Curriculum Vitae

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Research

Introduction

I am a mechanical engineer, I hold a PhD degree in Innovative Technologies - Perceptual Robotics Curriculum - that I obtained from Scuola Superiore Sant'Anna in 2012. I work with the Institute of Mechacnical Intelligence of the Scuola Superiore Sant'Anna (SSSA). I am IEEE member and I am a member of the Italian Group of Applied Mechanics, the association of Italian Professors and researchers in Applied Mechanics, since 2016. Thanks to my research activities I obtained the National Scientific qualification as Associate Professor in the Italian higher education system, in the call 2021/2023 (Ministerial Decree n. 553/2021 and 589/2021) for the disciplinary field of 09/A2 - Applied Mechanics, with five positive marks out of five members of the commission.

My research interests develop in two branches. The first regards **modeling of the human behavior, from motion reconstruction to biomechanics, performance analysis and risk assessment.** A strong focus has been dedicated to wearable sensor networks and vision systems to reconstruct human motion. The second branch includes the **design and control of haptic interfaces and wearable robots, with a focus on exoskeletons for power assist, multimodal interfaces for sport training and telemedicine**. The main outcomes of my research activities that have produced results beyond the state of the art are:

- Methods for human kinematics reconstruction based on wearable sensor networks.

- Methods for the computation of human biomechanics based on motion reconstruction and machine learning applied in sport and in medicine.

- Algorithms for quantitative evaluation of the biomechanical overload risk based on wearable sensor networks and deep learning.

- Multimodal haptic interfaces for force feedback applied in sport, telemedicine, and industry.

- Design and control of exoskeletons for power assist in logistics.

I lead a small group that works on these research topics within the Intelligent Automation Systems area.

I have **participated in many European, national, and regional projects**. The partners of these projects belong to the engineering, medicine, and experimental psychology fields. The multidisciplinary collaborations have always added value to my research activities, strongly rooted in the engineering field, extending the impact of my research activities beyond the communities of mechanical, electronic, and robotic engineers.

I spent a period abroad in 2012 that allowed me to establish a connection with the group of Prof. Didier Stricker, head of the group of Augmented Vision at the DFKI (Deutsches Foerschungzentrum fuer Kunstliche Intelligenz) in Kaiserslautern (Germany). I keep an active collaboration with Professor Oscar Sandoval Gonzalez (Tecnológico Nacional de México, Orizaba, 94320, Mexico) in research activities on exoskeletons. I am collaborating with Professor Thomas Seel (Technische Universitaet Berlin) on a proposal for a Marie Curie Doctoral Network on control of exoskeletons. I am also collaborating with Prof. Baltasar Beferull Lozano (Leader of the WISENET center, Agder University, Norway), Prof. Jose del R. Millan (The University of Texas at Austin, US), Prof. Ozgu Alay (University of Oslo) in an ERC Synergy proposal on telepresence systems.

This section has two subsections. The first includes my research activities and roles organized by research project and ends with a summary of my professional appointments and bibliometric indexes. The second subsection focuses on dissemination, including talks, and editorial activities.

Research activities and role in research projects

In the following list, "Funding" reports the funding entity, whereas funding figures refer to the budget of SSSA. The coordinator of consortia is underlined. Objectives state the objectives of the project that have been or are being achieved.

Role and contributions report my role and contribution to the project.

Project	Ergonet (Analisi del rischio da sovraccarico biomeccanico di netturbini)
Dates	15 February 2023 - Today
Funding	Caffè dei Cercatori S.r.L. - 12k€
Consortium	<u>Scuola Superiore Sant'Anna</u>, Caffè dei Cercatori S.r.L., ASCIT S.p.A., Minerva S.c.r.l.
Objectives	Biomechanical analysis based on a wearable sensor network for biomechanical overload assessment and definition of requirements for an assistance exoskeleton applied to garbage collection workers
Role	**Principal Investigator**
Contributions	

- Fundraising and project management.
- Definition of methodology for motion capture and biomechanical analysis.
- Development of algorithms for biomechanical analysis based on motion capture, electromyography, and computer vision. In particular, I devised a novel method based on the Recursive Newton-Euler Algorithm and kinematic tree forward and backward routing for the computation of human biomechanics. Moreover, the method exploits object recognition obtained with a convolutional neural network and an egocentric camera to estimate the carried load and the hand(s) that grasp the object.
- Organization and participation in the experimental activities that involved actual garbage collection on the road.

Project	Hairemi (Haptic Advanced Interactive Rower Enhancing Muscular strength and Inclusive)
Dates	17 May 2022 - Today
Funding	European Space Agency - 300k€
Consortium	<u>Protom S.p.A.</u>, Scuola Superiore Sant'Anna, Federazione Italiana Canottaggio
Objectives	Multimodal, multiplayer platform for rowing training aimed at sports promotion and at inclusion in schools.
Role	**Principal Investigator**
Contributions	

- Fundraising and project management.
- Design of the architecture of the rowing machine, including mechanics, electronics, and controllers.
- Mechatronic design and control of the haptic rowing simulator.
- Physical-based design of the rowing task (modeling of the boat plus crew dynamics as a multi-body system) for the modulation of force feedback and performance analysis.
- Algorithms for the user's performance analysis based on the simulator data.

Project	ICryptex Evo (Tecnica di allenamento innovativa per calciatori professionisti)
Dates	17 May 2022 - Today
Funding	Better Than Real S.r.l., Giovanni Bonocore - 48k€
Consortium	<u>Scuola Superiore Sant'Anna</u>, Giovanni Bonocore
Objectives	Biomechanical Analysis and Training Algorithms for Professional Soccer Players based on Wearable Inertial Motion Units (IMUs)
Role	**Principal Investigator**
Contributions	

- Fundraising and project management.

- Definition of the motion capture and analysis methodology.

- Data collection on professional soccer players.

- Biomechanical analysis and deep learning algorithms for the analysis of the performance of professional soccer players.

Project	ASSI (Assistente alla Sorveglianza e Sicurezza Industriale)
Dates	17 July 2022 - Today
Funding	Tuscany Region, Bando Ricerca e Sviluppo 2020 - 251k€
Consortium	<u>RJC Soft S.p.A.</u>, Scuola Superiore Sant'Anna, Blueoak S.r.L., VICS Consulting, Better Than Real S.r.L., La Cisa S.p.A.
Objectives	Distributed sensing and compuitation to monitor safety risks in urban and industrial areas.
Role	**Principal Investigator**
Contributions	

- Fundraising and project management.

- Conceptualization and architecture of the sensor network and of the deep-learning-based algorithms for the safety analysis.

- Research activities on calibration and motion capture algorithms based on RGB cameras.

- Novel method and algorithm based on structure from motion for the extrinsic calibration of RGB cameras in large outdoor environments. Experimental validation of the algorithm in a 20x30 m area and comparison with traditional calibration method based on Aruco markers.

- Supervision of the research activities on detection and tracking of agents in the monitored areas.

Project	BRIEF (Biorobotics Research and Innovation Engineering Facilities)
Dates	1 October 2022 - Today
Funding	Piano Nazionale di Resistenza e Resilienza - 172k€ (share of the SAPIO facility)
Consortium	<u>Scuola Superiore Sant'Anna</u>, Uniklinik Freiburg, Wearable Robotics S.r.L.
Objectives	Design and set up of facilities for the research in robotics and AI applied to health and medicine. Infrastructure for diagnosis support systems based on AI and robotic telediagnosis (objective of the SAPIO facility)
Role	**Task leader for the SAPIO Facility**
Contributions	

- Participation in writing of proposal and project management.

- Management of the facility and selection of equipment (computing units, manipulators, visualization systems, RGB and thermal cameras, force plates, devices for medical diagnosis.

- Collaboration in the definition of novel control algorithms for bilateral teleoperation with force feedback. Application of such algorithms to telediagnosis with remote ultrasonography assisted by visual and force feedback.

