

# Serena Moscato

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Biomedical Engineer, Junior Assistant Professor (RTD-A) at University of Bologna

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- h-index 5 (last update: 13/09/2024)

## Work Experience

**DECEMBER 2023 - PRESENT**

**JUNIOR ASSISTANT PROFESSOR (RTD-A) | UNIVERSITY OF BOLOGNA (IT)**

- Funding project: DARE – Digital Lifelong Prevention, PNC project funded by Ministry of University and Research
- Main activities: digital health solution development for prevention, health data management, biomedical signal and data analysis, wearable device management, artificial intelligence algorithms, scientific article production

**FEBRUARY 2023 – DECEMBER 2023**

**POST-DOC RESEARCH FELLOW | UNIVERSITY OF BOLOGNA (IT)**

- Funding project: EDITH – An ecosystem for digital twin in healthcare, Coordinated and Support Action, Digital European Program
- Main activities: health data management, standardization, biomedical signal and data analysis, scientific article production

**FEBRUARY 2020 – SEPTEMBER 2020**

**TEACHING TUTOR | UNIVERSITY OF BOLOGNA (IT)**

- Course: Biomedical Engineering Laboratory – Bachelor's Degree in Biomedical Engineering (Cesena Campus)

**OCTOBER 2018 – OCTOBER 2019**

**RESEARCH FELLOW | UNIVERSITY OF BOLOGNA (IT)**

- Funding project: Design of algorithms for the analysis of physiological signals recorded with Personal Health Systems
- Main activities: biomedical signal and data analysis, wearable device management, protocol writing for clinical trials, patent writing, industrial research, scientific article production

**JUNE 2018 – SEPTEMBER 2018**

**OCCASIONAL COLLABORATION CONTRACT | UNIVERSITY OF BOLOGNA (IT)**

- Funding project: MOTU - robotic lower limb prosthesis with smart socket and bidirectional interface for lower limb amputees
- Main activities: biomedical signal and data analysis, statistical analysis

## Education

**SEPTEMBER 2022 – JANUARY 2023**

**VISITING PHD STUDENT | NORTHEASTERN UNIVERSITY (USA)**

- Project: Novel Computational Methods for Continuous Objective Multimodal Pain Assessment Sensing System
- Main activities: biomedical signal and data analysis, artificial intelligence algorithms, statistical analysis, scientific article production

## **NOVEMBER 2019 – JUNE 2023**

### **PHD CANDIDATE | UNIVERSITY OF BOLOGNA (IT)**

- Project: [In search of] Digital biomarkers for objective pain assessment
- Main activities: biomedical signal and data analysis, wearable device management, artificial intelligence algorithms, statistical analysis, scientific article production, protocol writing for clinical trials, documentation management for ethics committee, experimental development and industrial research

## **SEPTEMBER 2015 – MARCH 2018**

### **MASTER'S DEGREE IN BIOMEDICAL ENGINEERING | UNIVERSITY OF BOLOGNA (IT)**

- Thesis project: Study of fractal features of functional MRI signals
- Vote: 110/110 cum laude

## **SEPTEMBER 2011 – JULY 2014**

### **BIOMEDICAL ENGINEERING IN INFORMATION ENGINEERING | UNVIERSITY MEDITERRANEA REGGIO CALABRIA (IT)**

- Thesis project: Differential microwave imaging for vesicoureteral reflux monitoring: measurement scenario optimization and performance analysis
- Vote: 110/110 cum laude

## **SEPTEMBER 2006 – JUNE 2011**

### **SCIENTIFIC HIGH SCHOOL DIPLOMA | ISTITUTO S. VINCENZO DE PAOLI (IT)**

- Vote: 100/100

## **Scientific Activity**

### **Research projects**

#### **OCTOBER 2023 – PRESENT**

- Bando PR-FESR Emilia Romagna 2021-2027 – REMEDY: Remote personalized modular monitoring for management of patients with non-communicable diseases to improve physiological and social recovery
- Activities: biomedical signal analysis, support in hardware development, project management

#### **JUNE 2023 – PRESENT**

- EU-HORIZON-RIA: METASTRA: Computer-aided effective fracture risk stratification of patients with vertebral metastases for personalized treatment through robust computational models validated in clinical settings
- Activities: data management, data standardization, REDCap CRF development

#### **MAY 2023 – PRESENT**

- EU-HORIZON-RIA: CPW: Cancer Prevention at Work – Occupational health surveillance in the implementation of prevention of infection-related cancer
- Activities: data management, data standardization, REDCap CRF development

