

# Manuel Reis Carneiro

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## Education

**Carnegie Mellon University**, Pittsburgh, PA, USA

Ph.D. Electrical and Computer Engineering, GPA: 3.75/4.0, **Expected June 2025**

Advisor: Professor Carmel Majidi (Soft Machines Lab)

Thesis: Soft, stretchable bioelectronics for health monitoring

**University of Coimbra**, Coimbra, Portugal

Ph.D. Electrical and Computer Engineering, GPA: 17.5/20, **Expected June 2025**

Advisor: Professor Mahmoud Tavakoli (Institute of Systems and Robotics)

Thesis: Soft, stretchable bioelectronics for health monitoring

**University of Coimbra**, Coimbra, Portugal

Integrated Masters (B.S & M.Sc.) in Electrical and Computer Engineering,  
Specialization in Automation, GPA: 16/20, **July 2019**

Advisor: Professor Mahmoud Tavakoli

Thesis: Comfortable Fabric-Based Headband for Forehead EEG Monitoring (18/20)

**Turin Polytechnic University**, Turin, Italy

Electrical Engineering

Erasmus Program (MSc), **September 2018 – February 2019**

## Languages

- Portuguese (**Native**)
- English (**C1** Cambridge ESOL CAE)
- German (**B1** ÖSD Zertifikat)
- French (**B1** DELF)
- Spanish (**B2** ALTE level 3)
- Italian (**A1**)

## Professional Experience

**Soft Machines Lab**, Carnegie Mellon University, Pittsburgh, PA, USA

PhD Candidate / Researcher, **September 2020 – June 2025**

**Institute of Systems and Robotics**, University of Coimbra, Portugal

PhD Candidate / Researcher, **September 2020 – June 2025**

**Institute of Systems and Robotics**, University of Coimbra, Portugal

Research Assistant, **September 2019 – August 2020**

## Teaching Experience

### 2024

Teaching Assistant – University of Coimbra (Spring 2024)  
Electrical and Computer Engineering; Biomedical Engineering; Physics  
Engineering - **Mechatronics (02000509)**  
(Ms.C. Level course)

### 2023

Teaching Assistant - Carnegie Mellon University (Spring 2023)  
Electrical and Computer Engineering (ECE) - **Design Experience (18-500)**  
(Undergraduate capstone project course)

### 2021

- STEM Teacher  
Developed the curriculum and contents for the “3D Printing and Design for Kids” course and delivered the hand-on remote lessons in the pilot program with 10 students.  
This is a 4-weeks (12h) course aimed at empowering young students (8 to 16 years old) with skills of digital design and manufacturing, while fostering discussion on the societal, economic, and environmental impact of such technologies  
Topics include design of 3D functional objects, specifics of various digital manufacturing tools and techniques, and hands-on FDM 3D printing.

### 2020

- STEM Teacher  
I developed the curriculum, contents and modular robotic platform used in the “Design and Build Your Own Robot” course and delivered the hand-on remote lessons in the pilot program with 10 students.  
This is a 3-month (20h) virtual course aimed at developing STEM skills in young students aged from 8 to 16 years old. Topics include design of 3D functional objects, electronics basics, design, simulation and implementation of electronic circuits, smart sensors, concepts of programming and algorithms in microcontroller platforms, and basic control of mobile robots.

### 2014-2018

- Mentoring fellow students in the Integrated Master’s in electrical and Computer Engineering in the University of Coimbra and helping them prepare for exams in various subjects.

## Student Mentoring and Supervision

### 2024

- “Enhancing signal quality in soft bioelectronic stickers through printed dry 3D-textured skin-interfacing electrodes” – Damiano Laudani (M.Sc. Thesis in Mechatronics Engineering)

- “Wearable e-glove with integrated electrostatic adhesives for grasping applications” – Denilze Monteiro (M.Sc. Thesis in Biomedical Engineering)
- “Digitally-fabricated glove with integrated pressure sensors and haptic feedback for Meta-world applications” – Cristiana Ramalho (M.Sc. Thesis in Biomedical Engineering)

### **2023**

- “Magnetic field-based position sensing for applications in soft robotics” – Ângelo Rodrigues (Undergraduate project – Electrical Engineering)
- “Digitally-printed soft electroadhesive grippers for robotic applications” – Gil Correia (M.Sc. Thesis in Electrical Engineering)
- “Development and control of bioinspired artificial muscle fascicles through integration of LM-coated LCE fibers” – Rafael Molter (M.Sc. Thesis in Biomedical Engineering)

### **2022**

- “Fabrication strategies for Liquid Crystal Elastomer- based soft actuators” – João Veiga (M.Sc. Thesis in Electrical Engineering)
- “Improving the reliability of dynamic respiration monitoring through textile-printed strain sensors” – João Silva (M.Sc. Thesis in Electrical Engineering)
- “Gait Cueing Wearable for Parkinson's Disease Patients” – Telmo Lopes (M.Sc. Thesis in Biomedical Engineering)
- “Soft carbon-based pressure-sensing foams for pressure mapping applications” – Luis Rosa (M.Sc. Thesis in Electrical Engineering)

## **Awards and Honors**

### **2023**

- Grant with the value of 5000€ in the 2<sup>nd</sup> edition of the Huawei Grant Program, awarded by Huawei in Lisbon, Portugal on April 4, 2023. 50 recipients were selected among more than 5300 candidates.