- Reconstruction of body segments volume by means of RGBD cameras and deep-learning-based algorithms for the reconstruction and segmentation of human body volumes. The segmentation serves for the estimation of the human mass distribution (with a coarse estimation of the inertial properties) and the temperature distribution of the body. These will be used for the estimation of heart failure risk and for biomechanical analysis.

- Supervision of the facility implementation.

Project	FWPA (Full body light exoskeleton for workers power assist)
Dates	3 June 2020 - 3 August 2022
Funding	Italian Ministry for the Economic Development (Bando ARTES 4.0 N°1) - 140k€
Consortium	<u>Sebach S.p.A.</u>, Wearable Robotics S.r.L.
Objectives	Full body exoskeleton featuring hybrid actuation for manual handling of chemical toilettes.
Role	**Responsible of the Exoskeleton design**
Contributions	

- Fundraising and project management.

- Conceptualization and architecture of the exoskeleton, including mechanics, electronics, and controllers.

- Supervision and collaboration with the mechanical design.

- Devising and implementation of the control algorithms.

- Experimental assessment of the exoskeleton

Project	Exosmooth (Innovative smooth control strategy for walking assistance with powered lower limbs exoskeleton)
Dates	4 March 2021 - 30 June 2022
Funding	European Commission - 26k€
Consortium	Scuola Superiore Sant'Anna, Uniklinik Freiburg, Wearable Robotics S.r.L.
Objectives	Investigation of the role of ankle actuation in a lower limb exoskeleton for load carrying.
Role	**Principal Investigator**
Contributions	

- Fundraising and project management.
- Conceptualization and architecture of the exoskeleton, including mechanics, electronics, and controllers.
- Supervision and participation in modeling the interaction through harnesses between the exoskeleton and the user.
- Novel simulation method for the comparison of kinematic and actuation solutions and for the optimization of the harnesses' impedance for lower limbs exoskeletons.
- Collaboration in devising and testing a novel control strategy for gait assistance. The control approach aims at compensating the device and load weight and inertia by blending assistance computed for single stances and double stance. Gait segmentation is based on linear regression of kinematic data for gait segmentation.
- Mechanical design, control, and test of the exoskeleton.
- Design of and participation in the experimental activities in the Eurobench facility in Madrid.
- Supervision in the analysis, discussion, and reporting of results.

Project	Gelit (Analisi del Rischio da Sovraccarico Biomeccanico per Operatori nella Produzione di Generi Alimentari Surgelati)
Dates	15 October 2019 - 15 December 2021
Funding	Gelit S.p.A. - 80k€
Consortium	Scuola Superiore Sant'Anna, Gelit S.p.A.
Objectives	Biomechanical analysis based on wearable sensor network for biomechanical overload assessment. Definition of risk mitigation actions that include the definition of the requirements for an assistance exoskeleton applied to frozen food production workers.
Role	**Principal Investigator**
Contributions	

- Fundraising and project management.
- Definition of the methodologies for the biomechanical analysis applied to the workers' tasks;
- Novel deep learning algorithms for the segmentation of manual material handling activities based on wearable sensor networks composed of inertial sensors and surface electromyography signals.
- Definition of and participation in the experimental activities.
- Supervision in the analysis, discussion, and reporting of results.

Project	Analisi del Rischio da Sovraccarico Biomeccanico per Operatori Sebach S.p.A.
Dates	26 June 2019 - 26 November 2019
Funding	Sebach S.p.A. - 16k€
Consortium	Scuola Superiore Sant'Anna, Sebach S.p.A.
Objectives	Biomechanical analysis based on wearable sensor network for biomechanical overload assessment and definition of requirements for an assistance exoskeleton applied to chemical toilettes logistics workers.
Role	**Principal Investigator**
Contributions	

- Fundraising and project management.

- Definition of the methodologies for the biomechanical analysis applied to the workers' tasks;

- Definition and supervision of the experimental activities.

- Analysis, discussion, and reporting of results.

Project	Sailport (Salute e Sicurezza dei lavoratori nelle aree portuali)
Dates	23 June 2017 - 23 November 2019
Funding	INAIL, bandi di ricerca in collaborazione 2016 - 216k€
Consortium	Scuola Superiore Sant'Anna, Azienda ULSS n. 3 Serenissima, Azienda Sanitaria Locale Taranto, Azienda USL della Romagna, Azienda USL Toscana Nordovest, Azienda Sanitaria Universitaria Integrata di Trieste, ASUR Marche Area Vasta 2 - Ancona, Azienda Sanitaria Locale Bari, ASL Roma 4
Objectives	Wearable and computer-vision-based algorithms for the analysis of safety and health issues in port and marine working contexts.
Role	**Principal Investigator**
Contributions	

- Fundraising and project management.

- Definition of the methodologies for the biomechanical analysis;

- Novel algorithms based on wearable sensor networks composed of inertial sensors and surface electromyography signals for the evaluation of the biomechanical overload risk based on risk evaluation methodologies reported in the ISO norms 11226 and 11228 (NIOSH Lifting Index, Snook and Ciriello method, Rapid Entire Body Assessment).

- Novel human kinematics reconstruction based on RGB cameras, deep learning, and Kalman Filters.

- Novel algorithm for online calibration of a wearable sensor network composed of IMUs and for the estimation of sensor motion with regards to bones. The algorithm is based on a Cascade Kalman Filter.

- Collision risk assessment by means of multiple cameras and deep learning algorithms for people and vehicle detection and tracking

- Supervision of and participation in the experimental activities.

- Supervision and participation in the analysis, discussion, and reporting of results.

Project	Ramcip (Robotic Assistant for MCI patients at home)
Dates	15 January 2015 - 30 June 2018
Funding	European Commission, GA 643433 - 335k€
Consortium	Centre for Research and Technology Hellas, Scuola Superiore Sant'Anna, Technische Universitaet Munchen, Foundations for Research and Technology Hellas, ACCREA Engineering, Medical University Lublin, Barcelona Alzheimer Treatment and Research Center, Shadow Robot
Objectives	Autonomous robotic assistant for elderly affected by mild cognitive impairments in activities of daily living.
Role	**Participant**
Contributions	

- Human motion tracking and analysis of the human's skills based on the robot's sensing devices.

- Definition of methodologies for the analysis of human motion and fatigue estimation based on deep-learning algorithms.

- Novel algorithms for the semi-automatic definition of a Virtual User Model.

- Robotic perceptual and projective head for the analysis of the user's motion and to render visual feedback.

- Supervision of and participation in experimental activities for the validation of the aforementioned algorithms.

Project	ReMeDi (Remote Medical Diagnostician)
Dates	1 January 2014 - 15 April 2017
Funding	European Commission, GA 610903 - 428k€
Consortium	<u>University of West England, ACCREA Engineering</u>, Scuola Superiore Sant'Anna, University of the West England, Paris-London Universitat Salzburg, Medical University Lublin, Eidgenoessische Technische Hochschule Zurich, Ploitechnica Wroclawska
Objectives	Telepresence system for co-located visual and haptic feedback aimed at remote ultrasonography and palpation medical examinations.
Role	**Key personnel**
Contributions	

- Collaboration to proposal writing

- Devising, designing, and control of a 4 DoFs haptic interface for force feedback in palpation.

- Collaboration to devising a novel algorithm for the computation of the direct and inverse kinematics of Clavel's Delta parallel kinematics robot.

- Novel control algorithm for haptic rendering in ultrasonography that exploits an encountered haptics paradigm to render an impedance in the contact phase and to track the doctor's hands when moving over the patient's body.

- Novel system for tele-auscultation and tele-echography that features force, visual, and auditory feedback. Force reflection is enabled by a bilateral teleoperation algorithm based on the model-mediated paradigm. Visual and haptic feedback are co-located, haptic feedback calculation exploits the implicit surfaces algorithm.

