

# Tommaso Proietti

## Postdoctoral Research Fellow

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## Experience

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### Postdoctoral Research Fellow

**Jun 2019 - present**

Harvard University

Cambridge, MA, USA

📍 *Harvard John A. Paulson SEAS and the Wyss Institute for Biologically Inspired Engineering*

- Development and evaluation of inflatable soft wearable robots for stroke individuals assistance.
- Main responsibilities:
  - \* Lead research project and interdisciplinary team (Ph.D. students in Mechanical Engineers, Occupational Therapists, Functional Apparel Designers, Staff Engineers).
  - \* Responsible for SW-side of the project: sensor estimation, control strategies, virtual interfaces.
  - \* Define and run testing protocols. Process data. Redact manuscripts.
- PI: Prof. Conor J. Walsh

### Control System Engineer

**Apr 2017 - Apr 2019**

General Motors

Turin, Italy

📍 *GM Global Propulsion Systems*

- Control function development and algorithm design for GM diesel engines sector.
- Main responsibilities:
  - \* Define system requirements and software architecture by taking into account legislation, standard, and quality.
  - \* Develop system Failure Mode and Effect Analysis (FMEA).
  - \* Contribute to definition of calibration methodologies.
  - \* Communicate with hardware and advanced tech. communities to develop production-oriented technology.
  - \* Assist in troubleshooting subsystem integration, testing and validation (dyno, in-vehicle, roller bench).
- Certification: GM Design For Six-Sigma - Green Belt

### Ph.D. in Robotics Engineering

**Jan 2014 - Mar 2017**

Université Pierre et Marie Curie

Paris, France

📍 *ISIR - Institut des Systèmes Intelligents et de Robotique*

- Ph.D. main purpose: study the possibility to optimize relearning of motor coordination during post-stroke neurorehabilitation by using a 4-DOF upper-limb robotic exoskeleton.
- Main responsibilities:
  - \* Study and control the physical Human-Robot Interaction (pHRI), with a specific focus on the human upper-limb motor control (adaptation, learning, after-effects).
  - \* Model, develop, code, and test innovative control strategies for exoskeletons on a Linux-based RTOS.
  - \* Define testing protocols and experimental setup. Collect human motion data through encoders, sEMG, and MOCAP. Data processing (filtering, data fusion, statistics, visualization).
  - \* Manuscripts redaction and publication.
- PI: Prof. Agnes Roby-Brami

### Visiting Pre-Doctoral Fellow

**Oct 2012 - Oct 2013**

Northwestern University

Evanston, IL, USA

📍 *NxR - Neuroscience and Robotics Laboratory, McCormick School of Engineering*

- Field of research: nonprehensile manipulation and hybrid dynamic systems.
- Main responsibilities:
  - \* Modelization of a planar robotic manipulator and dynamic contact modes.
  - \* Development of control strategies for nonprehensile manipulation.
  - \* Simulation of hybrid sample-based planning algorithms.
- PI: Prof. Kevin M. Lynch

## Internship

**Jul 2010 - Oct 2010**

Sapienza University of Rome

*Rome, Italy*

📍 *DIAG - Dipartimento di Ingegneria Informatica, Automatica e Gestionale Antonio Ruberti*

- Main field of research: hybrid automata and embedded systems.
- Partnership within Artemis "pShield" FP7 European Project.
- PI: Prof. Francesco Delli Priscoli

## Scientific Tour Guide

**Mar 2007, 2008, 2009**

Rome Mathematics Festival

*Rome, Italy*

📍 *Fondazione "Musica per Roma" - Auditorium Parco della Musica*

- Tour guide during three consecutive *Festival della Matematica* initiatives.
- Show and explain math-related pieces of art to festival visitors.

## Education

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### Ph.D. in Robotics Engineering

**Jan 2014 - Mar 2017**

*Université Pierre et Marie Curie*

*Paris, France*

- Thesis: *Characterizing the reciprocal adaptation in physical Human-Robot Interaction to address the inter-joint coordination in neurorehabilitation*
- Supervisors: A. Roby-Brami, N. Jarrassé

### MS in Control Engineering

**Nov 2010 - Oct 2013**

*Sapienza University of Rome*

*Rome, Italy*

- Final score: 110/110 magna cum laude
- Thesis: *Hybrid Dynamic Nonprehensile Manipulation: Application to a 3-DOF Robot*
- Supervisors: G. Oriolo (Sapienza University of Rome), K. Lynch (Northwestern University)

