Roberto Meattini

Curriculum Vitae

January 9, 2024

Personal Information

Surname, First name	Meattini, Roberto
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Biographical Sketch

- Roberto Meattini was born in [redacted], on [redacted].
- In 2014, he got the Master's Degree in Automation Engineering at the University of Bologna, with final grade of 110/110 *cum laude*.
- In 2018, he got the PhD in Biomedical, Electrical and Systems Engineering (XXX Cycle), within the "Automatic Control and Operational Research" curriculum, at the Department of Electrical, Electronic and Information Engineering "Gugliemo Marconi" (DEI) of the University of Bologna, under the supervision of Prof. Claudio Melchiorri.
- From 2017 to 2018, he was Visiting Scientist at the Institute of Robotics and Mechatronics of the German Aerospace Center (DLR), Germany.
- From 2018 to 2023, he was Research Fellow (post-doc) at the Department of Electrical, Electronic and Information Engineering "Gugliemo Marconi" (DEI) of the University of Bologna.
- Since 2019, he is teacher of the academic course "*Engineering and Technologies of Control Systems*", for the MSc in Mechanical Engineering of the University of Bologna.
- From 2019 to 2023, he participated to the project REMODEL (Robotic technologies for the manipulation of complex deformable linear objects) coordinated by Prof. Gianluca Palli, funded by the European Commission under the H2020 program.
- Since 2022, he participates to the project IntelliMan (AI-Powered Manipulation System for Advanced Robotic Service, Manufacturing and Prosthetics) coordinated by Prof. Gianluca Palli, funded by the European Commission under the Horizon Europe program.
- Since 2022, he is teacher of the academic course "*Foundations of Industrial Robotics*", for the BSc in Automation Engineering of the University of Bologna.
- Since 2023, he is Junior Assistant Professor (RTD-A) at the Department of Electrical, Electronic and Information Engineering "Gugliemo Marconi" (DEI) of the University of Bologna.

- He is co-author of more than 30 scientific publications presented at conferences or published on international journals.
- His research interests are mainly related to: robotic manipulation and telemanipulation; human-robot interaction (HRI); electromyographic (EMG) interfaces for the control of robotic devices; multimodal control of wearable and grounded robots; assistive and prosthetic robotics; wearable sensors and machine learning for human intent estimation for robotic applications.

Education and Training

May 2018 **PhD** in Biomedical, Electrical and Systems Engineering at the University of Bologna. Thesis title: "*sEMG Based Human-Robot Interfaces for the Control of Artificial Hands and Wearable Devices*." Supervisor: Prof. Claudio Melchiorri.

2017 - 2018 **Visiting Scientist** at the DLR (German Aerospace Center), Institute of Robotics and Mechatronics, Germany, during the Ph.D. course for carrying out research activity on the myoelectric control of artificial hands. Supervisor: Prof. Claudio Castellini.

Jul. 2014 **Master's Degree** in Automation Engineering at the University of Bologna. Thesis title: "*Sviluppo di una Brain-Computer Interface per l'esecuzione di gesti con la mano robotica UB Hand*" (Development of a Brain-Computer Interface for the Execution of Gestures with the Robotic Hand UB Hand.) Supervisor: Prof. Claudio Melchiorri.

2013 - 2014 **Visiting Student** at the Centre for Robotics and Neural Systems (CRNS) of the University of Plymouth, UK, for carrying out the Master's Degree thesis work on the control of robotic hands using brain-computer interfaces. Supervisor: Prof. Tony Belpaeme.

Dec. 2011 **Bachelor's Degree** in Automation Engineering at the University of Bologna. Thesis title: "*Doubly-fed Induction Machine: analisi di una soluzione di controllo basata su correnti di rotore*" (Doubly-fed Induction Machine: Analysis of a Control Strategy Based on Rotor Currents.) Supervisor: Prof. Andrea Tilli.

2010 - 2011 **Erasmus Exchange Student** for one academic year at the Universitat Jaume I, Castellon de la Plana, Spain, during the third year of the Bachelor's Degree course in Automation Engineering at the University of Bologna.

Professional Employment

2023 - pres. **Junior Assistant Professor (RTD-A)** in Robotics and Automatic Control at the University of Bologna, Department of Electrical, Electronic and Information Engineering "Gugliemo Marconi" (DEI.)

2022 - 2023 **Adjunct Professor** of the academic course "28642 - *Foundations of Industrial Robotics* (Modulo 2)" at the University of Bologna, for the BSc in Automation Engineering.

2021 - pres. **Treasurer** of the Italy Section of the American Society of Mechanical Engineers (ASME) (member of the Italy Section Leadership Group.)

2019 - 2023 **Adjunct Professor** of the academic course "73126 - *Ingegneria e Tecnologie dei Sistemi di Controllo* LM (Modulo 2)" (*Engineering and Technologies of Control Systems*) at the University of Bologna, for the MSc in Mechanical Engineering.

2018 - 2023 **Research Fellow (post-doc)** in Robotics and Automatic Control at the University of Bologna, Department of Electrical, Electronic and Information Engineering "Gugliemo Marconi" (DEI.)

Research Projects

2024 - pres. **European project** "SUPER HUMAN" (*SUPport Exo to Relief HUman Muscoloskeletal fAtigue in maNufacturing*), EIT Manufacturing project co-funded by the European Commission.
- **Responsible person** for the University of Bologna reasearch unit.

2022 - pres. **PRIN** "Co-MiR" (*Extending Robotic Manipulation Capabilities by Cooperative Mobile and Flexible Multi-Robot Systems*), Progetti di Rilevante Interesse Nazionale (*Projects of Significant National Interest*), funded by MUR – Ministero dell'Università e della Ricerca (*Italian Ministry of University and Research*).
- **Member** of the University of Bologna reasearch unit.

