Alessandro **Roncone, Ph.D.**

ROBOTICIST · COMPUTER SCIENTIST · TEAM LEAD

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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 robots work with and around people, anticipate people's needs, and provide the best support to them. 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.

RELEVANT EXPERIENCE

Assistant Professor CS DEPARTMENT, CU BOULDER — BOULDER, CO, USA 2018 – PRESENT

At CU Boulder, I lead the Human Interaction and RObotics Group [HIRO], where we perform state-of-the-art research in the field. 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. Our research team is divided in three strands: ALGORITHMIC HUMAN-ROBOT INTERACTION, CONTROL AND ARTIFICIAL SKIN TECHNOLOGIES, and LEARNING AND MODELING FOR ROBOTICS. .

Post-Doc SOCIAL ROBOTICS LAB, CS DEPARTMENT, YALE UNIVERSITY — NEW HAVEN, CT, USA 2015 – 2018

My research at Yale University focused on task and motion planning for Human-Robot Collaboration [**2018**]. I worked on systems that: i) provide effective support to the human when they need it the most [**2022**]; 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 worked on implementing a model of peripersonal space on the iCub robot, focusing on: i) *rich body representations* [**2016**] ii) *distributed motor control via whole-body awareness* [**2018**] I also worked on optimization-based approaches to inverse kinematics and robot control: my *gaze stabilization and control* framework [**2014**, **2016**]ormally solved the problem of controlling a binocular head to gaze toward arbitrary 3D points in space, and concurrently exploiting redundancy to stabilize gaze.

Ph.D. Student ICUB FACILITY, ITALIAN INSTITUTE OF TECHNOLOGY [IIT] — GENOA, IT 2012 – 2014

My research improved the sensorimotor capabilities of the iCub humanoid via a multisensory representation of the space around the its body (*Peripersonal Space*) [**2014**, **2015**, **2016**]

Research Fellow ROBOTICS, BRAIN AND COGNITIVE SCIENCES, IIT — GENOA, IT 2010 – 2011

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.

M.sc. in NeuroEngineering (110/110 *Summa cum Laude*) UNIVERSITY OF 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, 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.

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.

RESEARCH, TEACHING & SERVICE

FUNDING

- **CO-PI**, *The co-evolution of Human-AI Adaptation*, 2022 Army Research Laboratory (ARL) [2022, **1.5M$**, 3y].
- **PI**, *Policy Learning for Optimal Teaming via TF-Conditioned Metalearning (PLOT-Meta)*, 2021 Army Research Laboratory (ARL) [2021, **2M$**, 5y].
- **CO-DIRECTOR**, *Engineering Education and AI-Augmented Learning IRT*, one of six Interdisciplinary Research Themes sponsored by the College of Engineering and Applied Sciences. Our IRT is focused on developing a community and research capacity around a new science at the intersection of AI-augmented learning and K16 education research [2020, **250K$**, 2y].
- **PI**, *Strengthening Teamwork for Robust Operations in Novel Groups (STRONG)*, Army Research Laboratory (ARL) [2021, **100K$**, 1y].
- **PI**, *Towards equitable robot tutoring: an intersectional analysis of human-robot interaction in racially diverse classrooms*, IRT Seed Grant [2021, **15K$**, 1y].
- **SENIOR PERSONNEL**, *NSF AI Institute in Student-AI Teaming*, 2020 National Science Foundation [2020, **20M$**, 5y, award number 2019805].
- **PI**, *Programmable and reconfigurable soft robots for symbiotic soft/rigid robotic systems*, Research and Innovation Office [2020, **50K$**, 1y].

MENTORING

- Current students:
  - **SHIRAN DUDY**, post-doc.
  - **JOEWIE KOH**, Ph.D. Student, exp. graduation date: 2024.
  - **CALEB ESCOBEDO**, Ph.D. Student, exp. graduation date: 2024. *NSF GFRP* honorable mention.
  - **ANUJ PASRICHA**, Ph.D. Student, exp. graduation date: 2024.

- **STEPHANE AROCA-OUELLETTE**, Ph.D. Student, exp. graduation date: 2025.
- **CLARE LOHRMANN**, Ph.D. Student, exp. graduation date: 2025.
- **YI-SHIUAN TUNG**, Ph.D. Student, exp. graduation date: 2025.
- **KALEB BISHOP**, Ph.D. Student, exp. graduation date: 2025. *Chancellor's fellowship* recipient.
- **NATALIYA NECHYPORENKO**, Ph.D. Student, exp. graduation date: 2026. *NSF GFRP* recipient.
- **GILBERTO MARTINEZ**, Ph.D. Student, exp. graduation date: 2026. *GEM Fellowship* recipient.

