Giacomo Barzon

30-09-1996 | Padova, Italy

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- M.Sc. in Physics of Data at the University of Padova, integrating advanced Physics expertise with comprehensive Data Science training.
- PhD in Neuroscience at the Padova Neuroscience Center under the supervision of Prof. Samir Suweis from the LIPh and Prof. Manlio De Domenico from the CoMuNe Lab.
- I am primarily interested in how the complex structure of the brain, both at the meso and macro scales, drives the emergence of complex dynamical and behavioral patterns, how these patterns are altered during diseases, and how we can design interventions to restore normal functionality.
- Throughout my academic and professional experiences, I have acquired a strong understanding of computational simulations, data analysis, and machine learning techniques. I possess an advanced level of knowledge in several programming languages.

Research experience

Research fellowship — *Padova, IT*
Padova Neuroscience Center, University of Padova — *Oct. 2024 - Today*
Project: *Multimodal analysis and modeling of brain activity*

Visiting Ph.D. student — *Eugene, US*
University of Oregon — *Apr. 2024 - Aug.2024*
Computational Neuroscience Lab, with Prof. Luca Mazzucato

Visiting Ph.D. student — *Berkeley, US*
University of Berkeley — *May 2024*
Redwood Center for Theoretical Neuroscience

Education

Ph.D. in Neuroscience — *Padova, IT*
Padova Neuroscience Center, University of Padova - with honors — *Oct. 2021 - Sep. 2024*
Project: *Probing Brain Networks: Perturbation Models and their Role in Understanding Brain Structure and Function*

M.S. in Physics of Data — *Padova, IT*
University of Padova - Final Grade: 110/110 with honors - GPA: 30/30 — *Oct. 2018 - Apr. 2021*
Thesis: *Structure-function relation in a stochastic whole-brain model at criticality*

Erasmus+ scolarship — *Heidelberg, GE*
University of Heidelberg, ECTS GPA: A/A — *Oct. 2018 - Apr. 2021*

B.S. in Physics — *Padova, IT*
University of Padova, Final Grade: 108/110 - GPA: 28.2/30 — *Sep. 2015 - Sep. 2018*
Thesis: *Advanced automatic analysis of Cloud Chamber images*

Work Experience

App developer — *Venice, IT*

A4 Smart s.r.l.s. - Full time, apprenticeship — *Dec. 2017 - June 2018*

Within the VATE (Virtual Assistant Turist Executive) project, funded by the Region with EU funds Por-Fesr, consists in the design of a smartphone app that acts as a historical-artistic and commercial guide in the historic center of Venice, integrating a CRM system and the navigation functionality also for visually impaired thanks to iBeacon technology.

Software Engineer Intern — *Padova, IT*

Handing s.a.s. - Part Time — *Aug. 2016 - Dec. 2017*

Research and experimentation on signal propagation generated from beacons and their feasibility for geolocalization, both in internal and external environments, integration with mobile devices (iOS, Android).

Publications

Structural Connectome Dimension Shapes Brain Dynamics in Health and Disease — bioRxiv

G. Barzon, M. Allegra, M. H. Aarabi, L. Pini, M. De Domenico, M. Corbetta, S. Suweis — *2025.06.30.662336*

Excitation-Inhibition Balance Controls Information Encoding in Neural Populations — Phys. Rev. Lett.

G. Barzon, D. M. Busiello, G. Nicoletti — *134, 068403 (2025)*

EEG microstate transition cost correlates with task demands — PLOS Comp. Bio.

G. Barzon, E. Ambrosini, A. Vallesi, S. Suweis — *20 (10), e1012521 (2024)*

Unraveling the mesoscale organization induced by network-driven processes — PNAS

G. Barzon, O. Artime, S. Suweis, M. De Domenico — *121 e2317608121 (2024)*

Prenatal experience with language shapes the brain — Science Advances

B. Mariani, G. Nicoletti, G. Barzon, M. C. O. Barajs, M. Shukla, R. Guevara, S. Suweis, J. Gervain — *9 (47), eadj3524 (2023)*

Criticality and network structure drive emergent oscillations in a stochastic whole-brain model — J. Phys. Complex.

