Abolfazl ZIAEE MEHR

I am a computational neuroscientist. My research focuses on developing Bayesian methods to study whole-brain network dynamics. I also have experience with deep learning methods and have applied these techniques to analyze data from electrophysiological recordings in rats and humans.

Education

2021-present Postdoctoral Researcher at Institut de Neuroscience des Systèmes- Inserm UMR 1106 at Aix-Marseille University, France, under the direction of Dr. Viktor Jirsa.

2014-2020 Ph.D. in Computational Neuroscience, Institute for Advanced Studies in Basic Sciences, GPA: 18.08/20, Supervisors: Dr. Mina Zarei, Dr. Alireza Valizadeh, Thesis title: *Synchronization dynamics on undirected and directed hierarchical networks*.

2011-2013 Compulsory military service.

2008-2011 M.S. in Solid State Physics, University of Qazvin (IKIU), GPA: 15.5/20, Supervisor: Dr. Reza Poursalehi, Thesis title: *Calculation of optical properties of metallic nanoparticles*.

2004-2008 B.S. in Physics, University of Qom, GPA: 16.64/20 (Second Class Honors)

Research Interest

- Bayesian parameter estimation methods and machine/deep learning approaches.
- Network Neuroscience: Complex network approaches to brain structure and function
- Computational Neuroscience: Dynamic models of brain networks, neural synchrony, information transfer measurements in complex networks.

Publications

2025 **A. Ziaeemehr**, M. Woodman, L. Domide, S. Petkoski, V. Jirsa and M. Hashemi, **Virtual Brain Inference (VBI), a flexible and integrative toolkit for efficient probabilistic inference on whole-brain models**. eLife, 2025.

2025 A. Esmaeili, M. Demolliens, M. Viersen, **A. Ziaeemehr**, F. Isbaine, P. Huguet, F. Zaal, V. Jirsa, D. Boussaoud and M. Hashemi, **Probabilistic inference of social presence across brain scales reveals enhanced synaptic efficacy**. Communications Biology, 2025.

2025 G. Rabuffo, H. Lokossou, Z. Li, **A. Ziaeemehr**, M. Hashemi, P. Quilichini, A. Ghestem, O. Arab, M. Esclapez, P. Verma and others, **Mapping global brain reconfigurations following local targeted manipulations**. Proceedings of the National Academy of Sciences, 2025.

27, Boulevard Jean Moulin – 13005 Marseille – France
+33 (605) 62 4346 • *abolfazl.ziaee-mehr@univ-amu.fr*
github.com/Ziaeemehr

2025 C. Mazzara, **A. Ziaeemehr**, E. Troisi Lopez, L. Cipriano, M. Angiolelli, M. Sparaco, M. Quarantelli, C. Granata, G. Sorrentino, M. Hashemi and others, **Mapping brain lesions to conduction delays: the next step for personalized brain models in multiple sclerosis**. Human Brain Mapping, 2025.

2025 M. Angiolelli, D. Depannemaecker, H. Agouram, J. Régis, R. Carron, M. Woodman, L. Chiodo, P. Triebkorn, **A. Ziaeemehr**, M. Hashemi and others, **The virtual parkinsonian patient**. npj Systems Biology and Applications, 2025.

2024 M. Hashemi, D. Depannemaecker, M. Saggio, P. Triebkorn, G. Rabuffo, J. Fousek, **A. Ziaeemehr**, V. Sip, A. Athanasiadis, M. Breyton and others, **Principles and operation of virtual brain twins**. IEEE Transactions on Biomedical Engineering, 2024.

2024 M. Hashemi, **A. Ziaeemehr**, M. Woodman, J. Fousek, S. Petkoski and V. Jirsa, **Simulation-based inference on virtual brain models of disorders**. Machine Learning: Science and Technology, 2024.

2024 P. Sorrentino, A. Pathak, **A. Ziaeemehr**, E. Troisi Lopez, L. Cipriano, A. Romano, M. Sparaco, M. Quarantelli, A. Banerjee, G. Sorrentino and others, **The virtual multiple sclerosis patient**. iScience, 2024.

2023 B. H. Yalcinkaya, **A. Ziaeemehr**, J. Fousek, M. Hashemi, M. Lavanga, A. Solodkin, A. R. McIntosh, V. Jirsa and S. Petkoski, **Personalized virtual brains of Alzheimer's disease link dynamical biomarkers of fMRI with increased local excitability**. medRxiv, 2023.

2021 **A. Ziaeemehr** and A. Valizadeh, **Frequency-resolved functional connectivity: Role of delay and the strength of connections**. Frontiers in Neural Circuits, 2021.