- Study of the user interaction with the ultrasonography telemedicine setup with different visualization (2D, 3D screen, head-mounted display), navigation (scaling or clutching to comply with the haptic device workspace limitations), and force feedback features (scaling).

- Collaboration to the integration of the remote palpation system. In particular for the impedance control of the palpation haptic interface, the encountered haptics implementation, and the co-location with the Virtual Environment.

Project	Ergane (Reinserimento lavorativo di lavoratori affetti da patologie da sovraccarico biomeccanico degli arti superiori mediante riduzione del rischio, trattamento e recupero funzionale – esperienza pilota)
Dates	1 March 2012 - 31 March 2015
Funding	Ministry of Health, CCM 2011 - 91k€
Consortium	<u>Scuola Superiore Sant'Anna</u>, Azienda USL Toscana Nordovest
Objectives	Reintegration of workers suffering from work-related musculoskeletal disorders in upper limbs through biomechanical overload risk reduction, treatment, and functional recovery.
Role	**Participant**
Contributions	

- Collaboration to devising and developing a custom wearable sensor network composed of IMUs and sEMG electrodes for motion and muscular activity simultaneous gathering.

- Novel method for posture and motion reconstruction of upper limbs based on the Unscented Kalman Filter and on a kinematic model of the upper limbs using IMUs.

- Novel algorithm for the fusion of IMU signals and kinematic signals from a rowing simulator for the reconstruction of the rower's motion and for biomechanical analysis aimed at articular loads and at the estimation of a virtual boat motion through a physical-based model.

- Experimental activities for the validation of the device and of the motion and posture reconstruction. algorithms.

Project	SKILLS (Multimodal Interfaces for capturing and transfer of skill)
Dates	3 December 2007 - 30 Settembre 2011
Funding	European Commission, GA 035005 - 91k€
Consortium	<u>Scuola Superiore Sant'Anna</u>, University Montpellier 1, AAlborg University, Commissariat à l'énergie atomique et aux énergies alternatives - Paris, Deutsches Zentrum fuer Luft- und Raumfahrt (DLR), Fraunhofer Darmstadt, Techinion - Israel Institute of Technology, Uppsala University
Objectives	Study of Multimodal Interfaces for capturing and transfer of skill from expert users
Role	**Participant**
Contributions	

- Mechanical and sensing of a haptic rowing simulator for rowing training.

- Physical-based models of rowing based on motion data from the rowing platform and a fluid-dynamics model of the power-dissipating device for force estimation.

- Biomechanical and motion analysis of rowers for skills assessment.

- Machine learning algorithms to extract the experts' signatures in the rowing task and to evaluate the trainees' performance. These algorithms were based on regression and data reduction techniques as well as on neural networks (mainly ANN)

- Contribution to the development of the vibrotactile feedback devices, of the Virtual Environment, and of the auditory feedback.

- Experimental assessment of the effectiveness of multimodal feedback combinations on learning and retention of complex motor skills with a focus on rowing. Evaluation of transfer to the real task by instrumenting a rowing single scull.

- Classification and taxonomy of multimodal feedback and investigation of the role of affordances and of enactive feedback for the training of complex motor skills. Application to the rowing case study.

Participation in other projects

- Participation in the **project "Maintenance on Condition"** (CIG 62732154C8 - ended May 2023), in which a frame portal equipped with lasers and cameras was used, along with computer vision techniques, for the detection of damages and wear condition of selected parts of the train. I contributed with the mechanical design of the frame portal which included an illumination study of the environment to use the selected sensors.

- Participation in the **regional project TAUM** (POR CReO FESR 2007-2013 - ended January 2015), which targeted the development of a programming by demonstration system based on wearable sensors and feedback devices. I did the mechanical design of the haptic interface for the remote control and training of the robotic assistant.

- Participation in the **regional project (regione Toscana) VANTS - ended December 2012** "Valorizzazione degli apporti delle nuove tecnologie in materia di sicurezza sui luoghi di lavoro" with a focus on the biomechanical analysis of the selected working activities in the construction field for the evaluation of the articular loads and required power. I did this analysis that served the design of an energy-savvy lower limb exoskeleton that exploits hybrid actuation. I designed the legs of the exos.

Professional appointments list

Dates	Position	Title	Projects	SC-SSD	Employer
3/5/2021-Today	Technician (ex. legge 240/10, art. 24-bis)	-	Exosmooth, BRIEF, Hairemi, ASSI, Ergonet	-	Scuola Sant'Anna Pisa
1/12/2020-31/3/2021	Mechatronic senior engineer	-	FWPA	-	Wearable Robotics S.r.L.
1/5/2016-31/10/2020	Assistant Professor (ex. legge 240/10, art. 24 lett. a)	-	ReMeDi, Maintenance On Condition, Sailport, Gelit, Sebach	09/A2 ING-IND/13	Scuola Sant'Anna Pisa
1/11/2014-30/4/2016	Post-Doc (resarch grant ex legge 240/10 art.26)	"Progettazione dell'interfaccia aptica per la master side del sistema di teleoperazione"	ReMeDi, Ramcip, Sailport	09/A2 ING-IND/13	Scuola Sant'Anna Pisa
1/11/2012-31/10/2014	Post-Doc (resarch grant ex legge 240/10 art.26)	"Identificazione e presentazione mobile di anomalie e pattern di segnali multvariati in ambito industriale"	Ergane, ReMeDi	09/H1 ING-INF/05	Scuola Sant'Anna Pisa
15/12/2011-14/12/2012	PhD Candidate (research grant ex legge 240/10 art.26)	"Valutazione sperimentale dell'efficacia del controllo collaborativo della postura del body extender"	Vants, TESBE-ECHORD, Ergane	09/A2 ING-IND/13	Scuola Sant'Anna Pisa
1/1/2008-31/12/2008	Research Fellow (research grant ex legge 230/05 art.51)	"Sviluppo di un sistema per training sportivo"	SKILLS	09/A2 ING-IND/13	Scuola Sant'Anna Pisa

Bibliometric Indexes

The following table summarizes bibliometric scores at the present date

Fonte	Documenti	Citazioni	H-Index
Scopus	54	808	13
Scholar	66	1399	17

My bibliometric indices are above the average of the researchers in Applied Mechanics. Taking the last ten years as a reference, figure 1 reports the scholarly output, the citation count (excluded self-citations), the h-index (excluded self-citations), and the number of publications in the top 10% Journal Percentiles by Citescore of the researchers in Applied Mechanics. Red circles and my name printed on the figure highlight my scores. Red dashed lines represent the average values of the scores, whereas the black ones represent the median values.