### **2019**

- Honorable Mention in the IBM Scientific Prize 2019 with the work " The human brain meets soft electronics through ideal polymeric interfaces - A Breakthrough in Electrophysiology", selected among all M.Sc. and Ph.D theses in the year 2018/2019 in Portugal, awarded by IBM Portugal by the hand of the Portuguese Minister of Science, Technology and Higher Education Dr Manuel Heitor, in Lisbon, Portugal on December 17, 2019

- Third Place Award in the M.Sc. Thesis category of the Fraunhofer Portugal Challenge 2019 with the work "Comfortable Fabric-Based Headband for Forehead EEG Monitoring", selected among all M.Sc. thesis in the academic year 2018/2019 in Portugal, awarded by the Fraunhofer Portugal Research Association, in Porto, Portugal on October 31, 2019
- Honor Board of the University of Coimbra - Academic Excellence Diploma awarded to 5% of students with a distinguish academic career at the University of Coimbra, in the academic year 2018/19, awarded by the University of Coimbra, in Coimbra, Portugal, in 2019

### **2017**

- 3% Best Students of the University of Coimbra, in the academic year 2016/17, awarded by the University of Coimbra, in Coimbra, Portugal, in 2017

### **2016**

- 3% Best Students of the University of Coimbra, in the academic year 2015/16, awarded by the University of Coimbra, in Coimbra, Portugal, in 2016

### **2015**

- 3% Best Students of the University of Coimbra, in the academic year 2014/15, awarded by the University of Coimbra, in Coimbra, Portugal, in 2015

## Research Interests

- Soft and printed electronics and fabrication strategies
- Soft actuators and sensors, and full soft robotic systems
- Micro/Nano Fabrication of electromechanical systems
- Wearables for Healthcare (electrophysiology, motion, grasping monitoring)
- Human-Machine interfaces and input devices
- Digital Biomarkers through soft sensors and AI
- STEM Education

## Grants awarded

### **2021**

- 199€ scholarship awarded for participation in the HelloAI course by EIT health and KTH Royal Institute of Technology

### **2020**

- Doctoral Scholarship within the Carnegie Mellon University|Portugal dual degree Ph.D. program, awarded by the Department of Electrical and Computer Engineering at Carnegie Mellon University and the Portuguese Foundation for Science and Technology (FCT) - covered tuition fees and monthly stipend for 2 years at CMU, Pittsburgh, US, and 3 years at UC, Coimbra, Portugal.

### **2019**

- Research Grant (M.Sc. level) within the MATIS project (Sustainable Industrial Materials and Technologies), reference CENTRO-01-0145- FEDER-000014, awarded by the University of Coimbra.

## Peer Reviewed Publications

### 2023

- Olcay, P. R., **Reis Carneiro, M.**, Majidi, C., Stencil, B. (2023). Bio-Inspired Soft Electrodes for Robust and Reusable Bioelectronic Sticker. ACS Applied Materials & Interfaces. (under review)
- Lopes, T., **Reis Carneiro, M.**, Morgadinho, A., Reis Carneiro, D., Tavakoli, M. (2023). ParCuR – a novel AI-enabled gait cueing wearable for patients with Parkinson’s Disease. Frontiers in Neurology. (under review)
- **Reis Carneiro, M.†**, Rosa, L.†, Tavakoli, M. (2023). From conventional non-conductive foams to soft piezoresistive pressure sensors: A low-cost approach to large-area pressure-mapping. IEEE Sensors Conference 2023. <http://doi.org/10.1109/SENSOR56945.2023.10325315>  
(†these authors contributed equally to this work)
- **Reis Carneiro, M.**, Majidi, C., & Tavakoli, M. (2023). Gallium-based Liquid-Solid Biphasic Conductors for Soft Electronics. Advanced Functional Materials. <http://doi.org/10.1002/adfm.202306453>
- **Reis Carneiro, M.**, de Almeida, A. T., Tavakoli, M., & Majidi, C. (2023). Recyclable thin-film soft electronics for smart packaging and e-skins. Advanced Science. <http://doi.org/10.1002/advs.202301673>
- Veiga, J. S.†, **Reis Carneiro, M.†**, Molter, R., Vinciguerra, M., Yao, L., Majidi, C., Tavakoli, M. (2023). Toward fully printed soft actuators: UV-Assisted Printing of Liquid Crystal Elastomers and Biphasic Liquid Metal Conductors. Advanced Materials Technologies. <https://doi.org/10.1002/admt.202300144>  
(†these authors contributed equally to this work)
- Zhao, Y., Ohm, Y., Liao, J., Luo, Y., Cheng, H., Won, P., Roberts, P., **Reis Carneiro, M.**, Islam, M., Ahn, J., Walker, L., & Majidi, C. (2023). Self-healing Electrically Conductive Organogel Composite. Nature Electronics. <https://doi.org/10.1038/s41928-023-00932-0>