#### **FEBRUARY 2023 – PRESENT**

- EU-HORIZON-RIA: BIOTOOL-CHF: Biomarker based diagnostic toolkit to personalize pharmacological approaches in congestive heart failure
- Activities: data management, data standardization, REDCap CRF development

#### **SEPTEMBER 2022 – PRESENT**

- PNC: DARE – Digital Lifelong Prevention
- Activities: pilot projects revision, WP management, data management, technology R&D

#### **JUNE 2021 – PRESENT**

- EU Coordinated and Supported Action: EDITH – An Ecosystem for the digital twin in healthcare
- Activities: data standardization, user interface design, vision and roadmap drafting

### **AUGUST 2022 – PRESENT**

- Coordinated project with IRCCS Istituto delle Scienze Neurologiche di Bologna: PAINLESS - Pain assessment through wearable devices in patients undergoing neurorehabilitation
- Activities: biomedical data and signal processing, artificial intelligence, clinical protocol drafting, manuscript drafting

### **AUGUST 2022 – PRESENT**

- Coordinated project with IRCCS Istituto delle Scienze Neurologiche di Bologna: PAINLESS - Pain assessment through wearable devices in patients undergoing neurorehabilitation
- Activities: biomedical data and signal processing, artificial intelligence, clinical protocol drafting, manuscript drafting

### **SEPTEMBER 2022 – SEPTEMBER 2023**

- National Science Foundation – USA: COMPASS – Continuous Objective Multimodal Pain Assessment Sensing System
- Activities: Biomedical signal and data process, manuscript drafting

### **NOVEMBER 2020 – DECEMBER 2022**

- PPEG-AF - Prospective study on PPG and EEG signals for the monitoring of patients candidate to cardioversion and atrial fibrillation or flutter
- Activities: Signal processing, manuscript drafting

### **JUNE 2020 – MARCH 2021**

- Bando PR-FESR Emilia Romagna COVID emergency: MySIGN – Multiparametric Physiological Safe Monitoring of Patients with COVID
- Activities: Hardware development, algorithms development, signal processing, project management

### **SEPTEMBER 2018 – JULY 2020**

- Evonik Nutrition & Care GmbH: Industrial research collaboration and experimental development of algorithms for cardiovascular health assessment using PPG
- Activities: Clinical study data collection, algorithms development, signal processing, patent drafting

### **JUNE 2018 – PRESENT**

- Fondazione ANT: Look of Life 2.0 - Virtual reality at the home of the cancer patient in home palliative care
- Activities: Clinical study preparation, biomedical signal and data analysis, manuscript drafting

## **Scientific articles**

- [under review] Marfoggia A., Nardini F., Arcobelli V.A., Moscato S., Mellone S., Carbonaro A. Towards real-world clinical data standardization: a modular FHIR-driven transformation pipeline to enhance semantic interoperability in healthcare. Journal of Biomedical Informatics (IF 4.0)
- Arcobelli V.A., Moscato S., Palumbo P., Marfoggia A., Nardini F., Randi P., Davalli A., Carbonaro A., Chiari L., Mellone S., A 10-year data collection on the clinical rehabilitation pathway of 1006 trans-femoral amputees, Scientific Data (IF 10.8), 2024, doi: <https://doi.org/10.1038/s41597-024-03593-6>, 2024
- Giannelli A., Moscato S., Ostan R., Pannuti R., Chiari L., Biasco G., Varani S. Virtual Reality for advanced cancer patients assisted at home: a randomized controlled interventional study. Psycho-Oncology (IF 3.955)
- Moscato S., Orlandi S., Di Gregorio F., Lullini G., Pozzi S., Sabattini L., Chiari L., La Porta F. Study protocol for a feasibility interventional study investigating PAIN in neurorehabilitation through wearabLE SensorS (PAINLESS). BMJ Open (IF 3.007), <https://doi.org/10.1002/pon.6368>, 2024
- Massaro G., Moscato S., Spagni S., Dall'Olio L., Belà R., Spadotto A., Frisoni J., Biffi M., Galié N., Chiari L., Castellani G., Diemberger I. Prospective study on photoplethysmographic and