Dissemination

Publications

The complete list of my publications and patents is at the end of this document. I have always provided **open-access versions** of all the papers that I have published. In some cases, the published articles are available under **open-access policy**. I have always been available to **share the code and the data** underlying published results, with the exception of potential commercial exploitation or non-disclosure agreements with third parties. The code for the motion reconstruction algorithms is available along with the relevant dataset on Zenodo https://zenodo.org/record/804402. Similarly, the dataset created for human activity recognition, load estimation, and biomechanical analysis is available on Zenodo
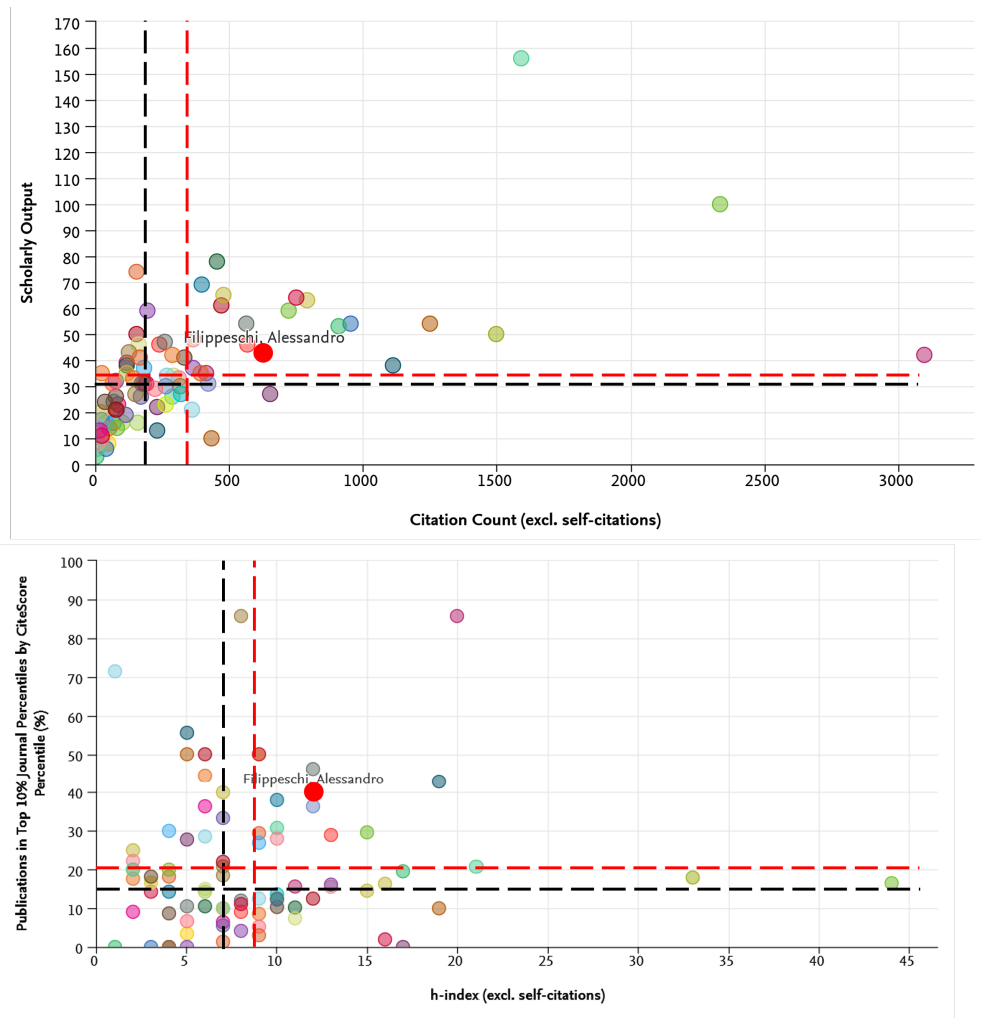
Figure 1: Bibliometric figures and comparison against the other researchers in Applied Mechanics. Red dashed lines represent the average values of the scores, whereas the black ones represent the median values. Red circles and my name printed on the figure highlight my scores.

`https://zenodo.org/record/4633087`. Data gathered for user skills evaluation in the framework of the EU RAMCIP project have been available on the project's data management portal for three years.

Editorial Activities

I am serving as

- **Associate Editor** of the Journal Frontiers in Robotics and AI - section Biomedical Robots.
- **Topic Editor** of the Journal MDPI Sensors.

I provided the following services for IEEE conferences:

- Participation on behalf of Carlo Alberto Avizzano, as secretary, in the **Standing Steering Committee of the conference RO-MAN 2017** - 26th IEEE International Symposium on Robot and Human Interactive Communication.
- Participation on behalf of Carlo Alberto Avizzano, as secretary, in the **Standing Steering Committee of the conference RO-MAN 2018** - 26th IEEE International Conference on Robot and Human Interactive Communication.
- member of the Program Committee of ROBIO - IEEE Conference on Robotics and Biomimetics from 2016 to 2019.

I serve as reviewer for the following journals and conferences:

- IEEE/ASME Journals: Transactions on Mechatronics, Transactions on Robotics, Robotics and Automation Letters, Sensors

- Frontiers: Robotics and AI, Physiology

- MDPI Sensors (**review editor**), Micromachines, Applied Sciences, Robotics, ISPRS International Journal of Geo-Information

- International Journal of Industrial Ergonomics

- Plos One

- Other Journals: Artificial Intelligence in Medicine, Computers and Electronics in Agriculture, Journal of Sports Engineering and Technology, Presence, others.

- IEEE Conferences: ICRA, IROS, ICORR, Biorob, Robio, Ro-man, World Haptics.

- Other conferences: Advances in Robot Kinematics, IFIT, ICIST, others.

Participation as speaker in scientific conferences

- **SIML 2021**. 83mo Congresso Nazionale di Medicina del Lavoro, online, 9-11 September 2020. Presentation (speaker) "Applicazione di una rete di sensori indossabili alla valutazione del rischio ergonomico nell'attività di carico-scarico di semirimorchi in ambito portuale".

- **IFIT 2020**. The 3rd IFToMM ITALY Conference, online, 15-17 September 2021. Presentation (speaker) "Kinematic optimization for the design of a UR5 robot end-effector for cardiac tele-ultrasonography".

- **ARK 2018**, 16th International Symposium on Advances in Robot Kinematics. Bologna, 1-5 July 2018. Presentation (speaker) titled "Online Calibration Procedure for Motion Tracking with Wearable Sensors Using Kalman Filtering".

- **GMA 2018** - Convegno del Gruppo Italiano di Meccanica Applicata. Catania 12-13 July 2018. Presentation (speaker) "Valutazione del rischio ergonomico tramite sensori indossabili".

- **RO-MAN 2018** - 27th IEEE International Symposium on Robot and Human Interactive Communication (IEEE - Scopus). Nanjing (CN), 27-31 Agosto 2018. Presentations (speaker) titled "Towards Skills Evaluation of Elderly for Human-Robot Interaction", and "A novel Diagnostician Haptic Interface for Tele-palpation"

- **GMA 2017** - Convegno del Gruppo Italiano di Meccanica Applicata. Bologna 11-12 Luglio 2017. Presentation (speaker) titled "Interfacce Robotiche per Telemedicina"

- **RO-MAN 2017** - 26th IEEE International Symposium on Robot and Human Interactive Communication (IEEE - Scopus). Lisbon, 28August - 1 September 2017. Presentation (speaker) titled "Teleoperated multimodal robotic interface for telemedicine: A case study on remote auscultation".

- Convegno dal titolo "Pevenzione e Sicurezza in un sistema complesso: le attività portuali". Venezia, 21 Settembre 2017. Invited speaker, presentation titled "Salute e Sicurezza per i lavoratori nelle aree portuali - Sailport INAIL BRIC-ID24".

- **SSRR 2016** - International Symposium on Safety, Security and Rescue Robotics (IEEE - Scopus). Lausanne (CH), 23-27 October 2016 Presentation (speaker) titled "New interaction metaphors to control a hydraulic working machine's arm".

- **MED 2014** - 22nd Mediterranean Conference on Control and Automation (MED) (IEEE - Scopus). Palermo. Presentations (speaker) titled "Assessment of task ergonomics with an upper limb wearable device"".

- **SKILLS 2011** - Second International Conference in Multimodal Interfaces for Skills Transfer. Montpellier. Presentations (speaker) titled "Expert rowers' motion analysis for synthesis and technique digitalization"" and "Preliminary evaluation of timing training accelerator for the sprint rowing system."".

- **SKILLS 2009** - First International Conference in Multimodal Interfaces for Skills Transfer. Bilbao. Presentation (speaker) titled "Visuo-vibrotactile trajectory training in rowing experiment"".

- **Laval Virtual 2009** - 11th International Conference on Virtual Reality. Laval (FR). Presentation (speaker) titled "Dynamic Models of rowing simulator for in-door skill training"".