2022 - pres. **European project** "IntelliMan" (*AI-Powered Manipulation System for Advanced Robotic Service, Manufacturing and Prosthetics*), HORIZON-CL4-2021-DIGITAL-EMERGING-01, GA no. 101070136.
- **Member** of the University of Bologna reasearch unit.
- **Task Leader** for the Work Package WP4 "*Adaptive Shared Autonomy*" – Task T4.1 "*Hierarchical Shared Autonomy Models For Adaptive Behaviours*"
- **Task Leader** for the Work Package WP4 "*Adaptive Shared Autonomy*" – Task T4.4 "*Algorithms For Autonomy Arbitration*."
- **Task Leader** for the Work Package WP1 – Task T1.4 "*Data Management*."
- **Responsible person** for the project's Data Management Plan.

2019 - 2023 **European project** "REMODEL" (*Robotic tEchnologies for the Manipulation of cOmplex DeformablE Linear objects*), DT-FOF-12-2019, GA no. 870133.
- **Member** of the University of Bologna reasearch unit.
- **Responsible person** for the University of Bologna research unit for the Work Package WP3 "*User and System Interface*" – Task T3.3 "*Teaching By Demonstration Of Skills For New Assembly References And Tasks*."
- **Task Leader** for the Work Package WP8 – Task T8.4 "*Data Management Plan (DMP)*."
- **Responsible person** for the project's Data Management Plan.

Teaching Activity

Holder (**teacher**) of a total of **8 academic course modules** corresponding to **24 CFU / ECTS** (**320 contract hours**.)
Holder (**teaching and students support activities**) of a total of **5 contracts of tutor of academic courses** corresponding to **24 CFU / ECTS** (**240 contract hours**.)

2023 - pres. **Academic course** "73126 - *Ingegneria e Tecnologie dei Sistemi di Controllo* LM (Modulo 2)" (*Engineering and Technologies of Control Systems*), MSc in Mechanical Engineering, University of Bologna. **3 CFU/ECTS**.

2023 - pres. **Academic course** "28642 - *Foundations of Industrial Robotics* (Module 2)", BSc in Automation Engineering, University of Bologna. **3 CFU/ECTS**.

2022 - 2023 **Academic course** "73126 - *Ingegneria e Tecnologie dei Sistemi di Controllo* LM (Modulo 2)" (*Engineering and Technologies of Control Systems*), MSc in Mechanical Engineering, University of Bologna. **3 CFU/ECTS**.

2022 - 2023 **Academic course** "28642 - *Foundations of Industrial Robotics* (Module 2)", BSc in Automation Engineering, University of Bologna. **3 CFU/ECTS**.

2021 - 2022 **Academic course** "28642 - *Foundations of Industrial Robotics* (Module 2)", BSc in Automation Engineering, University of Bologna. **3 CFU/ECTS**.

2021 - 2022 **Academic course** "73126 - *Ingegneria e Tecnologie dei Sistemi di Controllo* LM (Modulo 2)" (*Engineering and Technologies of Control Systems*), MSc in Mechanical Engineering, University of Bologna. **3 CFU/ECTS**.

2020 - 2021 **Academic course** "73126 - *Ingegneria e Tecnologie dei Sistemi di Controllo* LM (Modulo 2)" (*Engineering and Technologies of Control Systems*), MSc in Mechanical Engineering, University of Bologna. **3 CFU/ECTS**.

2019 - 2020 **Academic course** "73126 - *Ingegneria e Tecnologie dei Sistemi di Controllo* LM (Modulo 2)" (*Engineering and Technologies of Control Systems*), MSc in Mechanical Engineering, University of Bologna. **3 CFU/ECTS**.

2018 - 2019 **Tutor** of the academic course "28630 - *Controlli Automatici* T-A (L-Z)" ("*Automatic Control*") (Prof. Maria Elisabetta Penati), BSc in Engineering Management, University of Bologna. **6 CFU/ECTS**.

2018 - 2019 **Tutor** of the academic course "28630 - *Controlli Automatici* T-A (A-K)" ("*Automatic Control*") (Prof. Maria Elisabetta Penati), BSc in Engineering Management, University of Bologna. **6 CFU/ECTS**.

2017 - 2018 **Tutor** of the academic course "28630 - *Controlli Automatici* T-A (L-Z)" ("*Automatic Control*") (Prof. Maria Elisabetta Penati), BSc in Engineering Management, University of Bologna. **6 CFU/ECTS**.

2017 **Organizer and teacher** of the course "*Robot et Fermi*", 9 lessons and laboratory activity for the high school "Enrico Fermi" of Bologna.

2015 - 2016 **Tutor** for the academic course "28630 - *Controlli Automatici* T-A (L-Z) (Modulo 1)" ("*Automatic Control*") (Prof. Elena Zattoni), BSc in Engineering Management, University of Bologna. **3 CFU/ECTS**.

2015 - 2016 **Tutor** for the academic course "28630 - *Controlli Automatici* T-A (L-Z) (Modulo 2)" ("*Automatic Control*") (Prof. Maria Elisabetta Penati), BSc in Engineering Management, University of Bologna. **3 CFU/ECTS**.

Supervision Activity of Students

Supervisor or **co-supervisor** of a total of **41 BSc/MSc** student's **theses** (**1** of which **international visiting student**), **11 BSc/MSc** student's **internships** (**3** of which **international visiting students**) and **1 international visiting PhD** student's **traineeship**.

- **Supervisor** of the **BSc** student's **thesis** "*Identificazione di Relazioni Lineari da Segnali Elettromiografici dell'Avambraccio Tramite Schema di Frisch* (*Identification Of Linear Relationship From Forearm Electromyographic Signals Using The Frisch Scheme*.)" Graduated candidate: Luca Bertozzi (2023.)
- **Co-supervisor** of the **MSc** student's **thesis** "*Estimation of hand motions from sEMG: A tensor decomposition formulation*." Graduated candidate: Andrea Capuano (2023.)
- **Supervisor** of the **MSc** student's **thesis** "*Prototype System For Enhancing Hand Neuromuscular Rehabilitation Exercises Exploiting sEMG Signals And Visual Feedback*." Graduated candidate: Filippo Paganelli (2023.)