- electroencephalographic signals for the monitoring of candidates to electrical cardioversion of atrial arrhythmias (PPEEG-AF pilot study). *Journal of Mechanics in Medicine and Biology* (IF 0.883), doi: 10.1142/S0219519423400195, 2023
- Spadotto A, Moscato S., Massaro G., Spagni S., Chiari L., Diemberger I. Wearable multiparametric device for remote monitoring of cardiorespiratory function. *Journal of Mechanics in Medicine and Biology* (IF 0.883), doi: 10.1142/S0219519423400298, 2023
  - Moscato S., Lo Giudice S., Massaro G., Chiari L. Wrist photoplethysmography signal quality assessment for reliable heart rate estimate and morphological analysis. *Sensors* (IF 3.847), doi: 10.3390/s22155831, 2022
  - Moscato S., Palmerini L., Palumbo P., Chiari L. Quality assessment and morphological analysis of photoplethysmography in daily life. *Frontiers in Digital Health* (IF 2.3), doi: 10.3389/fdgth.2022.912353, 2022
  - Zeleke A.J., Moscato S., Miglio R., Chiari L. Length of stay analysis of COVID-19 hospitalizations using a count regression model and quantile regression: a study in Bologna, Italy. *International Journal of Environmental Research and Public Health* (IF 4.614), doi: 10.3390/ijerph19042224, 2022
  - Moscato S., Cortelli P., Chiari L. Physiological responses to pain in cancer patients: a systematic review. *Computer Methods and Programs in Biomedicine* (IF 7.027), doi: 10.1016/j.cmpb.2022.106682, 2022
  - Palumbo P., Randi P., Moscato S., Davalli A., Chiari L. The degree of safety against falls provided by 4 different prosthetic knee types in people with transfemoral amputation: a retrospective observational study. *Physical Therapy* (IF 3.671), doi: 10.1093/ptj/pzab310, 2022
  - Moscato S., Sichi V., Giannelli A., Palumbo P., Ostan R., Varani S., Pannuti R., Chiari L. Virtual Reality in home palliative care: brief report on the effect on cancer-related symptomatology. *Frontiers in Psychology* (IF 4.232), doi: 10.3389/fpsyg.2021.709154, 2021

## Indexed conference proceedings

- [in press] Sicbaldi M., Moscato S., Palmerini L., Silvani A., Diemberger I., Chiari L. Lab vs. Real-world PPG characterization for blood pressure stratification in healthy individuals. *Computing in Cardiology*, 2024
- Arcobelli V.A., Moscato S., Marfoggia A., Nardini F., Randi P., Davalli A., Carbonaro A., Chiari L., Mellone S. MOTU on FHIR: A preliminary strategy to enable interoperability for retrospective data standardization. *IEEE EMBS Conference on Data Science and Engineering in Healthcare, Medicine and Biology*, 2023, 10.1109/IEEECONF58974.2023.10404816
- Moscato S., Orlandi S., Battaglia G., Di Gregorio F., Lullini G., Pozzi S., Sabattini L., Chiari L., La Porta F. Feasibility of a diagnostic differentiation tool for nociceptive and neuropathic pain in a neurorehabilitation population using physiological data from wearable sensors. *IEEE EMBS Conference on Data Science and Engineering in Healthcare, Medicine and Biology*, 2023, 10.1109/IEEECONF58974.2023.10404975
- Moscato S., Orlandi S., Giannelli A., Ostan R., Varani S., Chiari L. Autonomic response to virtual reality in oncological patients in real-world context. *VIII National Congress of Bioengineering*, 2023
- Moscato S., Zhu W., Guo Y., Khamarathi S., Colebaugh A., Schreiber K.L, Edwards R.R., Urman R.D., Ziao Y., Chiari L., Lin Y. Comparison of autonomic signals between healthy subjects and chronic low back pain patients at rest and during noxious stimulation. *VIII National Congress of Bioengineering*, 2023
- Moscato S., Orlandi S., Giannelli A., Ostan R., Chiari L. Automatic pain assessment on cancer patients using physiological signals recorded in real-world contexts. *44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, doi: 10.1109/EMBC48229.2022.9871990, 2022

- Palumbo P., Moscato S., Caterini G., Miccio A., Casagli L., Davalli A., Randi P., Chiari L. Falls and prostheses in patients with transfemoral amputation. VII National Congress of Bioengineering, 2020

