Alessandro **Roncone, Ph.D.**

ROBOTICS RESEARCHER · COMPUTER SCIENTIST · INTERACTION DESIGNER

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PERSONAL SUMMARY

The central motivating theme of my research is endowing robots with enough communication, perception and control capabilities in order for them to proficiently interact with humans in practical, near future applications. I develop technologies that equip robots with the skills to partner with humans in their daily activities, with the aim of eventually replacing them in dangerous, repetitive or burdensome tasks. I explicitly focus on shaping the research landscape in perception, control and human-robot interaction with the goal of developing technologies that enable close, natural, and extended cooperation with humans.

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**], and iii) investigating how non-verbal [**2016**] and contextual [**2017**] communication can advance human-robot interaction and intelligent 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 **SVM**s 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 am focusing on the development of bidirectional, natural communication between the robot and the human in the context of human-robot collaborative tasks. I am generally working on the implementation of intuitive interactions, in order for them to be more efficient and effective, as well as less demanding for the human partner [**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**].
- Furthermore, I extended the *gaze stabilization* framework developed during my Ph.D. [**2014**] by integrating it with the existing iCub gaze controller [**2016**]. I was also contributing to an HRI project aimed at developing *natural interactions* between the iCub humanoid robot and humans during verbal communication [**2016**].

Robotics Engineer ICUB FACILITY, 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 above for details on my Ph.D. project.

PUBLICATIONS

[**2018**] J. N. Brawer, **A. Roncone**, O. Mangin, and B. Scassellati. **IMPROVING NATURAL LANGUAGE PROCESSING WITH CONTEXTUAL INFORMATION IN HUMAN ROBOT COLLABORATION**. In: In preparation.

[**2018**] **A. Roncone**, M. Hoffmann, B. Gardner, U. Pattacini, B. Scassellati, and G. Metta. **A REACTIVE CONTROLLER FOR COLLISION AVOIDANCE**. In: In preparation.

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

[**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

- Member of the **PROGRAM COMMITTEE FOR AAAI '18**, the thirty-second International Conference on Artificial Intelligence.
- **INVITED KEYNOTE SPEAKER** at the Synthetic Method in Social Robotics workshop, held at the *2016 International Conference on Social Robotics (ICSR '16)*. My talk dealt with the topic of Artificial Sociality in Human-Robot Collaboration.
- **GUEST LECTURER** at the *Intelligent Robotics Course* in Yale University (2015 and 2016). I introduced students to the research performed at the Italian Institute of Technology with a talk titled "*iCub - a shared platform for research in Robotics and AI*".
- **TEACHING ASSISTANT** at the *2015 CBMM Summer School*, organized by a number of MIT lab groups and affiliates. I focused on tutoring students during their projects with the iCub. A notable achievement has been the integration of Google Glass onto the YARP framework, that has been later used in order 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 International Conference on Robotics and Automation* (**ICRA**, 2017, 2016)
  - *IEEE/RSJ International Conference on Intelligent Robots and Systems* (**IROS**, 2017, 2016, 2015)
  - *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 International Symposium on Robot and Human Interactive Communication* (**ROMAN** 2014)
  - *IEEE International Conference on Robotics and Biomimetics* (**ROBIO**, 2016, 2013)
- **EXTERNAL REVIEWER** for the Ph.D. thesis of *Raúl Pérula–Martínez*, graduated from the **ROBOTICS LAB** in Universidad Carlos III de Madrid in 2017.

SKILLS

TECHNICAL SKILLS

- Extensive background in **HUMANOID ROBOTICS**, **COGNITIVE ROBOTICS**, and **HUMAN-ROBOT INTERACTION**.
- **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**.
- Main focus on machine perception and intelligent systems. Considerable background in **KINEMATICS, OPTIMIZATION, ROBOT CONTROL, DECISION MAKING, PLANNING UNDER UNCERTAINTY, CALIBRATION, TACTILE SENSING, MACHINE LEARNING, 2D AND 3D 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. Some experience with research grant writing.
- Experienced in carrying out well *balanced reports and presentations* thanks to significant background in graphic design.

PERSONAL AND SELF-MANAGEMENT SKILLS

- Strongly *self motivated*, i.e. able to be not only motivated by external rewards, but by an inner drive to accomplish and perform (at any level). This competence has been useful also in other fields, e.g. sport.
- Fast and avid *learner*, enthusiastic about technologically challenging projects in the **ROBOTICS** and **AI** fields.
- Able to look at problems and solve them in the most logical way possible. Capable of carrying out well-executed engineering projects with an eye to clean, scalable code and making things—really—work.

INTERPERSONAL AND TEAMWORK 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.
- Able to *delegate*, and to *value input from others* even if it comes from people who are reporting to me. Able to understand what motivates the people I am working with, and to leverage on their strengths and weaknesses in order to optimally distribute the amount of work a complex project is composed of.

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).