### 2022

- **Reis Carneiro, M.**, Majidi, C., & Tavakoli, M. (2022). Multi-electrode printed bioelectronic patches for long-term electrophysiological monitoring. Advanced Functional Materials, 2205956. <https://doi.org/10.1002/adfm.202205956>
- Zu, W., Ohm, Y., **Reis Carneiro, M.**, Vinciguerra, M., Tavakoli, M., & Majidi, C. (2022). A comparative study of silver microflakes in digitally printable liquid

metal embedded elastomer inks for stretchable electronics. *Advanced Materials Technologies*, 2200534. <https://doi.org/10.1002/admt.202200534>

- Tavakoli, M., Alhais Lopes, P., Hajalilou, A., Silva, A. F., **Reis Carneiro, M.**, Carvalheiro, J., Marques Pereira, J., & de Almeida, A. T. (2022). 3R electronics: Scalable fabrication of resilient, repairable, and recyclable soft-matter electronics. *Advanced Materials*, e2203266. <https://doi.org/10.1002/adma.202203266>
- **Reis Carneiro, M.**, Rosa, L. P., de Almeida, A. T., & Tavakoli, M. (2022). Tailor-made smart glove for robot teleoperation, using printed stretchable sensors. 2022 IEEE 5th International Conference on Soft Robotics (RoboSoft). <https://doi.org/10.1109/RoboSoft54090.2022.9762214>

## 2021

- **Reis Carneiro, M.**, Majidi, C., & Tavakoli, M. (2021). Dielectric elastomer actuators with biphasic Ag–EGaIn electrodes. *Advanced Engineering Materials*, 2100953. <https://doi.org/10.1002/adem.202100953>
- **Reis Carneiro, M.**, & Tavakoli, M. (2021). Wearable pressure mapping through piezoresistive C-PU foam and tailor-made stretchable e-textile. *IEEE Sensors Journal*, 21(24), 27374–27384. <https://doi.org/10.1109/jsen.2021.3126159>
- T. Caldeira and **M. Reis Carneiro**, "Design, Build and Play - Online Robotics Classes," 2021 IEEE World Conference on Engineering Education (EDUNINE), 2021, pp. 1-6. <https://doi.org/10.1109/EDUNINE51952.2021.9429157>

## 2020

- Carvalho, F. M., Lopes, P., **Reis Carneiro, M.**, Serra, A., Coelho, J., de Almeida, A. T., & Tavakoli, M. (2020). Nondrying, sticky hydrogels for the next generation of high-resolution conformable bioelectronics. *ACS Applied Electronic Materials*, 2(10), 3390–3401. <https://doi.org/10.1021/acsaelm.0c00653>
- **Reis Carneiro, M.**, de Almeida, A. T., & Tavakoli, M. (2020). Wearable and comfortable e-textile headband for long-term acquisition of forehead EEG signals. *IEEE Sensors Journal*, 20(24), 15107–15116. <https://doi.org/10.1109/jsen.2020.3009629>

## Conference and Poster Presentations

### 2023

- “From conventional non-conductive foams to soft piezoresistive pressure sensors: A low-cost approach to large-area pressure mapping” – Lecture presented at IEEE Sensors Conference 2023, in Vienna, Austria on October 29 – November 1, 2023.

- “Recyclable thin-film soft electronics for smart packaging and e-skins” – Poster presented at ISR Open Day 2023, by the Institute of Systems and Robotics of the University of Coimbra, in Coimbra, Portugal on July 20, 2023.
- “Recyclable thin-film soft electronics for smart packaging and e-skins” – Poster presented at Encontro Ciência 2023, National Science Conference by the Portuguese Foundation for Science and Technology, in Aveiro, Portugal on July 5-7, 2023.