- **Co-supervisor** of the **MSc** student's **thesis** "*Implementation And Experimental Evaluation Of A Twisted String Driven Endoscope Prototype*." Graduated candidate: Edoardo Fratarcangeli (2023.)
- **Supervisor** of the **BSc** student's **thesis** "*Hidden Markov Model per la descrizione delle fasi della presa robotica sulla base di misurazioni tattili* (*Hidden Markov Model For The Description Of Robotic Grasping Phases From Tactile Measurements*.)" Graduated candidate: Simone Comastri (2023.)
- **Supervisor** of the **BSc** student's **internship** project "*Studio di Hidden Markov Model e implementazione in ROS*" (*Study Of Hidden Markov Models And Implementation In ROS*.) Intern student: Simone Comastri (2023.)
- **Supervisor** of the **BSc** student's **thesis** "*Regolazione della velocità del movimento di presa di una mano robotica da parte di un operatore umano* (*Regulation Of The Grasping Motion Velocity Of A Robot Hand By A Human Operator*.)" Graduated candidate: Jacopo Costantino (2023.)
- **Supervisor** of the **BSc** student's **internship** project "*Integrazione della mano robotica AR10 in un framework basato su ROS*" (*Integration Of The AR10 Robot Hand In A ROS Framework*.) Intern student: Jacopo Costantino (2023.)
- **Supervisor** of the **BSc** student's **thesis** "*Moduli Vibrotattili Indossabili per la Regolazione Human-In-The-Loop della Forza di Presa di una Mano Robotica* (*Wearable Vibrotactile Modules For Human-In-The-Loop Robot Hand Grasp Strength Regulation*.)" Graduated candidate: Filippo Calzati (2023.)
- **Supervisor** of the **BSc** student's **internship** project "*Progettazione di moduli vibrotattili indossabili*" (*Design of wearable vibrotactile modules*.) Intern student: Filippo Calzati (2023.)
- **Co-supervisor** of the **MSc** student's **thesis** "*Imitation Learning From Teleoperation-Based Demonstrations Using Gaussian Mixture Regression For A Dual-Arm Robot*" (Supervisor: Prof. Gianluca Palli.) Graduated candidate: Luca Barbieri (2023.)
- **Supervisor** of the **BSc** student's **thesis** "*Realizzazione in Ambiente di Simulazione RobotStudio di una Lavorazione di Finitura Automatica su Basamenti di Motori Endotermici* (*Implementation Of An Automatic Finishing Process On Endothermic Engine Crankcases In RobotStudio Simulation Environment*.)" Graduated candidate: Stefano Zecchi (2023.)
- **Supervisor** of the **BSc** student's **thesis** "*Analysis Of Feedforward And LSTM Deep Neural Netwrok Architectures For Self-Supervised Regression Of sEMG Signals For Multi-Grasp Robot Hand Control*." Visiting student (Exchange Program: EPlus - Erasmus Studio): Josep Soto Alapont (Home university: Universitat Politècnica de València, Valencia, Spain.) (2023.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Manipolazione robotica: problemi e approcci basati su modellistica e machine learning*" (*Robotic Manipulation: Problems And Approaches Based On Mathematical Modelling And Machine Learning*) (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Michael Viani (2023.)
- **Co-supervisor** of the **MSc** student's **thesis** "*Programming by demonstration of robotic wiring tasks combining kinesthetic teaching, teleoperation and sEMG-based interfaces*" (Supervisor: Prof. Gianluca Palli.) Graduated candidate: Armando Amerì (2023.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Analisi Statistica di Risultati Sperimentali in Applicazioni Robotiche*" (*Statistical Analysis Of Experimental Results In Robotic Applications*) (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Benedetta Failla (2023.)
- **Supervisor** of the **international visiting PhD** student's **traineeship** project "*Improve performance of TSA for wearable robotics applications*." Visiting intern: Giuliano Giacoppo (Home university: University of Stuttgart, Stuttgart, Germany) (2022.)

- **Co-supervisor** of the **BSc** student's **thesis** "*Simulative Analysis Of Robotic Grasping Exploiting The Syngrasp Toolbox*" (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Dante Piotto (2022.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Dispositivi Vibrotattili per il Controllo della Forza di Presa Durante Operazioni di Telemanipolazione*" (*Vibrotactile Devices For The Control Of Grasp Strength During Telemanipulation*) (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Veronica Giuliani (2022.)
- **Co-supervisor** of the **MSc** student's **thesis** "*A Myo-Controlled Wearable Manipulation System with Tactile Sensing for Prosthetics Studies*" (Supervisor: Prof. Gianluca Palli.) Graduated candidate: Marco Perozzi (2022.)
- **Co-supervisor** of the **MSc** student's **thesis** "*Extraction of Grasping Motions from sEMG Signals for the Control of Robotic Hands through Autoencoding*" (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Alessandra Bernardini (2021.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Development of a sEMG-Driven Simulator for Robotic Hands Interacting with Simple Objects*" (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Jacopo Meglioraldi (2021.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Kernel Non-Negative Matrix Factorization for Grasp Oriented Myoelectric Control of Robotic Hands*" (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Filippo Castorri (2021.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Manipulability Ellipsoids And Robotic Fingers: Simulative Analysis Of A Motion Mapping Application*" (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Riccardo Belletti (2021.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Simulazione e Controllo di un Esoscheletro Attivo per l'Assistenza del Gomito*" (*Simulation and Control Of A Powered Exoskeleton For Elbow Assistance*) (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Laura Calzoni (2021.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Mappatura di Movimenti della Mano Umana su Mani Robotiche: Definizione di una Metrica per la Valutazione di Soluzioni allo Stato dell'Arte*" (*Mapping Human To Robot Hand Motions: Definition Of A Metrics For The Evaluation of State-OF-The-Art Solutions*) (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Daniele Ceccarelli (2021.)
- **Co-supervisor** of the **MSc** student's **thesis** "*Myocontrol Of Prosthetic Hands: Enforcing Active Learning By A Machine Learning Algorithm Based Fault Detector*" (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Vincenzo Salzillo (2020.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Teleoperazione di Mani Robotiche: Implementazione di un Controllo Ibrido di Giunto e Cartesiano sulla UB Hand*" (*Teleoperation Of Robot Hands: Implementation Of An Hybrid Joint-Cartesian Control On The UB Hand*) (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Riccardo Dalla (2020.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Acquisizione ed Elaborazione Dati dal Bracciale GForce Pro per lo Sviluppo di una Interfaccia Uomo-Robot*" (*Acquisition And Processing Of Data From The GForce Pro Bracelet For Human-Robot Interfaces*) (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Umberto Monti (2020.)
- **Supervisor** of the **BSc** student's **internship** project "*Integrazione del Bracciale GForce Pro in Ambiente Simulink*" (*Integration Of The GForce Bracelet in Simulink*.) Intern student: Umberto Monti (2020.)