Invited talks

In the last ten years I have been invited to give talks and seminars by academic and non-academic Institutions in the fields of biomechanics, ergonomics and exoskeletons:

- Seminar (6 hours) on biomechanics of human motion – invited by the Autonomous University of Mexico State – Toluca (Mexico) – August 2016

- Seminar (6 hours) on biomechanics of human motion – invited by the Tecnológico Nacional de México - Campus Orizaba – Toluca (Mexico) -August 2016

- Talk (2 hours) on multimodal interfaces for human skills training – invited by the Monterrey Institute of Technology and Higher Education – Monterrey (Mexico) – August 2016

- Talk (45 minutes) on wearable technologies for sensing and assistance at the Wearable Tech Turin 2015.

- Talk (45 minutes) on the research activities on Robotic Exoskeletons and Virtual Environments held at the workshop on Cerebral representation of Body, Movement and Space after spinal cord injury. Clinical and rehabilitative implications. Workshop organized by Fondazione Santa Lucia and Università La Sapienza – 29 November 2016

- Talk (20 minutes) on Technologies for ergonomic risk assessment and mitigation in maritime and port areas held at the national meeting on Prevention and Safety in complex systems: port and marine contexts, organized by INAIL (National Institute for Insurance against Accidents at Work) – Venezia, 21 September 2018.

- Talk (30 minutes) on Quantitative Evaluation of the Biomechanical Overload Risk in Ecological Conditions held at the workshop on Compensation in case of damage to the person, organized by the working group of ANIA (National Italian Association of Insurance Companies) – 22 February 2018

- Talk (30 minutes) on Technologies for ergonomic risk assessment and mitigation in maritime and port areas held at the regional meeting on Safety in the Livorno port, organized by Regione Toscana – Livorno, 14 February 2020

Other communication and dissemination activities

- Strabilianti 2022 – 6 and 16 September 2022, Livorno – Oral presentation "Interfacce multimodali per lo sport e disabilità, opportunità offerte dalle tecnologie attuali". Dissemination event to the general public – Event organized by Comune di Livorno, Questura di Livorno, Comitato Italiano Paralimpico Regione Toscana, Coni, Federazione Italiana Sport Paralimpici, Associazione Nazionale Cavalieri al merito della Repubblica, Confcommercio e altri

- Festival della Robotica 2018 – 2 October 2018, Pisa – Oral presentation "Percezione e Sensorizzazione Virtuali per Umani Virtuali" – Dissemination Event to the general public.

- Festival della Robotica 2017 – 11 September 2017, Pisa – Approccio cinematico per future soluzioni in ambito animatronico per il Carnevale di Viareggio– Dissemination Event to the general public.

- Altre forme di Welfare – 7 October 2017, Firenze – Oral presentation "Wearable technologies sui luoghi di lavoro: migliorare la salute dei lavoratori grazie alle nuove tecnologie indossabili" Dissemination event to the general public organized by Agenzia LAMA, Impact Hub Firenze e Circolo Culturale BUH, and supported by Fondazione Bosch, Fondazione Meyer, CGIL, Legacoop Toscana, UISP.

- L'aria che tira - 21 March 2014 – Exoskeletons with hybrid actuation – national, television (La7).

- Triwu - 3 December 2013 - Research activities on exoskeletons – national, radio (Radio 24).

Teaching and tutoring

Dates	February 2023 - today (24 hours per year)
Institution	University of Genoa
Activities	Lecturer of the course "Design of Advanced Machinery and Robotics" - MS Program "Mechanical Engineering Design and Production"
Dates	January 2022 - today (24 hours per year)
Institution	University of Pisa
Activities	Lecturer of the course "Laboratorio di Meccatronica e Visione" - MS Program "Robotics and Automation Enginnering"
Dates	June 2023 (6 hours)
Institution	Scuola Superiore Sant'Anna
Activities	Lecturer "Elements of Biomechanics and Human Behavioural Analysis in Work and Sport Environments" and "Physical Human Robot Interaction and multimodal interfaces". Seasonal School AIRONE.
Dates	June 2021 (4 hours)
Institution	Scuola Superiore Sant'Anna
Activities	Lecturer "Elements of Biomechanics and Human Behavioural Analysis in Work and Sport Environments" and "Physical Human Robot Interaction and multimodal interfaces". Seasonal School AIRONE.
Dates	June 2022 (4 hours)
Institution	University of Pisa
Activities	Lecturer "Strumenti per l'analisi biomeccanica e per la valutazione del rischio biomeccanico". Postgraduate Master (first level).
Dates	June 2021 (8 hours)
Institution	University of Pisa
Activities	Lecturer "Biomeccanica ed Ergonomia Applicazione del software AnyBody per l'Analisi Biomeccanica". Postgraduate Master (first level).
Dates	Feb 2017 - Today (20 hours per year)
Institution	Scuola Superiore Sant'Anna
Activities	Lecturer "Mechanics of Robots". Teaching assistant of the course. - Internal Course for Engineering students of Scuola Superiore Sant'Anna.
Dates	October 2017 - September 2021 (24 hours per year)
Institution	University of Pisa
Activities	Lecturer of the course ' "Laboratorio di Meccanica e Meccatronica" - MS Program "Robotics and Automation Enginnering"
Dates	October 2017 - September 2020 (24 hours per year)
Institution	University of Pisa and Scuola Superiore Sant'Anna
Activities	Lecturer of the courses 'Digital Control Systems and Mechatronics" - MS Program "Embeddec Computing Systems Engineering"

Dates	November 2016 - September 2020 (10 hours per year)
Institution	Scuola Superore Sant'Anna
Activities	Lecturer "Introduction to Computer Assisted Design (CAD) Modeling" - PhD in Emerging Digital Technologies
Dates	May 2014 - September 2017 (24 hours per year)
Institution	University of Pisa
Activities	Mentoring and teaching support for the course Mentoring and teaching support for the courses "Digital Control Systems and Mechatronics" and "Laboratorio di Meccanica e Meccatronica" (Mechanics and Mechatronics Laboratory).
Dates	Feb 2015 - May 2015 (10 hours)
Institution	Scuola Superiore Sant'Anna
Activities	Lecturer "Interaction with Virtual Environments". Teaching assistant of the course. - PhD in Emerging Digital Technologies.

I have tutored many of the doctoral students that graduated under the supervision of Prof. Carlo Alberto Avizzano and Dr. Emanuele Ruffaldi. The students I have helped more include Lorenzo Peppoloni (IMU-based motion tracking algorithms), Juan Manuel Jacinto Villegas (Haptic Interfaces), Filippo Brizzi (Haptic Interfaces and telepresence), Giulia Bassani (Wearable Sensor Network), Lorenzo Landolfi (Vision-based motion tracking). I am currently the co-supervisor of two PhD candidates in Emerging Digital Technology at SSSA. I have been part of the committee for the graduation of 8 PhD students in Emerging Digital Technologies at SSSA.

Since 2009 I have been supervisor of 12 MS candidates in robotics and automation at the University of Pisa and at Scuola Superiore Sant'Anna:

Student	MS Program	Year	Title (translated to English when originally in Italian)
Riccardo Bezzini	Robotics and Automation	2023	Transparency evaluation for the Kinematic Design of the Harnesses in Lower Limb Exoskeletons.
Emilio Maoddi	Robotics and Automation	2022	Development of a multi-camera system for the estimation of body segments volume aimed at cardiac insufficiency risk assessment.
Andrea Ferroni	Robotics and Automation	2021	Design and control simulation of a full body exoskeleton with hybrid actuation for power assist in lifting and pushing loads on a platform.
Gabriele Scivoletto	Embedded Computing Systems	2019	A robust Extended Kalman Filter with Gaussian mixture input observations for stitching and reconstructing rolling stocks from a single camera video flow.
Luca Crosato	Robotics and Automation	2019	Deep Learning assisted closed chain inverse dynamics for Biomechanical analysis during object manipulation.
Gabriele Baris	Embedded Computing Systems	2019	Visual SLAM for Driverless racing vehicle.
Salvatore D'Avella	Embedded Computing Systems	2019	Autonomous pick and place in cluttered environments.
Daniel Collazzo	Embedded Computing Systems	2018	Distributed data discovery and service for visual analysis and monitoring of running trains' health status.
Paolo Giannini	Robotics and Automation	2018	Wearable Sensor Network for the automatic evaluation of ergonomic risk.
Sara Falleni	Embedded Computing Systems	2017	A model-mediated tele-auscultation system with multimodal feedback.
Giuseppe Di Napoli	Robotics and Automation	2015	Design simulation and development of a decentralized control for a robotic manipulator.

