Tommaso Proietti
Postdoctoral Research Fellow

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Experience

Postdoctoral Research Fellow
Jun 2019 - present

Harvard University
Cambridge, MA, USA

📍 *Harvard John A. Paulson School of Engineering and Applied Science*
- ○ Main research topic: development and evaluation of inflatable soft wearable robots for upper-limb assistance.
- ○ Affiliated with the Wyss Institute for Biologically Inspired Engineering.
- ○ Main responsibilities:
  - ∗ Lead research project and coordinate interdisciplinary team (Ph.D. students, occupational therapists, functional apparel designers, staff engineers, visiting team members, undergrads).
  - ∗ First-hand development of the software of the project: sensor estimation, control strategies, virtual interfaces, data logging and processing in real-time.
  - ∗ Assistance in hardware development.
  - ∗ Define and run testing protocols. Process data. Redact manuscripts.
- ○ PI: Prof. Conor J. Walsh - Lab: Harvard Biodesign Lab

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).

Ph.D. in Robotics Engineering
Jan 2014 - Mar 2017

Université Pierre et Marie Curie
Paris, France

📍 *ISIR - Institut des Systèm Intelligents et de Robotique*
- ○ Main research topic: studying the possibility to induce relearning of motor coordination after a stroke by using an 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

📍 *McCormick School of Engineering*

- ○ Main research topic: planning and control of a nonprehensile manipulator through hybrid dynamic modelling.
- ○ Main responsibilities:
    - ∗ Modelization of a planar robotic manipulator and dynamic contact modes with an object.
    - ∗ Development of control strategies for nonprehensile manipulation.
    - ∗ Simulation of hybrid sample-based planning algorithms.
- ○ PI: Prof. Kevin M. Lynch - Lab: NxR - Neuroscience and Robotics Laboratory

Education

Ph.D. in Robotics Engineering
Université Pierre et Marie Curie

Jan 2014 - Mar 2017
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
Sapienza University of Rome

Nov 2010 - Oct 2013
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
Sapienza University of Rome

Sep 2007 - Oct 2010
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

Publications

▤ Google Scholar: 8 publications (+3 under review), 293 total citations, H-index: 4.　　👤 Orcid: 0000-0002-8875-8646.

Journal Papers

7. **Proietti T.***, O'Neill C.*, Hohimer C., Nuckols K., Clarke M., Zhou Y.M., Lin D., Walsh C. (2021) Sensing and control of a multi-joint soft wearable robot for upper-limb assistance and rehabilitation, *IEEE Robotics and Automation Letters* (under review). *Authors equal contribution.
6. Zhou Y.M., Hohimer C., **Proietti T.**, O'Neill C., Walsh C. (2021) Kinematics-based control of an inflatable soft wearable robot for assisting the shoulder of industrial workers, *IEEE Robotics and Automation Letters* (under review).
5. Chu X., Lo C.H., **Proietti T.**, Walsh C., Fukuda T., Au S. (2021) Opposite treatment on null space: avoiding null space towards unified and robust feedback stabilization control of underactuated robotic systems, *International Journal of Robotics Research* (under review).
4. 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*, vol. 5:3, pp. 3899 - 3906. *Authors equal contribution.
3. **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*, vol. 14. pp. 55.
2. **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.
1. 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.

Conference Papers

4. **Proietti T.**, Parry R., Lejeune F., Roby-Brami A., and Jarrassé N. (2018) Adaptation of upper limb movement using exoskeleton-based training and transfer of cinematic patterns to unconstrained movement: A preliminary study, *Annals of Physical and Rehabilitation Medicine*, vol. 61, pp 488, 12th World Congress of the International Society of Physical and Rehabilitation Medicine (Paris, France).

3. **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.

2. **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.

1. **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.

Teaching & Mentoring

Guest Lecturer *Harvard University*   **2020**

Course: Physiological Foundations for Bioengineering (BS in Biomedical Engineering)

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

IEEE Engineering in Medicine and Biology Prize Paper Award - 3rd place with [J2] paper.   **2019**

Personal Skills

✆ 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

✹ Certifications

2019 - General Motors Design For Six-Sigma - Green Belt
2014 - "European Computational Motor Control" Summer School - Université de Montpellier 1