- **Co-supervisor** of the **BSc** student's **thesis** "*Realizzazione di un'Interfaccia Vibrotattile per Compiti di Telemanipolazione*" (*Realization Of A Vibrotactile Interface For Telemanipulation Tasks*) (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Marco Scarpeccio (2020.)
- **Supervisor** of the **BSc** student's **internship** project "*Esperienza di Laboratorio per la Realizzazione di un'Interfaccia Vibrotattile*" (*Laboratory Training For The Realization Of A Vibrotactile Interface*.) Intern student: Marco Scarpeccio (2020.)
- **Supervisor** of the **international visiting MSc** student's **internship** project "*Development And Experimental Validation Of A Tactile Sensor Based On Inflatable Structures And Acceleration Measures*" Visiting intern student: Yuki Iwamoto (Home university: Ryukoku University, Kyoto, Japan.)(2020.)
- **Co-supervisor** of the **MSc** student's **thesis** "*Improving Pattern Recognition Based Myocontrol Of Prosthetic Hands Via User-In-The-Loop*" (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Donato Brusamento (2019.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Controllo di Mani Robotiche Basato su Elettromiografia: Sviluppo di un Modello del Segnale sEMG per la Simulazione di Algoritmi di Decodifica dell'Intento*" (*Electromyography-Based Control Of Robot Hands: Development Of A sEMG Signal Model For The Simulation Of Intent Detection Algorithms*) (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Alessandra Bernardini (2019.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Offline Evaluation Of Convolutional Neural Network For Simoultaneous And Proportional Myocontrol*" (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Federico Bennasciutti (2019.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Support Vector Regression Based Myocontrol: Implementation And Experimental Evaluation For Robotic Hands*" (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Iacopo Curti (2019.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Classification-Based Myoelectric Control For Robotic Hands: A Method Exploiting Muscle Coordination*" (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Xinrui Yan (2019.)
- **Co-supervisor** of the **MSc** student's **thesis** "*Realization And Performance Characterization Of A Myoelectric Control System For Robotic Hands Based On Kernel Ridge Regression*" (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Riccardo Semprevivo (2019.)
- **Co-supervisor** of the **BSc** student's **thesis** "*Classificazione di Gesti per il Controllo di Mani Robotiche Basata su Trasformata Wavelet di Segnali EMG*" (*Gesture Classification For Robot Hand Control Based On Wavelet Transform Of EMG Signals*) (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Enrico Guerra (2018.)
- **Supervisor** of the **international visiting MSc** student's **internship** project "*Implementation Of A Feedback System For The Myocontrol Of A Sensorized Robotic Hand*." Visiting intern student: Gamze Balkan (Home university: Yıldız Technical University, Istanbul, Turkey.)(2018.)
- **Supervisor** of the **international visiting MSc** student's **internship** project "*Design and Preliminary Validation Of An EMG-driven Control Strategy For A Twisted String Actuated Elbow Flexion Assistive Device*." Visiting intern student: Frank Heck (Home university: Eindhoven University of Technology, Eindhoven, Netherlands.)(2018.)
- **Co-supervisor** of the **BSc** student's **thesis** "*sEMG-Driven Techniques For Elbow Torque Estimation: Evaluation Of A Black-Box And Phenomenological Approach*" (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Andrea Amaduzzi (2017.)

- **Co-supervisor** of the **MSc** student's **thesis** "*Sinergie Muscolari da Segnali EMG per il Controllo di Mani Robotiche*" (*Muscular Synergies From EMG Signals For Robot Hand Control*) (Supervisor: Prof. Claudio Melchiorri.) Graduated candidate: Mirco Borcelli (2016.)
- **Co-supervisor** of 1 **BSc** student's **thesis** (2015.)

Invited Talks

Seminars

2017 Talk entitled: "sEMG-Based Human-Robot Interfaces for the Control of Artificial Hands and Assistive Devices", at Technical University of Munich (TUM), Department of Electrical and Computer Engineering, Munich, Germany. Invited by: Prof. Dongheui Lee.

Organization of International Scientific Events

2021 **General Co-Chair** of the 14th International Workshop on Human-Friendly Robotics (HFR2021), University of Bologna, Bologna, Italy (virtual conference.)

Presentations at International Scientific Events

Presenter of a total of **21 oral presentations** and **4 poster presentations**.

2023 **2** oral presentations and **1** poster presentation:

- **Oral** and **poster presentation** of the work "Robot Programming by Demonstration: Trajectory Learning Enhanced by sEMG-Based User Hand StiffnessEstimation" at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2023), Detroit, USA.
- **Oral presentation** of the work "Neuromuscular Interfaces For Intuitive Programming of Robot Interaction Behaviour During Kinesthetic Teaching: Going Beyond Trajectory-Only Demonstration" at the conference AUTOMATICA.IT 2023, Catania, Italy.

