

PERSONAL INFORMATION

Name: **CHIARA LIVOLSI**

WORK ACTIVITY

July 2024 – Ongoing	Researcher at IRCCS ISMETT - UPMC (Mediterranean Institute for Transplantation and Advanced Specialized Therapies)
Apr 2022 – June 2024	Postdoctoral Research assistant at Wearable Robotics Laboratory of The BioRobotics Institute of Sant’Anna School of Advanced Studies (Pisa) 09/G2 Bioengineering, scientific disciplinary sector ING-IND/34
Main activities	Design, development and experimental validation of lower-limb exoskeletons and robotic prostheses for human rehabilitation, assistance o augmentation of human motor functions. <ul style="list-style-type: none">- Developing innovative approaches for controlling software systems and analysing data in research projects- Designing clinical research investigational protocols- Coordinating and managing research activities- Writing scientific papers and project documentation.- Mentoring students
	PROFESSIONAL AFFILIATIONS <ul style="list-style-type: none">• The BioRobotics Institute, Scuola Superiore Sant’Anna, Pontedera, Pisa, Italy. Wearable Robotics Lab• Department of Excellence in Robotics & AI, Scuola Superiore Sant’Anna, Pisa, Italy.
March 2023 – December 2023 Sept 2022 – Dec 2022	Scientific investigation advisor - Research & Development at IUVO S.r.l. IUVO S.R.L., Pontedera, Pisa, Italy. www.iuvo.company via Puglie,9 temporary contracts
Main activities	Scientific and technical support to R&D IUVO team for activities of a multicentric clinical trial ITA-USA Designing clinical protocol, writing clinical documentation for ethics committee approval, developing electronic case report forms, providing

	<p>remote and onsite support to clinicians, conducting data and statistical analysis.</p> <p>The clinical study aims at assessing the performance of gait training using a hip exoskeleton in individuals with acquired brain injury.</p> <p>The clinical study is ongoing in US at the Jefferson Moss-Magee Rehabilitation - Einstein Hospital (Philadelphia, US) and in Italy at Villa Beretta, Costa Masnaga, Lecco (IT).</p> <p>June 2023 Monitoring visit at <i>Jefferson Moss-Magee Rehabilitation - Einstein Hospital (Philadelphia, US)</i> -Verify the application of the experimental procedures, review documentation, and provide training for specific features of the device.</p> <p>September 2022 Training course for clinicians and physical therapists to use a lower-limb exoskeleton at <i>Jefferson Moss-Magee Rehabilitation - Einstein Hospital (Philadelphia, US)</i></p>
Oct 2018 – July 2022	PhD in BioRobotics at Wearable Robotics Laboratory of The BioRobotics Institute of Sant’Anna School of Advanced Studies (Pisa) – PhD funded by IUVO S.r.l.
PhD thesis title:	<i>Design and clinical testing of new control strategies for a hip exoskeleton for individuals with moderate gait impairments.</i>
Main activities	<p><u>100/100 cum laude</u></p> <p>Design, development, and clinical validation of adaptive control human-robot interfaces for portable exoskeletons to assist locomotion tasks in individuals with mild-to-moderate gait impairments.</p> <ul style="list-style-type: none"> • Analysis state-of-the-art of full and partial lower-limb exoskeletons for gait assistance • Design and development of multi-layered control architectures running on real-time targets with FPGA processors. <ul style="list-style-type: none"> - Development of software methods for controlling the exoskeleton and ensure good dynamic human-robot interaction and synchronization. - Development of software methods for the automatic real-time recognition of locomotion activities based on machine learning approaches. • Experimental testing of exoskeleton performance during locomotion activities in impaired and unimpaired individuals • Design of clinical investigational protocols • Design of detailed procedures, case report forms and electronic data capture systems. • Writing of clinical documentation for approval of ethical committee and Ministry of Health.

