Florencia Garro

Neural Engineer

PhD student @ Italian Institute Technology

I am specialized in non-invasive brain-computer interfaces (BCI) for rehabilitation and enhanced human-machine interaction. I am currently in the last year of my PhD, exploring neuromechanical biomarkers to improve robot-assisted motor rehabilitation therapies.

My career drive is fourfold:

- As an engineer, I seek to **build neurotechnology for real-world patients**. I worked five years on the medical devices industry - focused on the R&D process - before starting my PhD.

- As a designer, I want to use **user-oriented design** to create practical application of cutting-edge prototypes, exploiting human-machine interaction and usability engineering.

- As a scientist, I have an infinite curiosity for **brain plasticity** and understanding how can we combine its mechanisms with technology to recover and enhance human capabilities.

- As a neurotech enthusiast, I want **science-based neurotechnology accessible to all**. I am very committed to teaching and mentoring since my time in college. I have plenty of public speaking training – I had the opportunity to give a TEDx talk. I thoroughly enjoy creating spaces for open discussion, learning opportunities, and networking.

Contact

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Expertise

- EEG/EMG signal processing
- Brain-computer interface design
- Medical device design & validation
- Usability engineering process
- Medical writing

Languages

- 🇦🇷 **Spanish** - Native
- 🇺🇸 **English** - C1
- 🇮🇹 **Italian** - B2
- 🇫🇷 **French -** A1

Education

2020-current

PhD Program in Bioengineering and Robotics
Università degli Studi di Genova – Istituto Italiano di Tecnologia

2019

IEEE Brain Neurotech Entrepreneur Workshop
Arizona State University - IEEE Brain
I won one of the twenty seats as a trainee for the first workshop edition, and I was awarded with the second place in the Funding Pitch Competition

Deep Learning & Natural Language Processing with Neural Networks
Postgraduate course at University of Buenos Aires

2018

Introduction to Neuroscience & Methodology for Quantitative Research
Postgraduate course at Favaloro University, Buenos Aires, Argentina

Experimental Design in Neuroscience
Postgraduate course at Favaloro University, Buenos Aires, Argentina

2017

Brain Computer Interfaces: Fundamentals, State of Art and Perspectives
Postgraduate course at National University of Entre Ríos, Argentina

2016

M.Sc. in Biomedical Engineering
National University of Córdoba, Argentina

CGPA: **8/10**
Thesis Title: "**Product Life-cycle Management for the Design and Development of Medical Devices: A Guide for Implementation"**

Professional Experience

Nov 2020 - current
PhD Researcher
@ Università degli Studi di Genova – Istituto Italiano di Tecnologia

My PhD project is focused on creating a benchmarking platform to evaluate robotic technology for upper limb neurorehabilitation, in collaboration with clinical partners. I have implemented the experimental setup, collected data from 40 healthy individuals. I am currently working on establishing a standardized approach for movement characterization and plan to conduct another phase of data collection with stroke patients.

Feb 2018 - Nov 2020
Technical Consultant - Brain-Computer Systems Designer
Freelance activity

I worked as a top-level system designer and project manager for a proof of concept of a neuromodulation system for cognitive rehabilitation, and I conducted a feasibility analysis for an implantable peripheral neuromodulation device.

Jun 2018 - Jun 2019
Research & Development Engineer
@ startup OTTAA

I worked on a non-invasive brain-computer interface project for communication and accessibility, for which I did the design of a functional prototype, and the first pilot test with 30 target users in 3 rehabilitation centers.

Jun 2015 - Jun 2018
Research & Development Analyst
@ Promedon SA

I worked on the design and clinical testing of two implantable medical devices currently on the market: *Steema TOT and Steema Retropubic*. I developed a design & development pipeline supported by product life-cycle management approaches, in compliance with MDR 2017/45. I implemented a usability engineering process according to IEC 62366 for product validation.

Jan 2015 - Jun 2015

Neurodiagnostic Technologist

@ Private Hospital "Córdoba Medical Center"

I worked as a technician, conducting electroencephalography and evoked potential studies for diagnosis.