2022 **1** oral presentations:

- **Oral presentation** of the work "sEMG-Based Minimally Supervised Regression Using Soft-DTW Neural Networks for Robot Hand Grasping Control" at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022), Kyoto, Japan.

2021 **5** oral presentations:

- **Oral presentation** of the work "Combining unsupervised muscle co-contraction estimation with bio-feedback allows augmented kinesthetic teaching" at the European Robotics Forum 2022 – 9th Hybrid Production Systems Workshop (ERF 2022), Rotterdam, Netherlands.
- **Oral presentation** of the work "Combining unsupervised muscle co-contraction estimation with bio-feedback allows augmented kinesthetic teaching" at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2021), Prague, Czech Republic (virtual conference.)
- **Oral presentation** of the work "Exploiting in-hand knowledge in hybrid joint-Cartesian mapping for anthropomorphic robotic hands" at the IEEE-RAS International Conference on Humanoid Robots (HUMANOIDS2020), Munich, Germany (virtual conference.)

- **Oral presentation** of the work "Mapping Finger Motions on Anthropomorphic Robotic Hands: Two Realizations of a Hybrid Joint-Cartesian Approach Based on Spatial In-Hand Information" at the 14th International Workshop on Human-Friendly Robotics (HFR2021), Bologna, Italy (virtual conference.)

2020 **5** oral presentations:

- **Oral presentation** of the work "A Low Cost Tactile Sensor for Large Surfaces Based on Deformable Skin with Embedded IMU" at the 3rd IEEE Conference on Industrial Cyber-physical Systems (ICPS2020), Tampere, Finland (virtual conference.)
- **Oral presentation** of the work "Combined Joint-Cartesian Mapping for Simultaneous Shape and Precision Teleoperation of Anthropomorphic Robotic Hands" at the IFAC World Congress 2020 (IFAC-WC2020), Munich, Germany (virtual conference.)
- **Oral presentation** of the work "Robotic Muscular Assistance-As-Needed for Physical and Training/Rehabilitation Tasks: Design and Experimental Validation of a Closed-Loop Myoelectric Control in Grounded and Wearable Applications" at the 13th International Workshop on Human-Friendly Robotics (HFR2020), Innsbruck, Austria (virtual conference.)
- **Oral presentation** of the work "A remarkable 'failure story' in close human-robot interaction: advanced myocontrol of prosthetic hands" at the IROS2020 workshop *Why robots fail to grasp?*, Las Vegas, NV, USA (virtual conference.)
- **Oral presentation** of the work "sEMG-based Human-in-the-Loop Control of Elbow Assistive Robots for Physical Tasks and Muscle Strength Training" at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS2020), Las Vegas, NV, USA (virtual conference.)

2019 **4** oral presentations and **2** poster presentations:

- **Oral** and **poster presentation** of the work "Development of a Twisted String Based Haptic Interface: Design, Preliminary Implementation and Testing" at the 1st Italian Conference for Robotics and Intelligent Machines (I-RIM-3D2019), Reggio-Emilia, Italia.
- **Oral presentation** of the work "Grasp-Oriented Myoelectric Interfaces for Robotic Hands: a Minimal-Training Synergy-Based Framework for Intent Detection, Control and Perception" at the International Workshop on Human-Friendly Robotics (HFR2019), Reggio-Emilia, Italia.
- **Oral presentation** of the work "Synergy-Based Control of Anthropomorphic Robotic Hands with Contact Force Sensors" at the Joint 8th IFAC Symposium on Mechatronic Systems (MECHATRONICS2019) and the 11th IFAC Symposium on Nonlinear Control Systems (NOLCOS2019), Vienna, Austria.
- **Oral presentation** of the work "Design and Evaluation of a Factorization-Based Grasp Myoelectric Control Founded on Synergies" at the IEEE-IFAC 12th International Workshop on Robot Motion and Control (RoMoCo2019), Poznan, Poland.
- **Poster presentation** of the work "A Control Architecture for Grasp Strength Regulation in Myocontrolled Robotic Hands Using Vibrotactile Feedback: Preliminary Results" at the IEEE/RAS-EMBS International Conference on Rehabilitation Robotics (ICORR2019), Toronto, Canada.

2018 **Oral presentation** of the work "Towards Improving Myocontrol of Prosthetic Hands: a Study on Automated Instability Detection" at the IEEE-RAS International Conference on Humanoid Robots (HUMANOIDS2018), Beijing, China.

2017 **2** oral presentations and **1** poster presentations:

- **Oral presentation** of the work "Experimental Evaluation of a sEMG-Based Control for Elbow Wearable Assistive Devices During Load Lifting Tasks" at the 15th International Conference on Rehabilitation Robotics (ICORR2017), London, UK.
- **Oral presentation** of the work "A sEMG-Based Control for Elbow Wearable Assistive Devices During Lifting Tasks" at the 10th International Workshop on Human-Friendly Robotics (HFR2017), Napoli, Italy.
- **Poster presentation** of the work "A sEMG-Based Control for Elbow Wearable Assistive Devices During Lifting Tasks" at the ASU International Workshop on Rehabilitation Robotics, Tempe, USA, 2017, Tempe, Arizona, USA.

2016 **Oral presentation** of the work "EMG-Based Grasp Proportional Control and Pattern Recognition for Human-Like Control of Robotic Hands" at the 9th International Workshop on Human-Friendly Robotics (HFR2016), Genova, Italy.

Journal and Conference Service

Journal Service

2022 - pres. **Review Editor** for *Frontiers in Neuroscience*, *Neuroprosthetics* section.

2021 - pres. **Review Editor** for *Frontiers in Psychology*, *Performance Science* section.

2014 - pres. **Reviewer** for: *IEEE Transactions on Robotics*, *IEEE Robotics and Automation Letters*, *IEEE Transactions on Automation Science and Engineering*, *IEEE Transactions on Systems, Man and Cybernetics*, *IEEE Transactions on Mechatronics*, *IFAC Journal on Mechatronics*, *Scientific Reports - Nature*.