## Non-Indexed conference proceedings

- Moscato S., Sicbaldi M., Orlandi S., Lullini G., Pozzi S., Sabattini L., Chiari L., La Porta F., Exploring the relationship between pain and physical activity in the real-world on people with Multiple Sclerosis". International Conference on Ambulatory Monitoring of Physical Activity and Movement (ICAMPAM), 2024
- Verrengia M.G., Moscato S., Orlandi S., Di Gregorio F., Lullini G., Pozzi S., Sabattini L., Chiari L., La Porta F. A differential diagnosis method to detect nociceptive and neuropathic pain: preliminary results of the PAINLESS project. 3° Annual Meeting Rete IRCCS di Neuroscienze e Neuroriabilitazione (RIN), 2023
- Moscato S., Orlandi S., Raimondi I., Battaglia G., Di Gregorio F., Lullini G., Pozzi S., Sabattini L., Chiari L., La Porta F. Classificazione binaria del dolore su pazienti con Sclerosi Multipla mediante sensori indossabili e algoritmi di Machine Learning. 51° Congresso Nazionale SIMFER, 2023
- Moscato S., Orlandi S., Di Gregorio F., Lullini G., Pozzi S., Sabattini L., Chiari L., La Porta F. Valutazione automatica del dolore mediante sensori indossabili e algoritmi di intelligenza artificiale. XXII Congresso Nazionale Società Italiana di Riabilitazione Neurologica, 2023
- Moscato S., Spadotto A., Massaro G., Chiari L., Diemberger I. Agreement between ECG and PPG in HRV analysis during provocative tests in healthy adults. XXII International Conference on Mechanics in Medicine and Biology, 2022
- Moscato S., Palumbo P., Vichi V., Giannelli A., Varani S., Chiari L. Impact of pain on physiological signals: a cosinor analysis. IEEE-EMBS International Conference on Biomedical and Health Informatics, 2021
- Moscato S. and Chiari L. Effect of physical activity on PPG signal quality. 8th International Conference on Ambulatory Monitoring of Physical Activity and Movement, 2021
- Moscato S., Palumbo P., Sichi V., Giannelli A., Chiari L. Objective Assessment of Pain in Uncontrolled Environments through Electrodermal Activity in Oncological Population. IASP World Congress on Pain, 2020
- Moscato S., Palumbo P., Sichi V., Giannelli A., Chiari L. Home care efficacy of Virtual Reality for anxiety and depression relief. Protocol of Look of Life 2.0, an observational study. IASP World Congress on Pain, 2020
- Moscato S., Palumbo P., Sichi V., Chiari L. Towards an objective pain assesment: characterization of autonomic signals through ambulatory monitoring. 41st Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)
- Chiari L., Davalli A., Moscato S., Palumbo P., Randi P. Falls and locomotor capabilities in lower limb amputees. First results of a retrospective study from the MOTU project. International Society of Posture and Gait Research, 2019
- Palumbo P., Moscato S., Palmerini L., Vitiello N., Davalli A., Gruppioni E., Randi P., Chiari L., Towards a personalized prosthetic prescription for transfemoral amputees: the strategy of the MOTU project. Società Italiana di Analisi del Movimento in Clinica, 2019

## Patents

- Lizio R., Ockermann P., Moscato S., Liebana S.V., Chiari L., Huth M. Methods to estimate the blood pressure and the arterial stiffness based on photoplethysmographic (PPG) signals. WO2019/206818A1

## Book chapters

- Moscato S., Palumbo P., Palmerini L., Mellone S., Borelli E., Corzani M., Chiari L. Monitoring Health and Behavior in an Ecological Environment with Digital Technologies. In ICT for Health: Sensing, Data Analysis, Applications. Roma, Texmat, pp 182-201, 2022

## Prizes and awards

### **JULY 2024**

ALBERTO MAZZOLDI Award for PhD thesis - Università di Pisa - Contribuito dalla famiglia Mazzoldi e dal gruppo di bioingegneria del Centro di Ricerca E.Piaggio dell'Università di Pisa.

### **FEBRUARY 2022**

Runner-up Prize – 3-minute thesis competition  
University of Bologna

### **JUNE 2021**

Runner-up for Best Poster Award – Technology and Algorithm Development  
International Conference on Ambulatory Monitoring of Physical Activity and Movement

## Conference participation as a speaker

### **SEPTEMBER 2024**

Computing in Cardiology  
Karlsruhe (DE)

### **JUNE 2023**

VIII National Congress of Bioengineering  
Padova (IT)

### **SEPTEMBER 2022**

XXII International Conference on mechanics in Medicine and Biology  
Bologna (IT)