Jan 2014 - Nov 2014

Biomedical Engineer Intern

@ Private Institute of Neuroscience "Córdoba"

I worked on the design and prototyping of a low-cost EEG helmet for patients with hyperkinetic disorders.

Speaking Experience

2023

- Guest speaker at [Women in Data Science 2023 Córdoba](#).
  Topic: Biomarkers for neurorehabilitation & workshop "an introduction to FAIR data and BIDS standard".

2022

- Guest speaker at **World Neurotechnologies Forum**, a hybrid event organized in São Paulo, Brazil.
  Topic: Neurotechnology for Rehabilitation ([link](#))
- Guest speaker at workshop "**Electrophysiology in Latin America**" at National University of San Marcos in Lima, Peru.
  Topic: Biomarkers based on electrophysiological signals applied to neurorehabilitation.

2021

- Guest speaker at workshop "**Insights into neural signal: an open, hands-on approach**" at National University of Buenos Aires.
  Topic: Multiparametric development of neuromechanical biomarkers for neurorehabilitation.

2019

- TEDx speaker: "**Neurotechnology: Beyond sci-fiction**". TEDx Salón Córdoba, Argentina. ([Link](#))
- Speaker at 2019 IEEE International Conference on Systems, Man and Cybernetics (SMC), presenting the paper "**SSVEP-based Brain-Computer Interface as an Input Device for an Alternative Communication System**." Bari, Italy.
- Speaker at NeuroTechX webinar. Topic: "**Brain-computer interfaces for communication and rehabilitation**". ([Link](#))

2018

- Guest speaker at webinar by Neurosurgical.TV. Topic: ""**Brain-computer interfaces: Fundamentals & State of Art**". ([Link](#))

2017

- Speaker at XXI Argentine Congress of Bioengineering, presenting the paper "**Product Life-cycle Management for the Design and Development of Medical Devices**". Córdoba, Argentina.

Teaching Experience

2023

- Support tutor in the **Neuroengineering Research Track course** at **University of Genoa**: 50 hours of organization and support for professors and students during laboratory activities.
- Thesis co-director at Italian Institute of Technology of the master thesis: **Electromyography-based evaluation of robotic technologies for neurorehabilitation**. Author: Capellini, Claudia.

2022

- Guest lecturer at specialization course '**Neuro with AI**' at **HUMAI** - an independent organization that develops the latest advances in Artificial Intelligence and Data Science in Argentina and Latin America.
  Topic: 'Introduction to brain-computer interfaces'.
- Thesis co-director at Italian Institute of Technology of the master thesis: **Does motor imagery supported by augmented reality promote learning?**. Author: Fenoglio, Elena.
- Organization and execution of **Hands-on Laboratory** for **Neural and Brain Computer Interfaces course at University of Genoa**: 20 hours of hands-on in electroencephalography acquisition and processing.
- Support tutor in the **Neuroengineering Research Track course** at **University of Genoa**: 25 hours of organization and support for professors and students during laboratory activities.

2020

- Guest lecturer at online postgraduate course "**Engineering as a Rehabilitation Tool**" at the Franz Tamayo University, Bolivia.
  Topic: "Brain-computer Interfaces as Rehabilitation Tools".
- Guest lecturer at chair in Rehabilitation Engineering at National University of Córdoba. Topic: "**Brain-Computer Interfaces in Rehabilitation**". Córdoba, Argentina.
- Thesis co-director at Biomedical Engineering School, University of Córdoba of the thesis: "**Implementation of good design and development practices for medical device design and development applied to a brain-computer interface, following general guidelines of ISO 13485: 2016.**". Authors: Antonel, Maximiliano, Raviolo, Agustín.

2019

- Thesis director at Biomedical Engineering School, University of Córdoba of the thesis: "**Design and Implementation of a Software Tool for the Optimization of Qualitative and Quantitative Electroencephalography Signals Analysis**". Authors: Lemos, Dante, and Lopez, Juan Manuel.
- Guest lecturer at chair in Prosthesis and Orthosis at National University of Córdoba. Topic: "**User-oriented design paradigms in the development of brain-computer interfaces**". Córdoba, Argentina.

