive Communication* (**ROMAN** 2014),
  ◦ *IEEE International Conference on Robotics and Biomimetics* (**ROBIO**, 2013).
- **EXTERNAL PH.D. REVIEWER** for *Raúl Pérula–Martínez*, graduated from the Robotics Lab in Universidad Carlos III de Madrid.
- **TEACHING ASSISTANT** at the *2015 CBMM Summer School*, organized by MIT. One of the projects I supervised was about integrating Google Glass with the iCub robot to perform head/gaze teleoperation.
- **ORGANIZER** of the *"Development of body representations in humans and robots"* workshop, with Matej Hoffmann, Lorenzo Jamone, and Beata Grzyb. It was a half-day workshop at the ICDL-EPIROB 2014 Conference, in Genova, IT.
- Proud of being featured on the **IEEE SPECTRUM VIDEO FRIDAY** with my **2014 ICRA VIDEO** on self-calibration.

SELECTED PUBLICATIONS

[2018] J. Brawer, O. Mangin, **A. Roncone**, S. Widder, and B. Scassellati. SITUATED HUMAN–ROBOT COLLABORATION: PREDICTING INTENT FROM GROUNDED NATURAL LANGUAGE. In: *IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS)*.

[2018] E. C. Grigore, O. Mangin, **A. Roncone**, and B. Scassellati. PREDICTING SUPPORTIVE BEHAVIORS FOR HUMAN-ROBOT COLLABORATION. In: *2018 Int. Conf. on Autonomous Agents and MultiAgent Systems [AAMAS]*.

[2018] E. C. Grigore, **A. Roncone**, O. Mangin, and B. Scassellati. PREFERENCE-BASED ASSISTANCE PREDICTION FOR HUMAN-ROBOT COLLABORATION TASKS. In: *IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS)*.

[2018] P. D. H. Nguyen, M. Hoffmann, **A. Roncone**, U. Pattacini, and G. Metta. COMPACT REAL-TIME AVOIDANCE ON A HUMANOID ROBOT FOR HUMAN-ROBOT INTERACTION. In: *2018 ACM/IEEE Int. Conf. on Human-Robot Interaction [HRI]*.

[2018] S. Zeylikman, S. Widder, **A. Roncone**, O. Mangin, and B. Scassellati. THE HRC MODEL SET FOR HUMAN-ROBOT COLLABORATION RESEARCH. In: *2018 IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS)*.

[2017] O. Mangin, **A. Roncone**, and B. Scassellati. HOW TO BE HELPFUL? IMPLEMENTING SUPPORTIVE BEHAVIORS FOR HUMAN-ROBOT COLLABORATION. eprint: 1710.11194.

[2017] **A. Roncone**. LEARNING PERIPERSONAL SPACE REPRESENTATION IN A HUMANOID ROBOT WITH ARTIFICIAL SKIN. In: *AI Matters* 3.1, pp. 17–18.

[2017] **A. Roncone**, O. Mangin, and B. Scassellati. TRANSPARENT ROLE ASSIGNMENT AND TASK ALLOCATION IN HUMAN–ROBOT COLLABORATION. In: *2017 IEEE Int. Conf. on Robotics and Automation [ICRA]*.

[2016] H. Lehmann, **A. Roncone**, U. Pattacini, and G. Metta. PHYSIOLOGICALLY INSPIRED BLINKING BEHAVIOR FOR A HUMANOID ROBOT. In: *8th Int. Conf. on Social Robotics [ICSR]*, pp. 83–93.

[2016] **A. Roncone**, U. Pattacini, G. Metta, and L. Natale. A CARTESIAN 6-DOF GAZE CONTROLLER FOR HUMANOID ROBOTS. In: *Proceedings of Robotics: Science and Systems [RSS]*.

[2016] **A. Roncone**, M. Hoffmann, U. Pattacini, L. Fadiga, and G. Metta. PERIPERSONAL SPACE AND MARGIN OF SAFETY AROUND THE BODY: LEARNING VISUO-TACTILE ASSOCIATIONS IN A HUMANOID ROBOT WITH ARTIFICIAL SKIN. In: *PLOS ONE*.

[2015] **A. Roncone**. EXPANDING SENSORIMOTOR CAPABILITIES OF HUMANOID ROBOTS THROUGH MULTISENSORY INTEGRATION – A STUDY ON THE IMPLEMENTATION OF PERIPERSONAL SPACE ON THE ICUB. PhD Dissertation. University of Genoa and Italian Institute of Technology.

[2015] **A. Roncone**, M. Hoffmann, U. Pattacini, and G. Metta. LEARNING PERIPERSONAL SPACE REPRESENTATION THROUGH ARTIFICIAL SKIN FOR AVOIDANCE AND REACHING WITH WHOLE BODY SURFACE. In: *2015 IEEE/RSJ Int. Conf. on Intelligent Robots and Systems [IROS]*, pp. 3366–3373.

[2014] S. R. Fanello, U. Pattacini, I. Gori, V. Tikhanoff, M. Randazzo, **A. Roncone**, F. Odone, and G. Metta. 3D STEREO ESTIMATION AND FULLY AUTOMATED LEARNING OF EYE-HAND COORDINATION IN HUMANOID ROBOTS. In: *2014 IEEE-RAS Int. Conf. on Humanoid Robots*, pp. 1028–1035.

[2014] **A. Roncone**, M. Hoffmann, U. Pattacini, and G. Metta. AUTOMATIC KINEMATIC CHAIN CALIBRATION USING ARTIFICIAL SKIN: SELF-TOUCH IN THE ICUB HUMANOID ROBOT. In: *2014 IEEE Int. Conf. on Robotics and Automation [ICRA]*.

[2014] **A. Roncone**, U. Pattacini, G. Metta, and L. Natale. GAZE STABILIZATION FOR HUMANOID ROBOTS: A COMPREHENSIVE FRAMEWORK. In: *2014 IEEE-RAS Int. Conf. on Humanoid Robots*, pp. 259–264.