Other teaching activities

Period	Hours	Framework	Course title
November 2016	8	Toscana LLL – Life Long Learning	Certificazione dei processi di saldatura ai sensi delle norme EN 1090
September 2017	12	ALEX – Arm Light Exoskeleton technology transfer	Implementazione dei processi per la costruzione di parti strutturali in metallo per il settore biomedicale
October 2017	12	ALEX – Arm Light Exoskeleton technology transfer	Attrezzaggio dei centri di lavoro per la costruzione di componenti meccaniche per il settore biomedicale.
October 2017	16	ALEX – Arm Light Exoskeleton technology transfer	Utilizzo delle macchine CNC per la costruzione di componenti meccaniche per il settore biomedicale.
January 2018	12	ALEX – Arm Light Exoskeleton technology transfer	Implementazione dei processi per la costruzione di parti in metallo a taglio laser per il settore biomedicale.
September 2018	12	"MIN"- Integrazione-Innovazione - Internazionalizzazione nella filiera Meccanica dell'area Pisa-Lucca-Pistoia-Prato	CAD parametrico.
February 2020	16	ALEX Hybrid technology transfer	Processi per lo sviluppo prototipale e la produzione di componenti strutturali dell'esoscheletro per gli arti superiori in conformità alla ISO 13485.

Enterprise

I am co-founder and collaborator of the company **Wearable Robotics S.r.L.**, Spin-Off of Scuola Superiore Sant'Anna. The company focuses on the design and commercialization of exoskeletons aimed at rehabilitation and human power assist and augmentation.

I contributed to the establishment of the company with the Marzotto award prize. I collaborated with the company in the research and development and product development areas. Ihave contributed to fund raising through the participation in research projects.

Awards

Winner of **Marzotto's Impresa del Futuro award**, providing a money prize of 250000€ and support for the start-up management. November 2013. See Premio Gaetano Marzotto `http://www.premiogaetanomarzotto.it/category/progetti-vincitori-2013/`

Second place at the **StartCup Toscana 2014 award**, providing a money prize of 3000€ and the access to the Premio Nazionale per l'innovazione contest. October 2014.

Finalist (top 5) at best paper award selection in the IEEE International Conference on Real-time Computing and Robotics 2019.

Education

PhD in Innovative information and communication technologies

Dates	November 2008 - November 2012
Institution	Scuola Superiore Sant'Anna, PERCRO Laboratory, Pisa
Marks	100/100 with honors
Thesis	**Training in Sport exploiting Virtual Reality: study, design and evaluation of a multimodal platform for rowing training**
Activities	**Human Computer Interface**: Study and development of multimodal systems for human abilities capturing, analysis and transfer of skills, with a focus on rowing. These studies carried out within the **SKILLS IP European project** in collaboration with M2H Laboratory of Montpellier University UM1 (France), Technion Israel Institute of Technology (Israel), Aalborg University (Denmark), and Oxford Metric Group (England). In particular, activities included: mechatronic design of the simulator and physical simulation of rowing based on the simulator sensors; rowers' kinetic analysis based on the physical simulation and motion capture; study and experiments for skills acquisition performed on custom instrumented rowing shells and on the developed rowing training system by means of multimodal (visual, audotory and vibrotactile) feedback; analysis, evaluation and digital representation of human skills by using machine lerning techniques.

Research period abroad

Dates	May 2012 - October 2012
Institution	Deutsches Forschungszentrum fuer Kuenstliche Intelligenz GmbH, Kaiserslautern (Germany)
Activities	**Motion Tracking by means of inertial units (IMU)**: Upper limb motion of humans is reconstructed by sensor fusion of IMUs output. Complementary filters, Kalman filters and extended Kalman filters were used to test and modify existing models for coupling sensor measurements estimation based on upper limbs kinematic and data gathered from IMUs.

Master of Science in Mechanical Engineering

Dates	November 2005 - October 2007
Institution	University of Pisa, Pisa
Marks	110/110 with honors
Thesis	Studio e progettazione di un simulatore meccanico per la voga indoor (**Mechanical design of a simulator for indoor rowing**)

Bachelor in Mechanical Engineering

Dates	October 2002 - October 2005
Institution	University of Pisa, Pisa
Marks	110/110
Dissertation Project	Studio della Cinematica di un giunto frontale con ruote a pioli (**Kinematic analysis of a novel pin wheel joint**)

Qualifications and Certifications

Qualifications

- **National Scientific Qualification (art.16 of the law 30 December 2010, n.240) in Mechanics Applied to Machines** from 3 February 2022 to 3 February 2031.

- Qualification as Industrial Engineer.

- Qualification for teaching Mechanical Science and Technology in High Schools.

Languages

Italian	Mother tongue
English	Fluent (C1 level CEFR)
German	Upper Intermediate (B2 level CEFR)
French	Beginner (A2 level CEFR)

Publications and patents

Articoli (J= peer reviewed journal, C= book chapter)

2023

J:Bezzini, R., Crosato, L., Teppati Losè, M., Avizzano, C. A., Bergamasco, M., and **Filippeschi, A.** (2023). Closed-chain inverse dynamics for the biomechanical analysis of manual material handling tasks through a deep learning assisted wearable sensor network. *Sensors*, 23(13):5885

Porcini, F., **Filippeschi, A.**, Solazzi, M., Avizzano, C. A., and Frisoli, A. (2023). Actuator capabilities aware limitation for tdpa passivity controller action. In *Robotics and Automation (ICRA), 2023 IEEE International Conference on*, page accepted. IEEE

2022

J:Tripicchio, P., D'Avella, S., Camacho-Gonzalez, G., Landolfi, L., Baris, G., Avizzano, C. A., and **Filippeschi, A.** (2022). Multi-camera extrinsic calibration for real-time tracking in large outdoor environments. *Journal of Sensor and Actuator Networks*, 11(3):40

Lippi, V., **Filippeschi, A.**, Camardella, C., Porcini, F., Maurer, C., and Lencioni, L. (2022). Exosmooth: Test of innovative exoskeleton control for smooth assistance, with and without ankle actuation. In *2022 17th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, pages 890–894. IEEE

Hernández-Rámos, M. A., Flores-Cuautle, J. d. J. A., **Filippeschi, A.**, Rodríguez-Jarquin, J. P., Landeta-Escamilla, O., Jacinto-Villegas, J. M., and Sandoval-Gonzalez, O. O. (2022). Design of a biomechatronic device for upright mobility in people with sci using an exoskeleton like a stabilization system. *Applied Sciences*, 12(16):8098

2021

J:**Filippeschi, A.**, Griffa, P., and Avizzano, C. A. (2021). Kinematic optimization for the design of a collaborative robot end-effector for tele-echography. *Robotics*, 10(1):8

J:Camardella, C., Porcini, F., **Filippeschi, A.**, Marcheschi, S., Solazzi, M., and Frisoli, A. (2021). Gait phases blended control for enhancing transparency on lower-limb exoskeletons. *IEEE Robotics and Automation Letters*, 6(3):5453–5460

J:Bassani, G., **Filippeschi, A.**, and Avizzano, C. A. (2021a). A dataset of human motion and muscular activities in manual material handling tasks for biomechanical and ergonomic analyses. *IEEE Sensors Journal*, 21(21):24731–24739

Bassani, G., **Filippeschi, A.**, Graziano, A., and Avizzano, C. A. (2021b). A wearable device to assist the evaluation of workers health based on inertial and semg signals. In *2021 29th Mediterranean Conference on Control and Automation (MED)*, pages 669–674. IEEE