## Peer-review activities

Life (IF 3.2)  
Scientific Data (IF 10.8)  
Scientific Report (IF 3.8)  
IEEE Journal of Biomedical and Health Informatics (IF 7.02)  
BMC Research Notes (IF 4.0)  
Medical & Biological Engineering & Computing (IF 3.2)  
ACM Computing Surveys (IF 14.324)  
PlosONE (IF 3.7)  
BMJ Open (IF 3.007)  
Scandinavian Journal of Pain (IF 1.45)

## Teaching and seminar activities

### Teaching activities

#### **A.Y. 2023/2024**

Rehabilitation bioengineering  
Master's Degree in Mechanical Engineering – University of Bologna  
Master's Degree in Electronic Engineering – University of Bologna

#### **A.Y. 2023/2024**

Biomedical signal and data processing  
Master's Degree in Electronic Engineering – University of Bologna

## Thesis co-supervisor

### A.Y. 2023/2024

[in progress] “Il dolore in neuroriabilitazione usando sensori indossabili: sviluppo di algoritmi di machine learning per classificare dolore nocicettivo e dolore neuropatico”

Master’s Degree in Electronic Engineering – University of Bologna

Supervisor: Prof. Lorenzo Chiari

### A.Y. 2022/2023

“A VR-based wheelchair driving simulator controlled via brain-computer interface for children with cerebral palsy”

Master’s Degree in Biomedical Engineering – University of Bologna

Supervisor: Dott.ssa Silvia Orlandi

“Metodi di machine learning per la valutazione del dolore da segnali fisiologici”

Master’s Degree in Biomedical Engineering – University of Bologna

Supervisor: Prof. Lorenzo Chiari

### A.Y. 2021/2022

“Il monitoraggio remoto multiparametrico di pazienti con scompenso cardiaco: lo studio MySIGN-HF”.

Single-cycle degree in Medical and Surgical Sciences – University of Bologna

Supervisor: Prof. Igor Diemberger

### A.Y. 2020/2021

“Il segnale di bioimpedenza per il monitoraggio remoto multiparametrico dei pazienti affetti da COVID-19: il sistema MySIGN”

Master’s Degree in Biomedical Engineering – University of Bologna

Supervisor: Prof. Lorenzo Chiari

### A.Y. 2019/2020

“Ruolo della fotopletismografia nella valutazione dell’heart rate variability e sull’età vascolare”.

Single-cycle degree in Medical and Surgical Sciences – University of Bologna

Supervisor: Prof. Igor Diemberger

### A.A. 2018/2019

“Caratterizzazione sperimentale dell’attività elettrodermica: valutazione della qualità del segnale e analisi esplorativa”

Bachelor’s Degree in Biomedical Engineering – University of Bologna

Supervisor: Prof. Lorenzo Chiari

## Tutor activities

### A.Y. 2021/2022, 2020/2021, 2019/2020, 2018/2019

Tutor for the implementation of research and development projects:

- Biofeedback system to support mental health intervention
- Re-Breathe: Monitoring platform for rehabilitation of post-COVID patients<sup>19</sup>
- Long-term monitoring: Monitoring GPS and physiological signals in an uncontrolled environment
- Development of a sensor t-shirt for measuring and assessing posture

Rehabilitation bioengineering

Master's Degree in Biomedical Engineering - University of Bologna (Cesena campus)

### A.Y. 2018/2019

Tutor for the implementation of research and development projects:

- Development of algorithms for extraction of physiological parameters from pervasive monitoring for analysis of potential differences between athletic and sedentary subjects

Biomedical signal and data processing

Master’s Degree in Electronic Engineering – University of Bologna

## **Tutor activities for Erasmus Internship**

**A.Y. 2018/2019**

Tutor for the Erasmus Internship: "Effects of audio-biofeedback on EEG and autonomic signals using a wobble board"

## **Social-academic activities**

### **Associations**

**JUNE 2022 – SEPTEMBER 2023**

Vice-coordinator

ADI – PhDs and PhD students in Italy – Bologna branch

**JANUARY 2022 – JUNE 2023**

Vice-president

ADIBO student association

**SEPTEMBER 2021 – DECEMBER 2023**

Communication manager

ADI – PhDs and PhD students in Italy – Bologna branch

### **Orientation seminars**

**A.Y. 2023/2024, 2022/2023**

Job orientation - The doctoral program: academic and business research

Seminar for PhD students at the University of Bologna - Forlì, Ravenna and Rimini campuses

### **Scientific outreach activities**

**2024, 2023**

Pint of Science – Bologna branch

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Bologna, 13/09/2024