	<ul style="list-style-type: none"> • Develop software routines for automatic data analysis and representation. • Writing technical documentation related to lower-limb exoskeleton, such as technical files, user guides, software validation, risk analysis documents. • Management of certification processes and regulatory approvals from ethical committees and Ministry of Health for conducting clinical trials.
Clinical research activity	
July 2020-May 2022	<ul style="list-style-type: none"> - Clinical study to verify performance of gait segmentation control algorithms and assess the impact of hip exoskeleton-assisted training on gait determinants in individuals with <i>neurological disorders</i>. <i>IRCCS Fondazione Don Carlo Gnocchi, Firenze, Italy</i>
May 2021-May 2022	<ul style="list-style-type: none"> - Clinical study to verify performance of locomotion recognition control algorithms and assess the effects of hip assistance on the gait efficiency of individuals with <i>above-knee amputation</i>. <i>IRCCS Fondazione Don Carlo Gnocchi, Firenze, Italy</i> - Clinical study to verify safety and usability of a knee exoskeleton in a clinical setting to improve gait biomechanics in individuals with <i>neurological disorders</i>. <i>IRCCS Fondazione Don Carlo Gnocchi, Firenze, Italy</i>
Courses	Statistics and data analysis, Machine learning, Creative Design, How to publish in international Science Journals, Functional Biomechanics of the Musculoskeletal System, Rehabilitation Robotics, Rehabilitation engineering, Bipedal locomotion, Intro to Biorobotics, English for Scientific Communication.
May 2018- Sept 2018	Bionic engineer - Research & Development, IUVO S.r.l., via Puglie,9 Pontedera (PI)
Main activities	Experimental activities, performance analysis, data analysis, benchmarking, and clinical verification of a portable hip exoskeleton.
Clinical research Jan-May 2018	Clinical study to assess the feasibility of using a hip exoskeleton as a gait trainer with individuals exhibiting mild-to-moderate gait impairments due to <i>acquired brain injury</i> . <i>Villa Beretta Rehabilitation Center, Valduce Hospital Como, Italy</i>
EDUCATION AND TRAINING	
Sep 2015-May 2018	Master of Science in Bionics Engineering - University of Pisa and Sant'Anna School of Advanced Studies (Pisa). [link]
Curriculum Biorobotics	Statistical signal processing, biological data mining, neural and fuzzy computation, behavioral and cognitive neuroscience, computational neuroscience, biomechanics of human motion, soft and smart materials, instrumentation and measurements for bionic systems, artificial limbs,

<p>Team projects:</p>	<p>robot companions for assisted living, human and animal models in biorbotics, robotics for minimally invasive therapy, robotic exoskeletons, micro/nano robotics and biomaterials, cloud robotics.</p> <p><u>110/110 cum laude</u></p> <ul style="list-style-type: none"> • Human activity classification using Artificial Neural Networks and Fuzzy Inference Systems • Design of a multigrasp hand sequential controller • Development of an Innovative Retina-inspired approach for a monocular camera-based braking system • Human Activity Recognition using wearable wireless sensors and Recurrent Neural Networks • A comparative study on Human Activity Recognition Using Data from Smartphones • SERRPA: Sky and Earth Robotic Rescue, Planning and Assistance • Silencing Gene nanoparticles and Focused Ultrasound for brain targeted delivery
<p>June 2017 - April 2018</p> <p>Clinical research</p> <p>Thesis title:</p>	<p>Internship in IUVO Srl</p> <p>Functional and technical performances analysis of a hip exoskeleton at MARE lab, SSSA/Fondazione Don Gnocchi, Firenze.</p> <p>Clinical validation of a robotic rehabilitation platform with post-stroke subjects, both chronic and subacute.</p> <p><i>Villa Beretta Rehabilitation Center, Valduce Hospital Como, Italy</i></p> <p><i>Towards wearable robotic products: analysis of the state of the market and development of a novel gait segmentation method for a portable hip exoskeleton.</i></p>
<p>Sep 2014 - Sep 2015</p> <p>Main subjects:</p>	<p>1st-year of Master of Science in Biomedical Engineering - University of Pisa</p> <p>Mechanics applied to the musculoskeletal system, Biomedical electronics I, Laboratory of electromedical devices, Analysis and models of biomedical signals, Bioengineering of radiation, Modelling and identification of physiological systems.</p>
<p>Sep 2011 – Dec 2014</p> <p>Team project:</p> <p>Thesis title</p>	<p>Bachelor’s degree in biomedical engineering - University of Pisa</p> <p><u>110/110 cum laude</u></p> <p>Deep Brain Stimulation for Treatment-Resistant Depression and bioethics essay.</p> <p><i>Neural interfaces for control of upper limb prostheses: State-of-the-art.</i></p>
<p>Sep 2006 – Jul 2011</p>	<p>Scientific High School Diploma – Liceo Scientifico “Luigi Failla Tedaldi”</p> <p><u>100/100 cum laude</u></p>

AWARD

Oct 2022	Finalist ITWIIN AWARD 2022 – XIV Edizione - <i>Associazione Italiana Donne Inventrici e Innovatrici.</i>
Sept 2014	Graduation prize for graduate students with honours. - University of Pisa.
Sept 2011	Award of excellence (<i>Memorial scholarship “Mimi Cancila”</i>), a prize awarded to the most outstanding student at the school in mathematics and in physics. (High school)
May 2010	Member of the winning team of the regional Mathematical Olympiad in Sicily. Selected student for the Italian Mathematical Olympiad in Cesenatico (FC). -High school

PERSONAL DESCRIPTION

Good theoretical background, fast learner and able to work hard to respect projects' deadlines.