Conference and Workshop Service

2023 **Member of the Program Committee** of the 16th International Workshop on Human-Friendly Robotics (HFR2023), Munich, Germany, 2023.

2022 **Co-Chair** of the session "*Human-Machine Interfaces and Natural Language Interaction*" at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022), Kyoto, Japan, 2022.

2021 **Vice-Chair** of the session "*Social Robotics*" at the 14th International Workshop on Human-Friendly Robotics (HFR2021), Bologna, Italy, 2022 (virtual conference.)

2021 **Chair** of the session "*Cognitive and Physical Human-Robot Interaction*" at the 14th International Workshop on Human-Friendly Robotics (HFR2021), Bologna, Italy, 2022 (virtual conference.)

2021 **Member of the Program Committee** and **General Co-Chair** of the 14th International Workshop on Human-Friendly Robotics (HFR2021), Bologna, Italy, 2022 (virtual conference.)

2021 **Chair** of the session "*Manufacturing Automation*" at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2021), Prague, Czech Republic, 2021 (virtual conference.)

2020 **Chair** of the session "*Rehabilitation Robotics*" at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2020), Las Vegas, USA (virtual conference.)

2020 **Chair** of the session "*Robots in Application Scenarios*" at the 13th International Workshop on Human-Friendly Robotics (HFR2020), Innsbruck, Austria, 2020 (virtual conference.)

2020 **Associate Editor** for the 8th IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob2020), Twente, The Netherlands, 2020.

2014 - pres. **Reviewer** for: several international conferences.

Scientific Associations

2023 - pres. **IEEE SMC**, IEEE Systems, Man, and Cybernetics Society, **member**.

2023 - pres. **IEEE RAS**, IEEE Robotics and Automation Society, **member**.

2021 - pres. **SIDRA**, Società Italiana Docenti e Ricercatori in Automatica (Italian Control Systems Society), **member**.

2021 - pres. **IEEE**, Institute of Electrical and Electronics Engineers, **member**.

2021 - pres. **ASME**, American Society of Mechanical Engineers, **member** and **treasurer** of the Italy Section.

2019 - pres. **I-RIM**, Italian Institute of Robotics and Intelligent Machines, **member**.

Awards

2022 **Finalist** of the **Best Paper Award** for the paper: Alessandra Bernardini, Roberto Meattini, Gianluca Palli and Claudio Melchiorri. Simulative and Experimental Evaluation of a Soft-DTW Neural Network for sEMG-based Robotic Grasping. In International Workshop on Human-Friendly Robotics. Springer, 2022.

2021 **Finalist** of the **Best Paper Award** for the paper: Roberto Meattini, Davide Chiaravalli, Gianluca Palli and Claudio Melchiorri. Exploiting In-Hand Knowledge in Hybrid Joint-Cartesian Mapping for Anthropomorphic Robotic Hands. In I-RIM 3D conference, Rome, Italy.

2019 **Winner** of the **Best Paper Award** for the paper: Roberto Meattini, Luigi Biagiotti, Gianluca Palli, and Claudio Melchiorri. Grasp-oriented myoelectric interfaces for robotic hands: a minimal-training synergy-based framework for intent detection, control and perception. In International Workshop on Human-Friendly Robotics, pages 110-124. Springer, 2019.

2019 **Finalist** of the **Best Poster Award** for the paper: Roberto Meattini, Luigi Biagiotti, Gianluca Palli, Daniele De Gregorio, and Claudio Melchiorri. A control architecture for grasp strength regulation in myocontrolled robotic hands using vibrotactile feedback: preliminary results. In 2019 IEEE 16th International Conference on Rehabilitation Robotics (ICORR), pages 1272–1277. IEEE, 2019.

2017 **Winner** of the **"*TJ. Tarn Best Paper in Robotics*" Best Paper Award** for the paper: Umberto Scarcia, Roberto Meattini, and Claudio Melchiorri. Mapping human hand fingertips motion to an anthropomorphic robotic hand. In 2017 IEEE International Conference on Robotics and Biomimetics (ROBIO), pages 774-779. IEEE, 2017.

2015 **Finalist** of the **Best Paper Award** for the paper: Roberto Meattini, Simone Benatti, Umberto Scarcia, Luca Benini, and Claudio Melchiorri. Experimental evaluation of a semg-based human-robot interface for human-like grasping tasks. In 2015 IEEE International Conference on Robotics and Biomimetics (ROBIO), pages 1030–1035. IEEE, 2015.

2015 **Winner** of the Robotics Competition at the SAPHARI Natural Machine Motion Initiative (NMMI) Winter School of Robotics, Rome, February 20-25, 2015.

Research Cooperations

2020 - pres. Polytechnic University of Catalonia (**UPC**), Spain, **Prof. Raul Suarez**.
2018 - pres. German Aerospace Center (**DLR**) and University of Erlangen-Nuremberg (**FAU**), Germany, **Prof. Claudio Castellini**.
2018 - 2023 École Polytechnique Fédérale de Lausanne (**EPFL**), Switzerland, **Prof. Jamie Paik**.
2018 - pres. **INAIL Centro Protesi**, Vigorso di Budrio, Italy, **Dr. Emanuele Gruppioni**.

Publications

Bibliometrics

In January 9, 2024, **Google Scholar** reports **348 citations** (316 since 2019), with indices **h=8** (8) and **i10=7** (5). By the same date, **Scopus** reports **34 documents**, **254 citations**, **h=7**.

International Journal Papers

13. **Roberto Meattini**, Alessio Caporali, Alessandra Bernardini, Gianluca Palli, and Claudio Melchiorri. Self-supervised regression of semg signals combining non-negative matrix factorization with deep neural networks for robot hand multiple grasping motion control. *IEEE Robotics and Automation Letters*, 8(12):8533–8540, 2023.