### BS in Automated Systems Engineering

**Sep 2007 - Oct 2010**

*Sapienza University of Rome*

*Rome, Italy*

- Final score: 107/110
- Thesis: *Modeling and Controlling Composability Property in Embedded Systems by applying Hybrid Automata Theory*
- Supervisors: F. Delli Priscoli, A. Fiaschetti

### High School Diploma

**Sep 2002 - Jul 2007**

*G. B. Morgagni Scientific High School*

*Rome, Italy*

- Final score: 100/100
- P.N.I. - Piano Nazionale di Informatica (Computer Science National Diploma)

## Personal Skills

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### 🗨 Languages

**Italian:** Mother Tongue | **English:** Fluent - C2 | **French:** Proficient - B2/C1

## </> Computer skills



**Programming:** Matlab/Simulink, C, C++, Python, Java, HTML, CSS, PHP, MySQL

**Software:** Solidworks, ROS, INCA, Git, LaTeX

**OSs:** Linux, Windows

## Publications

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 Google Scholar: 7 publications, 275 total citations, H-index: 4.  Orcid: 0000-0002-8875-8646.

### Journal Papers

- [J1] Jarrassé N., **Proietti T.**, Crocher V., Robertson J., Sahbani A., Morel G. and Roby-Brami A. (2014) “*Robotic exoskeletons: a perspective for the rehabilitation of arm coordination in stroke patients*”, *Frontiers in Human Neuroscience*, vol. 8:947, pp. 1-10.
- [J2] **Proietti T.**, Crocher V., Roby-Brami A., and Jarrassé N. (2016) “*Upper-limb robotic exoskeletons for neurorehabilitation: a review on control strategies*”, *IEEE Reviews in Biomedical Engineering*, vol. 9, pp. 4-14.
- [J3] **Proietti T.**, Guigon E., Roby-Brami A., and Jarrassé N. (2017) “*Modifying upper-limb inter-joint coordination in healthy subjects by training with a robotic exoskeleton*”, *Journal of NeuroEngineering and Rehabilitation (JNER)*, vol. 14, pp. 55.
- [J4] O'Neill C.\*, **Proietti T.\***, Nuckols K., Clarke M., Hohimer C., Cloutier A., Lin D., Walsh C. (2020) “*Inflatable soft wearable robot for reducing therapist fatigue during upper extremity rehabilitation in severe stroke*”, *IEEE Robotics and Automation Letters (RA-L)*, vol. 5:3, pp. 3899 - 3906. \*Authors equal contribution.

### Conference Papers

- [C1] **Proietti T.**, Jarrassé N., Roby-Brami A., and Morel G. (2015) “*Adaptive control of a robotic exoskeleton for neurorehabilitation*”, 7th International IEEE/EMBS Conference on Neural Engineering (NER15, Montpellier, France), pp. 803-806.
- [C2] **Proietti T.**, Roby-Brami A., Jarrassé N. (2016) “*Learning motor coordination under resistive viscous force fields at the joint level with an upper-limb robotic exoskeleton*”, 3rd International Conference on NeuroRehabilitation (ICNR16, Segovia, Spain), in *Converging Clinical and Engineering Research on Neurorehabilitation II*, pp. 1175-1179, Springer International Publishing.
- [C3] **Proietti T.**, Roby-Brami A., and Jarrassé N. (2017) “*Comparison of different error signals driving the adaptation in assist-as-needed controllers for neurorehabilitation with an upper-limb robotic exoskeleton*”, *IEEE International Conference on Robotics and Automation (ICRA17, Singapore)*, pp. 6645-6650.

## Teaching & Mentoring

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### Undergraduate Students Mentoring *Harvard University*

2019/2020

*Course:* Robotics Projects (BS in Mechanical Engineering)

*Responsibilities:* Helped in developing research projects, supervised and assisted graduate students during their summer/winter projects in the lab.

*Number of mentored students:* 2.

### Teaching Assistant *Université Pierre et Marie Curie*

2015

*Course:* Mobile Robotics (MS in Robotics Engineering)

*Responsibilities:* Prepared, supervised, and assisted 15-ish graduate students in weekly 6-hour lab course. Assistance to final project evaluation.

## Honors & Awards

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**IEEE Engineering in Medicine and Biology Prize Paper Award** - 3rd place with [J2] paper.

2019