TECHNICAL SKILLS AND COMPETENCES

Technical data skills	Data analysis, visualization, wrangling and modeling. Statistics Programming Debugging Data mining Machine learning Regression
Data tools and languages	Strong expertise in programming in MATLAB and LabView Real-time and FPGA environments. SMART-TRIAL Clinical Data Tool, REDCap, Python, R, Weka, SPSS Statistics, GPower 3.1, C++, HTML, CSS, Java Script, ANSYS, COMSOL Multiphysics, ROS and Gazebo, Unity, Mathcad, Code Visual/Composer Studio, OpenSim, Inkscape, Arduino, LaTeX, BTS Motion capture, analyzer, MS Office.
Specific training courses	
Apr 2024	<ul style="list-style-type: none"> - <i>Boolean Data week Python, Tableau</i> - <i>Data Scientist con R – Diskover Academy</i>
March 2024	<ul style="list-style-type: none"> - <i>Boolean Coding week HTML, CSS, Java Script</i>
Oct 2023	<p>Training course on Medical Device Regulation (MDR 2017/745) – by Italian Ministry of Health</p> <ul style="list-style-type: none"> • <i>“The fundamental elements of a clinical investigation application: object, purpose and subjects involved according to the regulation of medical devices.”</i> • <i>“The evaluation of the clinical and technological aspects of a clinical investigation: regulatory references, document requirements and evaluation criteria.”</i> • <i>“The preparation and presentation of the documents for a clinical investigation application.”</i>

Mar-Apr 2022	Training course on programming electronic case report forms using SMART TRIAL software. <i>How to design a clinical data management setup for electronic data capture – SMART TRIAL Clinical Data Tool.</i>
Oct-Dec 2021	Training course on LabVIEW software programming. <i>Best practices for designing LabVIEW Real-Time and LabVIEW FPGA applications - National Instruments.</i>
Oct-Dec 2021	Seminars for programming in Pythons
May 2018	<i>PhD+2018: Research valorization, innovation, entrepreneurial mindset</i> <ul style="list-style-type: none"> • <i>“Designing business in an ever-changing context”</i> • <i>“Coaching activity: business plan”</i> • <i>“Exploring novelty”</i> • <i>“How to write a patent application- the task of the inventor and of the patent attorney since the beginning”</i> • <i>“How to sell anything in one minute”</i>
Mother Languages	Italian
Foreign Languages	English – C1 (reading, writing, listening, and speaking) (*) Common European Framework of Reference for Languages.
English courses:	
01 Oct- 23 Nov 2021	English for Scientific Communication, Sant’Anna School of Advanced Studies, Pisa <i>“Writing Scientific Articles in English”</i> <i>“Presenting research at International conferences”</i>
26 Aug- 02 Sep 2016	Intensive Course B2-2, EF International Language Centers, Dublin, Ireland
04-15-Sep 2006	English Course, Anglo-Continental, Bournemouth, England.

SOCIAL SKILLS AND COMPETENCES

- Good inclination for solving problems.
- Ease of teamwork.
- Flexibility and adaptability
- Active listener and empathy

ORGANIZATIONAL SKILLS AND COMPETENCES

Efficient day-to-day management. Proficient in independently organizing tasks, assuming responsibilities, and respecting deadlines and objectives.