12. Luigi Biagiotti, **Roberto Meattini**, Davide Chiaravalli, Gianluca Palli, and Claudio Melchiorri. Robot programming by demonstration: Trajectory learning enhanced by semg-based user hand stiffness estimation. *IEEE Transactions on Robotics*, pages 1–20, 2023 (Early Access).

11. **Roberto Meattini**, Raúl Suárez, Gianluca Palli, and Claudio Melchiorri. Human to robot hand motion mapping methods: Review and classification. *IEEE Transactions on Robotics*, 39(2):842–861, 2023.

10. **Roberto Meattini**, Alessandra Bernardini, Gianluca Palli, and Claudio Melchiorri. semg-based minimally supervised regression using soft-dtw neural networks for robot hand grasping control. *IEEE Robotics and Automation Letters*, 7(4):10144–10151, 2022.

9. **Roberto Meattini**, Davide Chiaravalli, Gianluca Palli, and Claudio Melchiorri. Simulative evaluation of a joint-cartesian hybrid motion mapping for robot hands based on spatial in-hand information. *Frontiers in Robotics and AI*, page 145. doi: 10.3389/frobt.2022.878364.

8. **Roberto Meattini**, Davide Chiaravalli, Luigi Biagiotti, Gianluca Palli, and Claudio Melchiorri. Combining unsupervised muscle co-contraction estimation with bio-feedback allows augmented kinesthetic teaching. *IEEE Robotics and Automation Letters*, 6(4):6180–6187, 2021.

7. **Roberto Meattini**, Davide Chiaravalli, Gianluca Palli, and Claudio Melchiorri. Exploiting in-hand knowledge in hybrid joint-cartesian mapping for anthropomorphic robotic hands. *IEEE Robotics and Automation Letters*, 6(3):5517–5524, 2021.

6. Andrea Gigli, Donato Brusamento, **Roberto Meattini**, Claudio Melchiorri, and Claudio Castellini. Feedback-aided data acquisition improves myoelectric control of a prosthetic hand. *Journal of Neural Engineering*, 17(5):056047, 2020.

5. **Roberto Meattini**, Davide Chiaravalli, Gianluca Palli, and Claudio Melchiorri. semg-based human-in-the-loop control of elbow assistive robots for physical tasks and muscle strength training. *IEEE Robotics and Automation Letters*, 5(4):5795–5802, 2020.

4. Mohssen Hosseini, **Roberto Meattini**, Andres San-Millan, Gianluca Palli, Claudio Melchiorri, and Jamie Paik. A semg-driven soft exosuit based on twisted string actuators for elbow assistive applications. *IEEE Robotics and Automation Letters*, 5(3):4094–4101, 2020.

3. **Roberto Meattini**, Markus Nowak, Claudio Melchiorri, and Claudio Castellini. Automated instability detection for interactive myocontrol of prosthetic hands. *Frontiers in neurorobotics*, 13:68, 2019.

2. **Roberto Meattini**, Simone Benatti, Umberto Scarcia, Daniele De Gregorio, Luca Benini, and Claudio Melchiorri. An semg-based human–robot interface for robotic hands using machine learning and synergies. *IEEE Transactions on Components, Packaging and Manufacturing Technology*, 8(7):1149–1158, 2018.

1. Mohssen Hosseini, **Roberto Meattini**, Gianluca Palli, and Claudio Melchiorri. A wearable robotic device based on twisted string actuation for rehabilitation and assistive applications. *Journal of Robotics*, 2017, 2017.

Submitted Papers

3. **Roberto Meattini**, Armando Amerì, Alessandra Bernardini, Javier Gonzalez-Huarte, Aitor Ibarguren, Claudio Melchiorri, and Gianluca Palli. Neuromuscular interfacing for advancing kinesthetic and teleoperated programming by demonstration of collaborative robots. *IEEE Transactions on Haptics*, 2023. (Under Review).

2. Alessandra Bernardini, **Roberto Meattini**, Alex Pasquali, Gianluca Laudante, Cosimo Gentile, Emanuele Gruppioni, Gianluca Palli, and Claudio Melchiorri. Hidden markov model based shared autonomy for grasp strength regulation in semg driven robot hand control. *IEEE Robotics and Automation Letters*, 2023. (Under Review).

1. **Roberto Meattini**, Kevin Galassi, Davide Chiaravalli, Gianluca Palli, and Claudio Melchiorri. Programming robot interaction behaviour during kinesthetic teaching exploiting semg-based interfacing and vibrotactile feedback. *IFAC Journal on Mechatronics*, 2023. (Under Review).

Books

1. **Roberto Meattini**. *sEMG Based Human-Robot Interfaces for the Control of Artificial Hands and Wearable Devices*. 2018. Doctorate Thesis.

Edited Books

1. Gianluca Palli, Claudio Melchiorri, and **Roberto Meattini**. *Human-Friendly Robotics 2021*. Springer.

Book Chapters

5. Alessandra Bernardini, **Roberto Meattini**, Gianluca Palli, and Claudio Melchiorri. Simulative and experimental evaluation of a soft-dtw neural network for semg-based robotic grasping. In *Human-Friendly Robotics 2022: HFR: 15th International Workshop on Human-Friendly Robotics*, pages 205–217. Springer, 2023.

4. **Roberto Meattini**, Davide Chiaravalli, Gianluca Palli, and Claudio Melchiorri. Mapping finger motions on anthropomorphic robotic hands: Two realizations of a hybrid joint-cartesian approach based on spatial in-hand information. In *Human-Friendly Robotics 2021*, pages 77–89. Springer, 2022.

3. Donato Brusamento, Andrea Gigli, **Roberto Meattini**, Claudio Melchiorri, and Claudio Castellini. Closed-loop acquisition of training data improves myocontrol of a prosthetic hand. In *International Conference on NeuroRehabilitation*, pages 421–425. 2020.

2. **Roberto Meattini**, Davide Chiaravalli, Mohssen Hosseini, Gianluca Palli, Jamie Paik, and Claudio Melchiorri. Robotic muscular assistance-as-needed for physical and training / rehabilitation tasks: Design and experimental validation of a closed-loop myoelectric control in grounded and wearable applications. In *International Workshop on Human-Friendly Robotics*, pages 16–30. 2020.