## 2022

- “Multi-electrode printed bioelectronic patches for long-term electrophysiological monitoring” – Poster presented at CMU Portugal Summit 2022 – New Frontiers in Tech, in Lisbon, Portugal on November 9-10, 2022.
- “Multi-electrode printed bioelectronic patches for long-term electrophysiological monitoring” – Poster presented at Encontro Ciência 2022, National Science Conference by the Portuguese Foundation for Science and Technology, in Lisbon, Portugal on May 16-19, 2022.
- “Tailor-made smart glove for robot teleoperation, using printed stretchable sensors” – Poster presented at IEEE 5th International Conference on Soft Robotics (RoboSoft), in Edinburgh, United Kingdom on April 7, 2022.

## University Seminars and Invited Talks (all presented by M. Reis Carneiro)

### 2023

- “Sustainable soft electronic interfaces for health monitoring,” presented at the CMU Portugal 2023 Doctoral Symposium, in Lisbon, Portugal on December 6, 2023
- “Soft electronic interfaces for health monitoring,” presented during the official visit of the Portuguese Minister of Science, Technology and Higher Education, Professor Elvira Fortunato, the President of the Portuguese Foundation for Science and Technology, Professor Madalena Alves, the Portuguese Ambassador in the USA, Francisco Duarte Lopes, and CMU-Portugal program representatives as well as industry partners, in the Carnegie Mellon University, in Pittsburgh, PA, USA on March 26, 2023

### 2022

- “Soft electronics for healthcare,” presented in the Institute of Systems and Robotics at University of Coimbra, in Coimbra, Portugal on July 28, 2022
- “Soft electronics: the future of digital health,” presented remotely as a keynote talk in the session “Out-of-the-box biomarker approaches in neurodegenerative diseases” at the CIBB 4<sup>th</sup> Retreat – Neuroscience and Disease, in CIBB – Center

for Innovative Biomedicine and Biotechnology (CNC – Center for Neuroscience and Cell Biology – and iCBR – Coimbra Institute for Clinical Biomedical Research), in Coimbra, Portugal on May 23, 2022

- “Flexible Electronics for Healthcare Applications,” presented remotely as a keynote talk at Tech to Help Symposium, in the Centre for Informatics of Coimbra Academic Association at University of Coimbra, in Coimbra, Portugal on March 26, 2022

## **2021**

- “Stretchable multi-electrode bioelectronics and the future of healthcare,” presented remotely at the CMU Portugal 2021 Doctoral Symposium, in Lisbon, Portugal on September 15, 2021

## **2020**

- “Wearable EEG – a success case,” presented as a keynote talk at the ceremony of the 248<sup>th</sup> anniversary of the Faculty of Sciences and Technology of the University of Coimbra, in Coimbra, Portugal on October 12, 2020
- “Wearable EEG – a success case,” presented as a keynote talk at TeCience – Innovation and Technology in Health Symposium in the department of Pharmacy at University of Coimbra, in Coimbra, Portugal on February 18, 2020

## **2019**

- "The Human Brain meets Soft Electronics through ideal Polymeric Interfaces - A Breakthrough in Electrophysiology," presented at the IBM Scientific Prize award ceremony, in Instituto Superior Técnico, in Lisbon, Portugal on December 17, 2019
- “Comfortable Fabric-Based Headband for Forehead EEG Monitoring,” presented at the Fraunhofer Portugal Challenge 2019, in the Fraunhofer Portugal Research Association, in Porto, Portugal on October 31, 2019

## Peer review

### **2023**

- IEEE Sensors Conference 2023
- ACS Applied Electronic Materials

## Patents

- Method to obtain a skin electrode patch and respective skin electrode patch (International Patent pending)



## Media Outreach

- Interview for the national Portuguese journal “Exame Informática” (printed and online) entitled “Recyclable soft electronics” on September, 2023
- Multiple interviews and article pieces disseminated by dozens of Portuguese national newspapers, by Lusa News Agency (largest world agency in Portuguese language), and field-specific news channels (Tech Explore, Life Technology) regarding the development of an Eco-friendly conductive ink to revolutionize the production of soft stretchable electronic circuits, 2023
- Developments on Multi-Electrode Printed Bioelectronic Patches were featured in field-specific news channels such as Wearable Technology Insights, Printed Electronics Now: Printed Electronics Magazine, and Wevolver | Knowledge for engineers on September, 2022
- Invited talk on “90 Segundos de Ciência” (90 Seconds of Science) – Radio program for scientific dissemination, broadcasted by Antena 1 national radio station in Portugal as well as in online platforms – Episode 883 entitled “Researcher develops wearable and portable EEG headband” on June 23, 2020
- Interview for the national Portuguese journal “Exame Informática” (printed and online) entitled “The Brain Band” on February 1, 2020
- Multiple interviews and article pieces disseminated by dozens of Portuguese national newspapers and by Lusa News Agency (largest world agency in Portuguese language) regarding the development of textile-based electronic systems for electroencephalography, 2019