SUMMER SCHOOL

06-10 Sept 2021	Summer School on Wearable Robotics - COST Action CA16116 – Isla de Valdecañas, Spain (Imperial College London, University of Twente, Institute “Jozef Stefan” Ljubljana) Team project: <i>Gaussian mixture models for human activity recognition</i>
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PARTICIPATION IN RESEARCH PROJECTS

I was involved in the following research projects:

National and international collaborative projects

- **Fit4MedRob: Fit for Medical Robotics**, PNRR Complementary Investments. Coordinating institution: Consiglio Nazionale delle Ricerche. Fit4MedRob started on December 1, 2022.
- **BIOVET-Bionics for Veterans - BILATERAL USA-ITALY RESEARCH COLLABORATION**
Advancing wounded soldier care through robotics project agreement (awsctr pa). BIOVET started on June 14, 2023
- **PRIN2022- Exoskeleton-assisted walking for prehabilitation and active aging**. PRIN: Progetti di Ricerca di Rilevante interesse nazionale-Next Generation EU. Prot. 202254EAA5. Coordinating institution: Scuola Superiore Sant’Anna. PRIN2022 started on November 2023
- **THE: Tuscany Health Ecosystem**. PNRR-Next Generation EU. THE started on December 1, 2022.
- **PR19-PAI-P2 MOTU++ Project: Protesi robotica di arto inferiore con smart socket ed interfaccia bidirezionale per amputati di arto inferiore**. Project promoted by INAIL. MOTU++ started on January 21, 2021
- **H2020-ICT CYBERLEGS Plus Plus Project**, *The CYBERnetic LowEr-Limb CoGnitive Ortho-prosthesis Plus Plus*, Call: H2020-ICT25. Grant Agreement N. 731931. Coordinating institution: Scuola Superiore Sant’Anna. CYBERLEGS Plus Plus started on January 1, 2017.

CONFERENCES PARTICIPATION

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| 20-22 Oct 2023 | • I-RIM 2023 (5th Italian Conference on Robotics and Intelligent Machines– Invited for a workshop “Relationship between lower-limb robotics rehabilitation and neuroplasticity” – Rome (Italy) |
| 15 June 2023 | • State of the Science Symposium – Wearable robotics: Enhancing performance, reducing injury and improving rehabilitation - Uniformed Services University for the Health Science – Bethesda (Maryland, US) |
| 23 -27 May 2022 | • IEEE ICRA (International Conference on Robotics and Automation) 2022 , Philadelphia (PA), USA – Invited for a talk “A novel wavelet-based gait segmentation method for a portable hip exoskeleton”. |
| 16-20 Oct 2018 | • ICNR (International Conference on Neurorehabilitation), WeRob (The International Symposium on Wearable Robotics) e INBOTS (Inclusive Robotics for a better society), Pisa – Invited for a workshop on IUVO S.r.l. |
| 12 Oct 2018 | • 4T: Tech Transfer Think Tank , Politecnico di Torino, Torino
Invited for a workshop on IUVO S.r.l. |
| 25-27 June 2018 | • Sixth National Congress of Bioengineering , Politecnico di Milano, Milan – Invited for a workshop on IUVO S.r.l. |
| Feb – Mar 2018 | • PhD+ 2018 - Research valorization, innovation, entrepreneurial mindset • Pisa University, Pisa - Participant as selected student |
| 27 Apr 2017 | • Frontiers, TEDx – Scuola Superiore Sant’Anna, Pisa - Participant as selected student |
| 8 Apr 2017 | • XII Congresso Nazionale SIRN - Società italiana di riabilitazione neurologica, Pisa. Participant as auditor. |

15-17 Dec 2016	<ul style="list-style-type: none"> • “Quale Tecnologia per Quale Riabilitazione” - Pediatric Hospital Bambino Gesù - Auditorium San Paolo, Roma. Participant as auditor.
23-26 Oct 2016	<ul style="list-style-type: none"> • Le tecnologie robotiche in riabilitazione. Italian Society of Physical and Rehabilitation Medicine - SIMFER 44° National Conference, Bari. Participant as auditor.
25-27 Sep 2015	<ul style="list-style-type: none"> • BIOlogos, The future of Life, TriesteNext – Salone europeo della ricerca scientifica, Trieste - Participant as selected student.

SCIENTIFIC PRODUCTION – PAPERS

C. Livolsi, R. Conti, F. Giovacchini, S. Crea and N. Vitiello “A novel wavelet-based gait segmentation method for a portable hip exoskeleton”, *IEEE Transactions on Robotics* 38.3 (2021): 1503-1517.

C. Livolsi, R. Conti, E. Guanziroli, P. Friðriksson, Á. Alexandersson, K. Kristjánsson, A. Esquenazi, R. Molino Lova, D. Romo, F. Giovacchini, S. Crea, F. Molteni, N. Vitiello, “An impairment-specific hip exoskeleton assistance for gait training in subjects with acquired brain injury: a feasibility study”, in *Neuroengineering and its clinical applications, Scientific Reports*, 2022.

