

Pedro Abranches de Carvalho

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Profile

Applied machine learning researcher working at the intersection of **optimization**, **clinical data**, **graph learning**, and **generative models**. Experience training machine learning models and translating them into clinical and experimental systems, including closed-loop optimization for neurotechnology applications.

Education

École polytechnique fédérale de Lausanne (EPFL)

PhD in Computer Engineering at *NeuroRestore & LIONS*

Lausanne, Switzerland

Sep 2020 – Dec 2025

- Advisors: Grégoire Courtine, Volkan Cevher.
- Doctoral committee: Maïke Osborne, Joel Burdick, Auke Ijspeert.
- **BCI Award 2025**: Author in work that won 3rd place ([link](#))

University of Porto

MSc in Computer Science

Porto, Portugal

Sep 2017 – Sep 2019

- Advisor: Pedro Ribeiro.
- Master thesis selected for oral presentation at Swiss Society for Biomedical Engineering

University of Coimbra

BSc in Biochemistry

Coimbra, Portugal

Sep 2013 – Jan 2017

- **Merit award**: top 3% of bachelor and master students.
- Six-month fellowship to work in the Blue Brain Project

Professional Experience

Centre hospitalier universitaire vaudois (CHUV)

Postdoctoral Researcher

Lausanne, Switzerland

Dec 2025 – Present

- Developing self-supervised learning methods for time-series sensor data.

world models deep learning generative models clinical data

ZEISS

Research intern

Oberkochen, Germany

Oct 2022 – Oct 2023

Bayesian Optimization for Electron Microscopes

- Developed a Bayesian optimization loop using a learned neural image-quality metric for automatic electron microscope tuning.

optimization invertible models computer vision image acquisition

EPFL

Graduate Researcher

Lausanne, Switzerland

Sep 2020 – Dec 2025

Bayesian Optimization for Neurotechnology (EES and BCI)

- Built a closed-loop optimization system deployed in real-life experimental workflows (**submitted patent**).

Gaussian processes kernel learning experimental design clinical ML pipelines sensor data (EMG, IMU)

EPFL, Laboratory for Information and Inference Systems (LIONS)

Research intern

Lausanne, Switzerland

Oct 2019 – Aug 2020

Equivariant Graph Generation and Generative Models

- Developed geometric deep learning methods for generating novel graphs.

GNNs GANs VAEs score matching graph theory

Publications

- [1] **Pedro Abranches***, G. Carparelli*, C. Frayssinhes, S. A. Komi, X. Yang, N. Macellari, S. Hernandez, C. Harte, G. Dumont, H. Lorach, F. B. Wagner, L. Asboth, R. Demesmaeker, V. Cevher, J. Bloch, and G. Courtine. "Automated programming of spinal cord stimulation to restore mobility after paralysis". In: *Submitted manuscript and Poster at Neuroscience Meeting 2023*. [Paper](#) [Poster](#) .

- [2] **Pedro Abranches***, Igor Krawczuk*, Andreas Loukas*, and Volkan Cevher. "GG-GAN: A geometric graph generative adversarial network". In: *OpenReview*. [Paper](#) .
- [3] Rui DM Travasso, Fernando Sampaio dos Aidos, Anahita Bayani, **Pedro Abranches**, and Armindo Salvador. "Localized redox relays as a privileged mode of cytoplasmic hydrogen peroxide signaling". In: *Redox biology* 12 (2017), pp. 233–245. [Paper](#) .
- [4] V. Spagnolo*, I. Sakr*, S. Dahan*, G. Carparelli*, **P. Abranches***, L. Coquoz*, N. Interling, C. Deschenaux, S. Hernandez Charpak, N. Hankov, T. Collin, V. Rouanne, P. Forero, S. Cruz, A. Galvez, [...], F. Becce, V. Aureli, R. Demesmaeker, Jordan W. Squair, L. Asboth, G. Charvet, J. Bloch, G. Courtine, and H. Lorach. "An implantable brain-spine interface restoring lower limb movements after complete spinal cord injury". In: *Manuscript in preparation*. 2025. [Paper](#) [BCI Award 2025](#) .
- [5] Thibault Collin, ..., **Abranches, Pedro**, ..., Jocelyne Bloch, Henri Lorach, and Grégoire Courtine. "Noninvasive and invasive methodologies of stimulating the cervical spinal cord in order to improve upper-limb functions after tetraplegia". In: *2023 Neuroscience Meeting Planner*. Poster presentation at Neuroscience 2023. Society for Neuroscience. Washington, DC, USA, 2023. [Poster](#) [BCI Award 2024](#) .
- [6] Laure Coquoz, Valeria Spagnolo, ..., **Abranches, Pedro**, ..., G. Charvet, Jocelyne Bloch, Grégoire Courtine, and Henri Lorach. "Long term use of a digital bridge to restore lower limb function". In: *2025 Neuroscience Meeting Planner*. Poster presentation at Neuroscience 2025. Society for Neuroscience. San Diego, CA, USA, 2025. [Poster](#) .
- [7] P Rodrigues Santos, **Pedro Abranches**, P Couceiro, JR Simplicio, JS Almeida, V Alves, L Ruzickova, P Freitas-Tavares, and M Santos-Rosa. "Expression profiles of transcribed ultraconserved noncoding RNAs (T-UCRs) associated with molecular response in chronic myeloid leukemia". In: *2017 Portuguese Society of Hematology annual meeting*. Selected oral communication. Selected oral communication. 2017. [Poster](#) .

Teaching

Mathematics of Data: From Theory to Computation

[Head Teaching Assistant 2024](#) [Teaching Assistant 2021–2023](#)

Master course, EPFL

Sep 2021 – Feb 2024

Covers key advances in continuous optimization and statistical analysis for machine learning.

Reinforcement Learning

[Teaching Assistant](#)

Doctoral course, EPFL

Feb 2022 – Jun 2022

Covers theory and methods for Reinforcement Learning (RL), which revolves around decision making under uncertainty.

Assistive Technologies

[Teaching Assistant](#)

Master course, EPFL

Jan 2023 – May 2024

Give students the opportunity to design and develop meaningful technological solutions for and with people with disabilities.

Technical Skills

Programming: Python (PyTorch, BoTorch, PySpark, Scikit, ...), C++, MATLAB

MLOps & Computing: SLURM, Docker, Kubernetes, RunAI

Neuroscience Tools: NEURON simulator, wet-lab techniques

Social Outreach

- **Cartas com Ciência** Sep 2019 – Aug 2025
Participation as a scientist in a science outreach program ([website](#)).
- **Students Association of the Faculty** Jul 2016 – Jul 2017
Liaison between the faculty and students.
- **Minibioqs** Sep 2014 – Sep 2015
Coordinator of an initiative bringing science activities to hospitals ([website](#)).

Additional Information

Languages : Portuguese (Mother tongue), English (C2), French (B1), Spanish (A2) | **Main Sports :** Basketball (National level), Swimming (National level), Ski, Climbing | **Activities :** · *1st place* in the 2005 National Mathematical Games in Ouri category · 2008 Regional Basketball Team · *3rd place* in the 2010 Regional Physics Olympiads