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**, **2018**] and contextual [**2017**, **2018**] communication can advance human-robot interaction and manufacturing.

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. Finally, this representation is then exploited with a *sensory-based guidance of the motor actions* performed by the robot [**2015**]. That is, an avoidance and reaching controller capable of using any body part in order to either prevent collision with or come into contact with incoming objects.

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*.
- I implemented an SVM-based framework able to integrate visual and haptic information, read from the force/torque sensor of the **iCub** robot. The system proved successful in improving the vision-based detection of a set of objects by means of the haptic exploration of the same objects.

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*.
- I used SVMs to train a PUMA robotic arm how to be the goalkeeper in an air hockey game. The robot observed which of the previously experienced puck trajectories scored a point. Based on this, it learned how to prevent such scores by predicting the final outcome of a trajectory from its first 30ms. Its success rate was beyond 95%.

Student (with scholarship) INSTITUTE FOR ADVANCED STUDIES IN ICT [ISICT] GENOA, IT 2005 – 2008

- Successfully selected for scholarship, after thorough examination (only three positions available out of hundreds of candidates). Attended a number of supplementary courses (e.g. *Marketing*, *Management*, *Effective Communication*, and more).

RELEVANT EXPERIENCE

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

- I develop *transparent* robotic applications, that aim at fundamentally changing the interaction between humans and robots. I implement intuitive, human-centered technologies where robots transition from being recipients of human instructions to becoming proficient and proactive collaborators. My work revolves around the idea that shared knowledge and transparent commitment to the task are central for collaborative behaviors [**2017**]. 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 [**2018**]; 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) *better, richer body representations* (in collaboration with CITEC in Bielefeld, DE) [**2014**, **2015**]; ii) *distributed motor control via whole-body awareness* (partially collaborating with WYSIWYD project partners) [**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. I also contributed to an HRI project aimed at developing natural *non-verbal behaviors* in the **iCub** humanoid robot during verbal communication [**2016**].

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. See the **EDUCATION** section for details.

PUBLICATIONS

[**2018**] J. N. Brawer, **A. Roncone**, O. Mangin, and B. Scassellati. **SITUATED HUMAN-ROBOT COLLABORATION: PROVIDING SUPPORTIVE BEHAVIORS FROM GROUNDED NATURAL LANGUAGE**. In preparation.

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

[**2018**] O. Mangin, **A. Roncone**, and B. Scassellati. **HOW TO BE HELPFUL? IMPLEMENTING SUPPORTIVE BEHAVIORS FOR HUMAN-ROBOT COLLABORATION**. Under review. eprint: 1710.11194.

[**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]*.

[**2017**] S. Zeylikman, S. Widder, **A. Roncone**, O. Mangin, and B. Scassellati. **THE HRC MODEL SET FOR HUMAN-ROBOT COLLABORATION RESEARCH**. In: *ArXiv e-prints*. Under review. eprint: 1710.11211.

[**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.

MISC

- **SUPERVISED** a total of 19 graduate and undergraduate students during my post-doc at Yale University.
- **EXTERNAL PH.D. REVIEWER** for *Raúl Pérula–Martínez*, graduated from the Robotics Lab in Universidad Carlos III de Madrid.

- **INVITED TALKS**:
  - *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 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.
- **REVIEWER** for the following conferences and journals: *IEEE Transactions on Robotics* (**T-RO**, 2018), *IEEE International Conference on Robotics and Automation* (**ICRA**, 2018, 2017, 2016), *IEEE/RSJ International Conference on Intelligent Robots and Systems* (**IROS**, 2017, 2016, 2015), *ACM International Conference on Human–Robot Interaction* (**HRI**, 2018), *International Conference on Artificial Intelligence* (**AAAI**, 2018), *Robotics and Automation Letters* (**RA-L**, 2018), *Robotics: Science and Systems* (**RSS**, 2016), *Frontiers in Robotics and AI* (2017), *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* (**RO-MAN** 2014), *IEEE International Conference on Robotics and Biomimetics* (**ROBIO**, 2013).

SKILLS

TECHNICAL SKILLS

- Extensive background in **HUMAN-ROBOT INTERACTION**, **HUMANOID ROBOTICS**, and **COGNITIVE ROBOTICS**.
- **5+ years'** research experience in the development of one of the most advanced robotic platforms out there, i.e. the **iCub**, a state-of-the-art, 53-DoF humanoid robot with a variety of sensors on board (camera, force sensors, tactile sensors). **2+ years'** experience with the **Baxter Research Robot**. My open-source code is available **HERE**, **HERE** and **HERE**.
- Considerable background in *kinematics, optimization, robot control, decision making, planning under uncertainty, tactile sensing, calibration, machine learning, computer vision, IMU processing, multisensory integration*.
- Mastery of **C++**. Extensive competence in **YARP, ROS, MATLAB/R, IPOPT, OPENCV, BASH, HTML5, CSS, JAVA/ANDROID**.
- Familiar with the implementation and maintenance of cross-platform software for Linux, Windows, macOS via **CMAKE**. Comfortable with versioning (**CVS**, **SVN**, **GIT**), continuous integration (**TRAVIS**), debugging (**GDB**), unit testing (**GTEST**).

COMMUNICATION SKILLS

- *Strong presentation and communication skills* thanks to experience in giving both technical and non-technical talks to both small and big groups, tailoring to the audience. Presented to major 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 research grant writing.
- Experienced in carrying out well *balanced reports and presentations* thanks to significant background in graphic design.

TEAMWORK AND SELF-MANAGEMENT SKILLS

- Demonstrated ability to *manage multiple projects* and *supervise multiple people* while meeting challenging deadlines.
- Mentored and trained technicians, Ph.D. students, and post-docs, adapting to various scientific levels and backgrounds.
- Solid *people skills*. Able to understand what motivates the people I am working with, to leverage their strengths and improve on their weaknesses. Able to value input from others even if it comes from people who are reporting to me.
- Strong *self motivation*. To me life is an unending journey to self-improvement. I apply this philosophy to everything I do.
- Enthusiastic about Robotics and AI. Capable of carrying out clean, scalable projects and making things—really—work.
- Solid *organizational skills* with the ability to work under pressure, coordinate multiple projects and meet stringent deadlines.

ADDITIONAL SKILLS

- Long-time **LINUX** user with 12+ 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 with various design projects from a number of companies.
- Semi-professional *runner*: strengthened self-reliance and self-motivation, as well as ability to push until a project is done. Captain of a local water polo team during high school: developed teamwork and communication skills.
- Languages: **ITALIAN** (native proficiency), **ENGLISH** (full professional proficiency), **FRENCH** (elementary proficiency).