1. **Roberto Meattini**, Luigi Biagiotti, Gianluca Palli, and Claudio Melchiorri. Grasp-oriented myoelectric interfaces for robotic hands: a minimal-training synergy-based framework for intent detection, control and perception. In *International Workshop on Human-Friendly Robotics*, pages 110–124. 2019, has received the HFR2019 Best Paper Award.

International Conference Papers

16. Davide Chiaravalli, Alessio Caporali, Anna Friz, **Roberto Meattini**, and Gianluca Palli. A vision-based shared autonomy framework for deformable linear objects manipulation. In *2023 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)*, pages 733–738, 2023.

15. **Roberto Meattini**, Davide Chiaravalli, Kevin Galassi, Gianluca Palli, and Claudio Melchiorri. Experimental evaluation of intuitive programming of robot interaction behaviour during kinesthetic teaching using semg and cutaneous feedback. *IFAC-PapersOnLine*, 55(38):1–6, 2022.

14. Linda Feenstra, Umberto Scarcia, Riccardo Zanella, **Roberto Meattini**, Davide Chiaravalli, Gianluca Palli, and Claudio Melchiorri. Towards a twisted string actuated haptic device: Experimental testing of a 2-d virtual environment and teleoperation interface. In *2021 20th International Conference on Advanced Robotics (ICAR)*, pages 757–762. IEEE, 2021.

13. Marcello Zanghieri, Simone Benatti, Alessio Burrello, Victor Javier Kartsch Morinigo, **Roberto Meattini**, Gianluca Palli, Claudio Melchiorri, and Luca Benini. semg-based regression of hand kinematics with temporal convolutional networks on a low-power edge microcontroller. In *2021 IEEE International Conference on Omni-Layer Intelligent Systems (COINS)*, pages 1–6. IEEE, 2021.

12. Yuki Iwamoto, **Roberto Meattini**, Davide Chiaravalli, Gianluca Palli, Koji Shibuya, and Claudio Melchiorri. A low cost tactile sensor for large surfaces based on deformable skin with embedded imu. In *2020 IEEE Conference on Industrial Cyberphysical Systems (ICPS)*, volume 1, pages 501–506. IEEE, 2020.

11. **Roberto Meattini**, Davide Chiaravalli, Luigi Biagiotti, Gianluca Palli, and Claudio Melchiorri. Combined joint-cartesian mapping for simultaneous shape and precision teleoperation of anthropomorphic robotic hands. *IFAC-PapersOnLine*, 53(2):10052–10057, 2020.

10. **Roberto Meattini**, Daniele De Gregorio, Gianluca Palli, and Claudio Melchiorri. Design and evaluation of a factorization-based grasp myoelectric control founded on synergies. In *2019 12th International Workshop on Robot Motion and Control (RoMoCo)*, pages 252–257. IEEE, 2019.

9. **Roberto Meattini**, Luigi Biagiotti, Gianluca Palli, Daniele De Gregorio, and Claudio Melchiorri. A control architecture for grasp strength regulation in myocontrolled robotic hands using vibrotactile feedback: preliminary results. In *2019 IEEE 16th International Conference on Rehabilitation Robotics (ICORR)*, pages 1272–1277. IEEE, 2019.

8. Davide Ortenzi, Umberto Scarcia, **Roberto Meattini**, Gianluca Palli, and Claudio Melchiorri. Synergy-based control of anthropomorphic robotic hands with contact force sensors. *IFAC-PapersOnLine*, 52(15):340–345, 2019.

7. **Roberto Meattini**, Markus Nowak, Claudio Melchiorri, and Claudio Castellini. Towards improving myocontrol of prosthetic hands: a study on automated instability detection. In *2018 IEEE-RAS 18th International Conference on Humanoid Robots (Humanoids)*, pages 1–7. IEEE, 2018.

6. Umberto Scarcia, **Roberto Meattini**, and Claudio Melchiorri. Mapping human hand fingertips motion to an anthropomorphic robotic hand. In *2017 IEEE International Conference on Robotics and Biomimetics (ROBIO)*, pages 774–779. IEEE, 2018, has received the "*TJ. Tarn Best Paper in Robotics*" Best Paper Award.

5. **Roberto Meattini**, Gianluca Palli, and Claudio Melchiorri. Experimental evaluation of a semg-based control for elbow wearable assistive devices during load lifting tasks. In *2017 International Conference on Rehabilitation Robotics (ICORR)*, pages 140–145. IEEE, 2017.

4. Mohssen Hosseini, **Roberto Meattini**, Gianluca Palli, and Claudio Melchiorri. Development of semg-driven assistive devices based on twisted string actuation. In *2017 3rd International Conference on Control, Automation and Robotics (ICCAR)*, pages 115–120. IEEE, 2017.

3. **Roberto Meattini**, Mohssen Hosseini, Gianluca Palli, and Claudio Melchiorri. Early evaluation of semg-driven muscle modelling for rehabilitation and assistive applications based on wearable devices. In *2016 IEEE International Conference on Robotics and Biomimetics (ROBIO)*, pages 1480–1485. IEEE, 2016.

2. **Roberto Meattini**, Simone Benatti, Umberto Scarcia, Luca Benini, and Claudio Melchiorri. Experimental evaluation of a semg-based human-robot interface for human-like grasping tasks. In *2015 IEEE International Conference on Robotics and Biomimetics (ROBIO)*, pages 1030–1035. IEEE, 2015.

1. **Roberto Meattini**, Umberto Scarcia, Claudio Melchiorri, and Tony Belpaeme. Gestural art: A steady state visual evoked potential (ssvep) based brain computer interface to express

intentions through a robotic hand. In *The 23rd IEEE International Symposium on Robot and Human Interactive Communication*, pages 211–216. IEEE, 2014.