G. Barzon, G. Nicoletti, B. Mariani, M. Formentin, S. Suweis — *3, 025010 (2022)*

Modelling the deceleration of COVID-19 spreading — J. Phys. A Math. Theor.

G. Barzon, K. Kabbur Hanumanthappa Manjunatha, W. Rugel, E. Orlandini, M. Baiesi — *54(4), 044002 (2021)*

Invited talks

How excitation-inhibition balance shapes efficient encoding and flexible control in neuronal populations — *Florence, IT*

Population activity : the influence of cell-class identity, synaptic dynamics, plasticity and adaptation - Workshop @ CNS 2025 — *July 2025*

Optimal control of neural activity in circuits with excitatory-inhibitory balance — *Montreal, CA*

Dynamics of brain computations through the lens of control theory - Workshop @ Cosyne 2025 — *Apr. 2025*

Structural Foundations of Brain Criticality: Unraveling the Influence of the Human Connectome — *Vienna, AU*

Multiscale & Integrative compleX Networks: EXperiments & Theories 2023 - Satellite @ NetSci — *Jul. 2023*

Quantifying reconfiguration cost from neurophysiological data — *Venice, IT*

Spring Workshop on Physics of Data 2023 — *Apr. 2023*

Contributed talks & posters

Collective Dynamics and Information Processing in Neural Systems — *Venice, IT*

Talk: Excitation-Inhibition Balance Controls Information Encoding in Neural Populations — *June 2025*

Network days: Bridging micro with macro — *Padova, IT*

Talk: Unraveling the mesoscale organization induced by network-driven processes — *Oct. 2024*

First conference of the Italian Network for Computational Neuroscience — *Rome, IT*
Poster: Optimal coding in excitatory-inhibitory neural populations — *Sep. 2024*

NetSciX 2024: International School and Conference on Network Science — *Venice, IT*
Talk: Unraveling the mesoscale organization induced by network-driven processes — *Jan. 2024*

NetSci 2023: International School and Conference on Network Science — *Vienna, AU*
Talk: Unraveling the mesoscale organization induced by network-driven processes — *Jul. 2023*

Bernstein Conference — *Berlin, GE*
Poster: Criticality and network structure drive emergent oscillations in a stochastic whole-brain model — *Sep. 2022*

Padova-Monash Connect: Brain connectivity workshop — *Online*
Talk: Brain criticality and structural features of the human connectome — *Jul. 2022*

LIPh Spring Workshop 2022 — *Asiago, IT*
Talk: Approaches to brain controllability — *Apr. 2022*

Attended schools & workshops

Neuroscience and Artificial Intelligence — *Seattle, US*
Workshop @ University of Washington — *Aug 2024*

Mediterranean School of Complex Networks — *Catania, IT*
School — *June 2023*

EITN Fall School in Computational Neuroscience — *Paris, FR*
School — *Sep. 2022*

Workshop: Spatial Brain Dynamics — *Online*
Workshop @ University of Copehnhagen — *May 2021*

Spring College on the Physics of Complex Systems — *Online*
Workshop @ ICTP and SISSA — *Mar. 2021*

International Winter School 'MRInference: From data to knowledge' — *Padova, IT*
School @ University of Padova — *Feb. 2021*

Teaching experience

Programming — *Padova, IT*
Bachelor Degree in Mathematics, University of Padova — *Fall Semester 2022/23*

Supervision

Co-supervision of four Bachelor's thesis in Physics.

Referee

PLOS Computational Biology, IEEE Transactions on Neural Networks and Learning Systems, Physical Review E, PLOS One, Chaos: An Interdisciplinary Journal of Nonlinear Science, Frontiers in Human Neuroscience.

Projects

A collection of my academic and work projects can be found at https://github.com/gbarzon.

Skills

Languages Italian (native language) English (proficient)
Programming Python (advanced) Swift (advanced) Matlab (advanced) R (advanced) Java (basic) C++ (basic)