2018

- Thesis co-director at Biomedical Engineering School, University of Córdoba of the thesis: "**Comparative Study of Electroencephalographic Signal Classification Algorithms in the P300 Spelling Paradigm**". Author: Sappia, Sofia. ([Link](#))

Volunteer activities

Event organizer at [Brainhack School Hub @ Buenos Aires](#), Argentina during May 2023
I was part of the organizers to bring the first Brainhack in Argentina, with 20 students and 6 tutors working together during one month

Event organizer at [IEEE Women in Engineering International Leadership Summit](#) in 2021
I was part of the organization staff of a hybrid event for 200 people, handling the website, communication and logistics

Volunteering with Women in Technology, a local organization dedicated to outreach activities in Córdoba, Arg. since 2017
I participate in workshops, mentoring programs, and networking events to inspire and support women pursuing careers in technology.

Career mentor at Careermeetings.com since 2021
I hold one-on-one meetings periodically with college students that seek career advice

Volunteer and newsletter editor at [NeuroTechX](#) during 2018-2020
I managed the community newsletter for two years, for which I created the editing workflow and the design.

Publications

2023

- **Mapping neural modulation during a standardized robot-assisted task: a step towards neurorehabilitation benchmarking (Submitted)** Garro F., Fenoglio, E., Forsiuk, I., Buccelli S., Chiappalone M., De Michieli L., Semprini M. Society for Neuroscience SFN 2023
- **Effects of robotic-assistance in ERP modulation for upper-limb exoskeleton control**
Garro F., Fenoglio, E., Forsiuk, I., Buccelli S., Chiappalone M., De Michieli L., Semprini M. BCI 2023 Meeting
- **Tackling Motor Imagery Based BCI Illiteracy through a Novel Augmented Reality Paradigm**
Fenoglio, E., Garro F., Bucchieri A., Forsiuk, I., Barresi, G., Buccelli S., De Michieli L., Semprini M. BCI 2023 Meeting
- **NeBULA: A Standardized Protocol for the Benchmarking of Robotic-based Upper Limb Neurorehabilitation (Accepted)**
Garro F., Fenoglio, E., Forsiuk, I., Canepa, M., Mozzon, M., De Michieli L., Buccelli S., Chiappalone M., Semprini M. IEEE EMBC 2023

2021

- **Neuromechanical Biomarkers for Robotic Neurorehabilitation**
Garro F., Chiappalone M., Buccelli S., De Michieli L., Semprini M. Frontiers in Neurorobotics.
- **Exploratory Analysis of Cortico-Muscular Coupling in Last-Moment Reach Corrections**
Garro F., Barban F., Mantini D., Sanguineti V., Semprini M. International IEEE/EMBS Conference on Neural Engineering, NER.
- **Analysis of Cognitive and Muscular Fatigue During Last-Moment Reach Correction**
Garro F., Rapicano V., Barban F., Mantini D., Sanguineti V., Semprini M. Conference of the Society for the Neural Control of Movement.

2020

- **Toward a Standard User-Centered Design Framework for Medical Applications of Brain-Computer Interfaces.**
Garro F., McKinney Z. 2020 IEEE International Conference on Human-Machine Systems (ICHMS) ([Link](#))

2019

- **SSVEP-based BCI for an Alternative Communication System: Case Report of Performance in ALS User**
Garro F., Sappia M. S., Costa H.A. IEEE International Conference on Systems, Man and Cybernetics. ([Link](#))
- **Accessibility for Alternative Communication Systems: Design and Validation of a SSVEP-based BCI system**
Garro F., Raviolo A., Moresi M., Costa H. A. (2019). IBERDISCAP2019. (Published in Spanish)
- **Wearable Headband Design for a Steady State Visual Evoked Potential based Brain Computer Interface.**
Open-source publication on OpenBCI community forum. ([Link](#))

2017

- **Product Life-cycle Management for the Design and Development of Medical Devices: A Guide for Implementation.**
Garro F., Gigli J. P. XXI Argentine Congress of Bioengineering.

2016

- **Implementation of the Usability Engineering Process in R&D of Medical Devices: A Case Study.**
Garro F., Gigli J. P. Advances in New Technologies, Interactive Interfaces and Communicability (ADNTIIC 2017)