Alessandro Roncone, Ph.D.

ROBOTICIST · COMPUTER SCIENTIST · TEAM LEAD

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PERSONAL SUMMARY

My work lies at the intersection of *Human-Robot Interaction*, *Artificial Intelligence* and *Robot Control & Planning* with the goal of **developing robot technologies that enable close, natural, and extended cooperation with humans**. I aim at lowering the barriers to entry for humans to naturally interact with robots, and in doing so I design human-aware robot systems that are able to work with and around people. To me, the engineering is as important as the science: **I make robots work**, and I hold a deep commitment to doing so while implementing scalable, robust, and elegant systems.

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. I built my diverse team of 20+ graduate and undergraduate students coming from TOP INSTITUTIONS from scratch (MIT, Yale, UToronto, and more), and my yearly operation (which I fund through competitive research funding at national level) amounts to an average of $1M/YEAR.

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. I worked on systems that: i) provide effective support to the human when they need it the most; ii) learn complex hierarchical representations from single instructions; iii) proactively ask questions and provide contextual information to query and share internal states and intents.

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*; ii) *distributed motor control via whole-body awareness*. I also worked on optimization-based approaches to inverse kinematics and robot control: my *gaze stabilization and control* frameworkformally 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*).

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

M.sc. in NeuroEngineering (110/110 *Summa cum Laude*)   UNIVERSITY OF GENOA, IT **2008 – 2011**

B.sc. in Biomedical Engineering (110/110 *Summa cum Laude*)   UNIVERSITY OF GENOA, IT **2005 – 2008**

Scholarship INSTITUTE FOR ADVANCED STUDIES IN ICT [ISICT]   GENOA, IT **2005 – 2008**

SKILLS

TECHNICAL SKILLS

- **15+ YEARS' RESEARCH EXPERIENCE** in Human-Robot Interaction, Humanoid Robotics, and Artificial Intelligence. Published to multiple top venues in the field of robotics.
- **7+ YEARS' LEADERSHIP EXPERIENCE**. I currently lead an interdisciplinary group of Ph.D. and graduate students that perform state of the art work in robotics. Proven ability to manage multiple projects and supervise people while meeting challenging deadlines.
- Regularly taught undergraduate and graduate level courses on state of the art work in Reinforcement Learning, Robot Control, Physical Human-Robot Interaction, and more.
- Considerable background in *kinematics, optimization, robot control, decision making, planning under uncertainty, machine learning, tactile sensing, calibration, machine learning, computer vision, IMU processing, multisensory integration*.
- Mastery of C++. Extensive competence in YARP, ROS, Matlab/R, IPOPT, OpenCV, Bash, and others..
- Familiar with the implementation and maintenance of cross-platform software for Linux, Windows, macOS, and Android. Comfortable with versioning, continuous integration, debugging, unit testing.

SELECTION OF RESEARCH, TEACHING AND SERVICE

- **CO-DIRECTOR**, *Engineering Education and AI-Augmented Learning IRT*, one of six College-sponsored Interdisciplinary Research Themes. Our IRT is focused on developing a community and research capacity around a new science at the intersection of AI and education [**250K$**, 2y].
- **RESEARCH ADVISOR** and mentor of 10 Ph.D. students, 1 post-doc, 15+ master students and 15+ undergraduate students. Most of my students went on to top jobs in the country (Amazon, Google, Facebook, Microsoft, Zoox, and more), as well as top Ph.D. programs. Some won prestigious awards, such as the NSF GRFP.
- Graduated PhD students with direct supervisory role:
  - **GUOHUI DING**, Spring 2021, now at Facebook.
- Funding:
  - **CO-PI**, *The co-evolution of Human-AI Adaptation*, 2022 Army Research Laboratory (ARL) [**1.5M$**, 3y].

- ∘ **PI**, *Policy Learning for Optimal Teaming via TF-Conditioned Metalearning (PLOT-Meta)*, 2021 Army Research Laboratory (ARL) [**2M$**, 5y].
- ∘ **PI**, *Army STRONG – Strengthening Teamwork for Robust Operations in Novel Groups*, 2021 Army Research Laboratory [**100K$**, 1y].
- ∘ **PI**, *Towards equitable robot tutoring: an intersectional analysis of human-robot interaction in racially diverse classrooms*, IRT Seed Grant, [**15K$**, 1y].
- ∘ **CO-PI**, *AI Institute in Student-AI Teaming*, 2020 National Science Foundation [**20M$**, 5y].
- ∘ **PI**, *Programmable and reconfigurable soft robots for symbiotic soft/rigid robotic systems*, 2020 Research and Innovation Office Seed Grant [**50K$**, 1y].
- 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)

INTERPERSONAL, TEAMWORK AND SELF-MANAGEMENT SKILLS

- Solid *people skills*. Able to understand what motivates the people I am working with, to leverage their strengths and improve on their weaknesses. Mentored and trained technicians, Ph.D. students, and post-docs, adapting to various scientific levels and backgrounds.
- Strong *self motivation*. To me life is an unending journey toward self-improvement. I apply this philosophy to everything I do—from personal to professional development.
- Solid *organizational skills* with the ability to work under pressure, coordinate multiple projects, and supervise multiple people while meeting stringent deadlines.

COMMUNICATION SKILLS

- *Strong presentation and communication skills* thanks to experience in giving both technical and non-technical talks to small and big groups, tailoring to the audience. Presented my work at international robotics conferences, as well as several outreach events, ranging from exhibitions and fairs, to live TV shows and various interviews.
- Confident in *writing technical reports as well as scientific papers*. Authored and co-authored numerous international peer-reviewed scientific articles and journals. Experience with grant writing.
- Experienced in carrying out well *balanced reports and presentations*. Significant background in graphic design.

ADDITIONAL SKILLS

- 20+ years' daily usage of the Linux/UNIX OS, and active contributor of the Linux FOSS community.
- Experienced graphic artist and freelancer. Design is problem solving, no different from engineering: design skills are advantageous for many engineering-related situations. Developer of two well known iconsets (AwOken and FlatWoken), and a number of websites. Commissioned various design projects from a number of companies.
- Semi-professional *runner*; strong self-reliance and self-motivation, as well as ability to push until a project is done. Captain of a water polo team during high school: developed teamwork and communication skills.

- Languages: ITALIAN (native), ENGLISH (full professional proficiency), FRENCH (elementary proficiency).

SELECTED 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**] 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]*.

[**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**] **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.