• Graduated PhD students:
- **GUOHUI DING**, co-advised with Lijun Chen, Spring 2021, now at Facebook.

• Primary Advisor of Theses:
- **MATT STRONG**, Spring 2021, BS, now at Microsoft. Honorable Mention at the *Computing Research Association's Outstanding Computer Science Undergraduate Researcher award* (national level). Recipient of the *Research Award* and *Active Learning Program Award* for 2021 (College level).
- **BYUNGJIN KIM**, Spring 2021, BS, now MS student at UMichigan.
- **ANDER ARAMBURU FERNANDEZ**, Summer 2020, MS.
- **KRISHNA KODUR**, Spring 2020, MS, now Ph.D. student at UT Arlington.
- **SOUSHEEL VUNNAM**, co-advised with Nisar Ahmed, Spring 2020, BS, now at Amazon.
- **JACOB FIOLA**, Spring 2020, BS.
- **CHI-JU WU**, Spring 2019, MS, now at Zoox.

TEACHING

• **CSCI 7000** Physical Human–Robot Interaction and Robot Control—*Spring 2019, Fall 2020, Fall 2021*.
• **CSCI 7000** Deep Reinforcement Learning and Robotics—*Summer 2020*.
• **CSCI 3302** Introduction to Robotics—*Fall 2018, Spring 2020, Spring 2021, Spring 2022*.

SERVICE

• **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 (2021, 2020, 2019).

• **INVITED TALKS**:
- *Samsung AI NYC* [2021].
- *International Conference on Advanced Robotics* [ICAR, 2021]. Invited speaker at the *Workshop on Design, Learning and Control for Safe Human-Robot Collaboration*.
- *Colorado School of Mines* [2019].
- *iCub Facility*, Italian Institute of Technology [2017].
- *Computation and Cognitive Development Lab*, Yale University [2017].
- *International Conference on Social Robotics* [ICSR, 2016]. Invited speaker at the *Workshop on Synthetic Method in Social Robotics*.
- *Yale University* [2015 and 2016].

• **ASSOCIATE EDITOR** or **PROGRAM COMMITTEE MEMBER** for the following conferences:
- *IEEE International Conference on Robotics and Automation* (**ICRA**)

- *IEEE/RAS International Conference on Humanoid Robots* (**HUMANOIDS**),
- *ACM International Conference on Human–Robot Interaction* (**HRI**),
- *International Conference on Artificial Intelligence* (**AAAI**).

- **REVIEWER** for the following conferences and journals: *IEEE Transactions on Robotics*, *IEEE International Conference on Robotics and Automation* (ICRA), *IEEE/RSJ International Conference on Intelligent Robots and Systems* (IROS), *Frontiers in Robotics and AI*, *ACM International Conference on Human–Robot Interaction* (HRI), *ACM Transactions on Human–Robot Interaction* (T-HRI), *Robotics and Automation Letters* (RA-L), *Robotics: Science and Systems* (RSS), *Frontiers in NeuroRobotics*, *IEEE/RAS International Conference on Humanoid Robots* (Humanoids), *International Journal of Humanoid Robotics*, *IEEE International Conference on Development and Learning and on Epigenetic Robotics* (ICDL-Epirob), *IEEE International Symposium on Robot and Human Interactive Communication* (ROMAN), *IEEE International Conference on Robotics and Biomimetics* (ROBIO), *IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechatronics* (BioRob).
- **TEACHING ASSISTANT** at the *2015 CBMM Summer School*, organized by MIT.
- **ORGANIZER** of the *"Development of body representations in humans and robots"* workshop, with Matej Hoffmann, Lorenzo Jamone, and Beata Grzyb.
- Featured on the **IEEE SPECTRUM VIDEO FRIDAY** with my **2014 ICRA VIDEO** on self-calibration.

PUBLICATIONS

[**2022**] N. Correll, C. Heckman, B. Hayes, and **A. Roncone**. INTRODUCTION TO AUTONOMOUS ROBOTS: MECHANISMS, SENSORS, ACTUATORS, AND ALGORITHMS. In: *MIT Press*.