Lippi, V., Camardella, C., **Filippeschi, A.**, and Porcini, F. (2021). Identification of gait phases with neural networks for smooth transparent control of a lower limb exoskeleton. In *18th International Conference on Informatics in Control, Automation and Robotics*, pages 171–178

2020

J:Giannini, P., Bassani, G., Avizzano, C. A., and **Filippeschi, A.** (2020). Wearable sensor network for biomechanical overload assessment in manual material handling. *Sensors*, 20(14):3877

Griffa, P., **Filippeschi, A.**, and Avizzano, C. A. (2020). Kinematic optimization for the design of a ur5 robot end-effector for cardiac tele-ultrasonography. In *The International Conference of IFToMM ITALY*, pages 423–430. Springer

2019

Filippeschi, A., Pellicci, M., Vanni, F., Forte, G., Bassani, G., Landolfi, L., DeMerich, D., Campo, G., Avizzano, C. A., and Bergamasco, M. (2019b). The sailport project: A trilateral approach to the improvement of workers' safety and health in ports. In *Advances in Safety Management and Human Factors: Proceedings of the AHFE 2019 International Conference on Safety Management and Human Factors, July 24–28, 2019, Washington DC, USA*, page 69. Springer

J:**Filippeschi, A.**, Brizzi, F., Ruffaldi, E., Jacinto Villegas, J. M., Landolfi, L., and Avizzano, C. A. (2019a). Evaluation of diagnostician user interface aspects in a virtual reality-based tele-ultrasonography simulation. *Advanced Robotics*, pages 1–13

Landolfi, L., Tripicchio, P., **Filippeschi, A.**, and Avizzano, C. A. (2019). Fast and fluid human pose tracking. In *2019 IEEE International Conference on Real-time Computing and Robotics*

J:Avizzano, C. A., Tripicchio, P., Ruffaldi, E., **Filippeschi, A.**, and Jacinto Villegas, J. M. (2019). Real-time embedded vision system for the watchfulness analysis of train drivers. *IEEE Transactions on Intelligent Transportation Systems*, pages 1 – 11. 10.1109/TITS.2019.2955787

2018

J:Bassani, G., **Filippeschi, A.**, and Ruffaldi, E. (2018). Nonresonant kinetic energy harvesting using macrofiber composite patch. *IEEE Sensors Journal*, 18(5):2068–2076

Filippeschi, A., Ruffaldi, E., Peppoloni, L., and Avizzano, C. A. (2018b). Online calibration procedure for motion tracking with wearable sensors using kalman filtering. In *International Symposium on Advances in Robot Kinematics*, pages 440–448. Springer

Jacinto, J. M., **Filippeschi, A.**, Avizzano, C. A., and Ruffaldi, E. (2018). Preliminary stiffness perception assessment for a tele-palpation haptic interface. In *International Conference on Human Haptic Sensing and Touch Enabled Computer Applications*, pages 175–185. Springer

Filippeschi, A., Villegas, J. M. J., Satler, M., and Avizzano, C. A. (2018c). A novel diagnostician haptic interface for tele-palpation. In *2018 27th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)*, pages 328–335. IEEE

Filippeschi, A., Peppoloni, L., Kostavelis, I., Gerłowska, J., Ruffaldi, E., Giakoumis, D., Tzovaras, D., Rejdak, K., and Avizzano, C. A. (2018a). Towards skills evaluation of elderly for human-robot interaction. In *2018 27th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)*, pages 886–892. IEEE

2017

J:**Filippeschi, A.**, Schmitz, N., Miezal, M., Bleser, G., Ruffaldi, E., and Stricker, D. (2017). Survey of motion tracking methods based on inertial sensors: A focus on upper limb human motion. *Sensors*, 17(6):1257

J:Jacinto-Villegas, J. M., Satler, M., **Filippeschi, A.**, Bergamasco, M., Ragaglia, M., Argiolas, A., Niccolini, M., and Avizzano, C. A. (2017). A novel wearable haptic controller for teleoperating robotic platforms. *IEEE Robotics and Automation Letters*, 2(4):2072–2079

Falleni, S., **Filippeschi, A.**, Ruffaldi, E., and Avizzano, C. A. (2017). Teleoperated multimodal robotic interface for telemedicine: A case study on remote auscultation. In *Robot and Human Interactive Communication (RO-MAN), 2017 26th IEEE International Symposium on*, pages 476–482. IEEE

2016

J:Peppoloni, L., **Filippeschi, A.**, Ruffaldi, E., and Avizzano, C. (2016). A novel wearable system for the online assessment of risk for biomechanical load in repetitive efforts. *International Journal of Industrial Ergonomics*, 52:1–11

J:Loconsole, C., Frisoli, A., Semeraro, F., Stroppa, F., Mastronicola, N., **Filippeschi, A.**, and Marchetti, L. (2016). Relive: A markerless assistant for cpr training. *IEEE Transactions on Human-Machine Systems*, PP(99):1–6

Di Napoli, G., **Filippeschi, A.**, Tanzini, M., and Avizzano, C. A. (2016). A novel control strategy for youbot arm. In *Industrial Electronics Society, IECON 2016-42nd Annual Conference of the IEEE*, pages 482–487. IEEE

Filippeschi, A., Brizzi, F., Jacinto, J., Ruffaldi, E., Avizzano, C., Taddei, C., Pasanisi, E., Petersen, C., Emdin, M., Szczesniak-Stanczyk, D., and others (2016). Preliminary usability assessment for a novel robotic interface for remote doppler-echocardiography. In *European Heart Journal*, volume 37, pages 1043–1043. Oxford Univ Press Great Clarendon St, Oxford OX2 6DP, England

Tanzini, M., Jacinto-Villegas, J. M., **Filippeschi, A.**, Niccolini, M., and Ragaglia, M. (2016). New interaction metaphors to control a hydraulic working machine's arm. In *Safety, Security, and Rescue Robotics (SSRR), 2016 IEEE International Symposium on*, pages 297–303. IEEE

2015

J:Ruffaldi, E., Peppoloni, L., and **Filippeschi, A.** (2015c). Sensor fusion for complex articulated body tracking applied in rowing. *Proceedings of the Institution of Mechanical Engineers, Part P: Journal of Sports Engineering and Technology*, 229(2):92–102

Ruffaldi, E., **Filippeschi, A.**, Brizzi, F., Jacinto, J. M., and Avizzano, C. A. (2015b). Encountered haptic augmented reality interface for remote examination. In *3D User Interfaces (3DUI), 2015 IEEE Symposium on*, pages 179–180. IEEE

Filippeschi, A., Brizzi, F., Ruffaldi, E., Jacinto, J. M., and Avizzano, C. A. (2015). Encountered-type haptic interface for virtual interaction with real objects based on implicit surface haptic rendering for remote palpation. In *Intelligent Robots and Systems (IROS), 2015 IEEE/RSJ International Conference on*, pages 5904–5909

Ruffaldi, E., Brizzi, F., **Filippeschi, A.**, and Avizzano, C. A. (2015a). Co-located haptic interaction for virtual usg exploration. In *Engineering in Medicine and Biology Society (EMBC), 2015 37th Annual International Conference of the IEEE*, pages 1548–1551. IEEE

Bassani, G., **Filippeschi, A.**, and Ruffaldi, E. (2015). Human motion energy harvesting using a piezoelectric mfc patch. In *Engineering in Medicine and Biology Society (EMBC), 2015 37th Annual International Conference of the IEEE*, pages 5070–5073. IEEE

Avizzano, C. A., **Filippeschi, A.**, Jacinto, J. M., and Ruffaldi, E. (2015). An optimal geometric model for clavels delta robot. In *In Proceedings of the 2015 European Modelling Symposium. IEEE Computer Society*, pages 232–237. IEEE