A. Pergolini, **C. Livolsi**, E. Trigili, B. Chen, F. Giovacchini, A. Forner-Cordero, S. Crea, N. Vitiello “Real-time locomotion recognition algorithm for an active pelvis orthosis to assist lower-limb amputees” *IEEE Robotics and Automation Letters* 7.3 (2022): 7487-7494.

A. Mazzarini, I. Fagioli, H. Eken, **C. Livolsi**, T. Ciapetti, A. Maselli, M. Piazzini, C. Macchi, A. Davalli, E. Gruppioni, E. Trigili, S. Crea, N. Vitiello “Improving Walking Energy Efficiency in Transtibial Amputees Through the Integration of a Low-Power Actuator in an ESAR Foot” in *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, doi: 10.1109/TNSRE.2024.3379904.

E. Martini, C.B. Sanz-Morère, **C. Livolsi**, A. Pergolini, G. Arnetoli, S. Doronzio, A. Giffone, R. Conti, F. Giovacchini, P. Friðriksson, K. Lechler, S. Crea and N. Vitiello “Lower-limb amputees can reduce the energy cost of walking when assisted by an Active Pelvis Orthosis”, *2020 8th IEEE RAS/EMBS International Conference for Biomedical Robotics and Biomechatronics (BioRob)*. IEEE, 2020.

H. Laloyaux, **C. Livolsi**, A. Pergolini, S. Crea, N. Vitiello, R. Ronsse “Simplified Motor Primitives for Gait Symmetrization: Pilot Study with an Active Hip Orthosis” *2023 IEEE International Conference on Robotics and Automation (ICRA)*. IEEE, 2023.

H. Laloyaux, C. Sanz-Morère, **C. Livolsi**, A. Pergolini, S. Crea, N. Vitiello, R. Ronsse “Experimental Assessment of a Control Strategy for Locomotion Assistance Relying on Simplified Motor Primitives” *2022 IEEE/RIS International Conference on Intelligent Robots and Systems (IROS)*. IEEE, 2022.

H. Eken, A. Pergolini, A. Mazzarini, **C. Livolsi**, I. Fagioli, M. F. Penna, E. Gruppioni, E. Trigili, S. Crea, N. Vitiello “Continuous Phase Estimation in a Variety of Locomotion Modes Using Adaptive Dynamic Movement Primitives” *2023 International Conference on Rehabilitation Robotics (ICORR)*. IEEE, 2023.

C. Livolsi, A. Pergolini, F. Giovacchini, S. Crea and N. Vitiello “Enhancing walking performance with a bilateral hip exoskeleton assistance in individuals with above-knee amputation”, *IEEE TRANSACTIONS ON NEURAL SYSTEMS AND REHABILITATION ENGINEERING*, 2024

H. Eken, **C. Livolsi**, A. Pergolini, M. F. Penna, G. Hamoui, E. Gruppioni, E. Trigili, S. Crea, and N. Vitiello. “Continuous Gait Phase Estimation and Torque Profile Generation using adaptive Dynamic Movement Primitives for Able-Bodied Individuals and Stroke Survivors” accepted for *IEEE BioRob*, 2024.

I. Fagioli, A. Mazzarini, **C. Livolsi**, E. Trigili, S. Crea, N. Vitiello “Advancements and challenges in the development of robotic lower-limb prostheses: a systematic review” (accepted in *IEEE Transactions on Medical Robotics and Bionics*)

C. Livolsi, R. Conti, A. Pergolini, P. Friðriksson, R. Molino Lova, F. Giovacchini, S. Crea and N. Vitiello “Powered bilateral hip exoskeleton increases walking speed in chronic post-stroke individuals”, (under review in *Scientific Reports*).

A. Pergolini, **C. Livolsi**, C. Sanz-Morère, M. Tuzzo, E. Trigili, S. Crea, N. Vitiello “Knee exoskeleton-assistance improves mobility in subjects with chronic stroke: A feasibility study.” (under review in *IEEE Transactions on Robotics*).

PATENTS

C. Livolsi, R. Conti, F. Giovacchini, S. Crea and N. Vitiello “System and process for estimation of gait phase for use with a wearable robot” - [WO2022053934](#), March 17th, 2022.

R. Conti, S. Crea, F. Giovacchini, **C. Livolsi**, A. Parri, N. Vitiello, F. Molteni, E. Guanziroli “Wearable robot, system and method for correcting gait impairments” - [WO2022137031](#), June 30th, 2022.