[**2022**] O. Mangin, **A. Roncone**, and B. Scassellati. HOW TO BE HELPFUL? IMPLEMENTING SUPPORTIVE BEHAVIORS AND PERSONALIZATION FOR HUMAN-ROBOT COLLABORATION.

[**2022**] K. Merckaert, B. Convens, C. J. Wu, **A. Roncone**, M. M. Nicotra, and B. Vanderborght. REAL-TIME MOTION CONTROL OF ROBOTIC MANIPULATORS FOR SAFE HUMAN–ROBOT COEXISTENCE. In: *Robotics and Computer-Integrated Manufacturing* 73, p. 102223.

[**2022**] A. Pasricha, Y. Tung, B. Hayes, and **A. Roncone**. POKERRT: POKING AS A SKILL AND FAILURE RECOVERY TACTIC FOR PLANAR NON-PREHENSILE MANIPULATION. In: *Robotics and Automation Letters and IEEE Int. Conf. on Robotics and Automation [ICRA]*.

[**2021**] A. Aroca-Ouellette, C. C. Paik, **A. Roncone**, and K. Kann. PROST: PHYSICAL REASONING ABOUT OBJECTS THROUGH SPACE AND TIME. In.

[**2021**] K. Bishop, B. Hayes, and **A. Roncone**. TEACHING GROUNDED READING SKILLS VIA AN INTERACTIVE ROBOT TUTOR. In: *2021 ACM/IEEE Int. Conf. on Human-Robot Interaction [HRI], Robots for Learning workshop*.

[**2021**] G. Ding, J. J. Koh, C. Heckman, **A. Roncone**, and L. Chen. DISTRIBUTED APPROXIMATION OF CENTRALIZED VALUE FUNCTIONS:CONVERGENCE AND PERFORMANCE BOUNDS. In: *Under Review*.

[**2021**] C. Escobedo, M. Strong, M. West, A. Aramburu, and **A. Roncone**. CONTACT ANTICIPATION FOR PHYSICAL HUMAN–ROBOT INTERACTION WITH ROBOTIC MANIPULATORS USING ONBOARD PROXIMITY SENSORS. In: *IEEE/RSJ Int. Conf. on Intelligent Robots and Systems [IROS]*.

[**2021**] C. Paik, S. Aroca-Ouellette, **A. Roncone**, and K. Kann. THE WORLD OF AN OCTOPUS: HOW REPORTING BIAS INFLUENCES A LANGUAGE MODEL'S PERCEPTION OF COLOR. In: *Int. Conf. on Empirical Methods in Natural Language Processing [EMNLP]*.

[**2021**] K. Watanabe, M. Strong, M. West, K. Chaitanya, C. Escobedo, and **A. Roncone**. SELF-CONTAINED KINEMATIC CALIBRATION OF A NOVEL WHOLE–BODY ARTIFICIAL SKIN FOR COLLABORATIVE ROBOTICS. In: *IEEE/RSJ Int. Conf. on Intelligent Robots and Systems [IROS]*.

[**2020**] G. Ding, J. J. Koh, K. Merckaert, B. Vanderborght, M. M. Nicotra, C. Heckman, **A. Roncone**, and L. Chen. DISTRIBUTED REINFORCEMENT LEARNING FOR COOPERATIVE MULTI-ROBOT OBJECT MANIPULATION. In: *19th Int. Conf. on Autonomous Agents and Multiagent Systems [AAMAS]*.

[**2020**] J. J. Koh, G. Ding, C. Heckman, L. Chen, and **A. Roncone**. COOPERATIVE CONTROL OF MOBILE ROBOTS WITH STACKELBERG LEARNING. In: *2020 IEEE/RSJ Int. Conf. on Intelligent Robots and Systems [IROS]*.

[**2019**] F. Stramandinoli, **A. Roncone**, O. Mangin, F. Nori, and B. Scassellati. AN AFFORDANCE-BASED ACTION PLANNER FOR ON-LINE AND CONCURRENT HUMAN-ROBOT COLLABORATIVE ASSEMBLY. In: *2nd ICRA International Workshop on Computational Models of Affordance in Robotics*.

[**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. Nirenburg, M. McShane, S. Beale, P. Wood, B. Scassellati, O. Mangin, and **A. Roncone**. TOWARD HUMAN–LIKE ROBOT LEARNING. In: *International Conference on Applications of Natural Language to Information Systems*, pp. 73–82.

[**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**] **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**, 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*.

[**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]*.

[**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.