Patrinostro, S., Tanzini, M., Satler, M., Ruffaldi, E., **Filippeschi, A.**, and Avizzano, C. A. (2015). A haptic-assisted guidance system for working machines based on virtual force fields. In *Information, Communication and Automation Technologies (ICAT), 2015 XXV International Conference on*, pages 1–6. IEEE

2014

J: Hoffmann, C. P., **Filippeschi, A.**, Ruffaldi, E., and Bardy, B. G. (2014). Energy management using virtual reality improves 2000-m rowing performance. *Journal of sports sciences*, 32(6):501–509

Ruffaldi, E., Peppoloni, L., **Filippeschi, A.**, and Avizzano, C. A. (2014). A novel approach to motion tracking with wearable sensors based on probabilistic graphical models. In *Robotics and Automation (ICRA), 2014 IEEE International Conference on*, pages 1247–1252. IEEE

Peppoloni, L., **Filippeschi, A.**, and Ruffaldi, E. (2014). Assessment of task ergonomics with an upper limb wearable device. In *2014 22nd Mediterranean Conference on Control and Automation (MED) Proceedings*

Lenzo, B., **Filippeschi, A.**, Ruffaldi, E., Marcheschi, S., Frisoli, A., Salsedo, F., and Bergamasco, M. (2014). Alex, a new exoskeleton for power assist and motor learning. In *International workshop on Wearable Robotics*

2013

J: **Filippeschi, A.** and Ruffaldi, E. (2013). Boat dynamics and force rendering models for the sprint system. *Human-Machine Systems, IEEE Transactions on*, 43(6):631–642

J: Varlet, M., **Filippeschi, A.**, Ben-sadoun, G., Ratto, M., Marin, L., Ruffaldi, E., and Bardy, B. G. (2013). Virtual reality as a tool to learn interpersonal coordination: Example of team rowing. *PRESENCE: Teleoperators and Virtual Environments*, 22(3):202–215

Peppoloni, L., **Filippeschi, A.**, Ruffaldi, E., and Avizzano, C. A. (2013). A novel 7 degrees of freedom model for upper limb kinematic reconstruction based on wearable sensors. In *Intelligent Systems and Informatics (SISY), 2013 IEEE 11th International Symposium on*, pages 105–110. IEEE

2012

J: Ruffaldi, E. and **Filippeschi, A.** (2013). Structuring a virtual environment for sport training: A case study on rowing technique. *Robotics and Autonomous Systems*, 61(4):390–397

C: Ruffaldi, E., **Filippeschi, A.**, Varlet, M., Hoffman, C., and Bardy, B. (2012). Design and evaluation of a multimodal vr platform for rowing training. In Bardy, Benoît; Bergamasco, Massimo; Gopher, D., editor, *Skill Training in Multimodal Virtual Environments*, number ISBN 978-143-987-895-8. Taylor and Francis

Filippeschi, A., Tripicchio, P., Satler, M., and Ruffaldi, E. (2012). Capturing the rower performance on the sprint platform. In Botia, J. A., editor, *Intelligent Environments; Workshop Proceedings*, number ISBN 978-161-499-079-6, pages 331–340. IOS Press, Incorporated, IOS Press

2011

J: Ruffaldi, E., **Filippeschi, A.**, Avizzano, C. A., Bardy, B., Gopher, D., and Bergamasco, M. (2011a). Feedback, affordances and accelerators for training sports in virtual environments. *MIT Presence*, 20(1):33–46

Johard, L., **Filippeschi, A.**, and Ruffaldi, E. (2011a). Real-time error detection for a rowing training system. *BIO Web of Conferences*, 1:00044

Shorr, Y., **Filippeschi, A.**, Gopher, D., Ruffaldi, E., and Korman, M. (2011). Evaluation of multimodal feedback effects on improving rowing competencies. *BIO Web of Conferences*, 1:00083

Filippeschi, A. and Ruffaldi, E. (2011). Expert rowers' motion analysis for synthesis and technique digitalization. *BIO Web of Conferences*, 1:00024

Filippeschi, A., Ruffaldi, E., and Korman, M. (2011). Preliminary evaluation of timing training accelerator for the sprint rowing system. *BIO Web of Conferences*, 1:00025

Hoffmann, C. P., **Filippeschi, A.**, Ruffaldi, E., Blanc, S., Verbrugge, L., and Bardy, B. G. (2011). Mastering energy management during rowing using virtual reality. *BIO Web of Conferences*, 1:00035

Ruffaldi, E., **Filippeschi, A.**, Bardy, B., Marin, L., Varlet, M., Hoffmann, C., Korman, M., Gopher, D., and Bergamasco, M. (2011b). Training rowing with virtual environments. *BIO Web of Conferences*, 1:00078

Johard, L., Ruffaldi, E., Hoffmann, P., and **Filippeschi, A.** (2011b). Machine learning analysis of binaural rowing sounds. *BIO Web of Conferences*, 1:00043

2010

J: Frisoli, A., Ruffaldi, E., **Filippeschi, A.**, Avizzano, C. A., Vanni, F., and Bergamasco, M. (2010). In-door skill training in rowing practice with a vr based simulator. *International Journal of Sport Psychology*, 41(4):14

Ruffaldi, E., **Filippeschi, A.**, Avizzano, C. A., and Bergamasco, M. (2010). Skill modeling and feedback design for training rowing with virtual environments. In Kaber, D. and Boy, G., editors, *Proceedings of 3rd Conference on Human Factors and Ergonomics*, number 978-1-4398-3491-6, pages 832–841. CRC Press / Taylor & Francis, Ltd

Tripicchio, P., **Filippeschi, A.**, Ruffaldi, E., Tecchia, F., Avizzano, C. A., and Bergamasco, M. (2010). A measuring tool for accurate haptic modeling in industrial maintenance training. In *Haptics: Generating and Perceiving Tangible Sensations*, pages 377–384. Springer

2009

Filippeschi, A., Ruffaldi, E., Frisoli, A., Avizzano, C. A., Varlet, M., Marin, L., Lagarde, J., Bardy, B., and Bergamasco, M. (2009). Dynamic models of team rowing for a virtual environment rowing training system. *The International Journal of Virtual Reality*, 4(8):19–26

Ruffaldi, E., **Filippeschi, A.**, Frisoli, A., Sandoval, O., Avizzano, C. A., and Bergamasco, M. (2009b). Vibrotactile perception assessment for a rowing training system. In *EuroHaptics Conference, 2009 and Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems. World Haptics 2009. Third Joint*, pages 350–355. IEEE

Ruffaldi, E., Sandoval-Gonzalez, O., **Filippeschi, A.**, Tripicchio, P., Frisoli, A., Avizzano, C., and Bergamasco, M. (2009d). Integration of multimodal technologies for a rowing platform. In *Mechatronics, 2009. ICM 2009. IEEE International Conference on*, pages 1–6. IEEE

Tripicchio, P., Sandoval-Gonzalez, O., **Filippeschi, A.**, Ruffaldi, E., Avizzano, C. A., and Bergamasco, M. (2009). Human forces in hands free interaction: a new paradigm for immersive virtual environments. In *Robot and Human Interactive Communication, 2009. RO-MAN 2009. The 18th IEEE International Symposium on*, pages 1179–1185. IEEE

Ruffaldi, E., **Filippeschi, A.**, Frisoli, A., Avizzano, C. A., Benoit, B., Gopher, D., and Bergamasco, M. (2009a). Sprint: a training system for skills transfer in rowing. In *SKILLS09 International Conference on Multimodal Interfaces for Skills Transfer*, number ISBN:978-84-613-5456-5, Bilbao,Spain

Ruffaldi, E., **Filippeschi, A.**, Gonzales, O., and Gopher, D. (2009c). Visuo-vibrotactile trajectory training in rowing experiment. In *SKILLS09 International Conference on Multimodal Interfaces for Skills Transfer*

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