2020 **A. Ziaeemehr**, M. Zarei, A. Valizadeh and C. Mirasso, **Frequency-dependent organization of the brain's functional network through delayed interactions**. Neural Networks, 2020.

2020 **A. Ziaeemehr**, M. Zarei and A. Sheshbolouki, **Emergence of global synchronization in directed excitatory networks of type I neurons**. Scientific Reports, 2020.

2011 **A. Ziaeemehr** and R. Poursalehi, **Optical properties of silver nanoparticle dispersed in polymer matrix**. European Quantum Electronics Conference, 2011.

Work and Research Experience

Mar 2021-Sep 2021 Senior scientific developer at Panoptopia, *preparing Python packages for costing and risk management*.

Sep 2020-Mar 2021 Researcher at Institute for Research in Fundamental Sciences (IPM), Tehran, Supervisors: Prof. Alireza Valizadeh, Prof. Abdol-Hossein Vahabie, Research title: *Modeling the Basal Ganglia for Parkinson's disease*.

Apr 2019-Feb 2020 Research assistant at Institute for Research in Fundamental Sciences (IPM), Tehran, Supervisor: Prof. Abdolhosein Abbasian, Research title: *Studying the chimera state and using neuronal population models to study Chimera-like states on the human connectome*.

Apr 2018-Sep 2018 Research visitor at the University of Granada, Computational Physics Group, Supervisor: Prof. Joaquin J. Torres, Research subject: *Studying the phase transition in the human connectome, analyzing the endurance of a weak signal in a noisy environment and the noise-induced volatility in a network of interacting LIF neurons*.

Jun 2011-May 2014 Spent two years in compulsory military service and preparing for Ph.D. entrance exams.

Teaching Experience

Jul 2020 **TA** at Neuromatch Academy 3-week summer school.

2016-2017 **Workshop Lecturer**, Held workshops at IASBS on Python scripting for scientific programming, and additional programming sessions on Julia, C++ and neuron simulation packages like Brian and Nest simulator.

2015-2016 Being **TA** several times in Ph.D. period in Classical Electrodynamics (I, II) and Computational Physics.

Notable Events Attended

Sep 2021 Simulation-based inference for scientific discovery workshop, Mackelab.

Jul 2020 Neuromatch Academy summer school.

Jan 2018 Comprehensive Workshop on Analysis and Interpretation of Primate Electrophysiological Data, Institute for Research in Fundamental Sciences (**IPM**), Tehran, Iran;

Mar 2017 5th Workshop on Advanced Techniques for Scientific Programming and Management of Open Source Software Packages, **ICTP**, Sharif University, Tehran, Iran;

Oct 2016 Introductory School on Parallel Programming and Parallel Architecture for High-Performance Computing, **ICTP**, Trieste, Italy;

Nov 2014 High-Performance Computing and grid computing (HPC8), Institute for Research in Fundamental Sciences (**IPM**), Tehran, Iran.

Voluntary Work, Open-Source Software Development and Contributions

- **ziaeeNN2020**, This repository contains the source codes for reproducing results and figures of Neural Networks, 2020 paper.
- **SReport2020** This repository contains the source codes for reproducing results and figures of: Scientific Reports, 2020 paper.
- **Frontiers2020**, repository contains the source codes for reproducing results and figures of: Frontiers 2021 paper.
- Contribution on nest simulator (PR 543, PR560) and Brian2 (PR1265).
- **Parkinson Modeling**, Implementing some of the most-cited papers on modeling BG with spiking and rate models for Parkinson's disease.
- **ModelingNeuraldynamics** and **mndynamics**, I wrote the code for this book: "An Introduction to Modeling Neuronal Dynamics" by Borgers in Python scripts and using Brian.
- **SBI**, *sbi* package by mackelab is a *PyTorch* package for simulation-based inference. Simulation-based inference is the process of finding parameters of a simulator from observations. I provide some wrapper to integrate *sbi* with the *NEST simulator* and *scipy*.
- **workshop scripting** This repository was created for weekly sessions of a Python scripting course at IASBS and includes many examples and applications from simple to complex.
- **workshop julia** The source code and examples for the Julia workshop, including benchmarking simple and generalized Kuramoto models.
- **workshop C++** The source code and examples for the C++ workshop.

Skills

OS Ubuntu;

Languages	Python, C++, Julia;
Packages	Nest Simulator, Brian, MNE-Python, TVB, ...;
GUI	PyQtGraph, Dash

Honors and Awards

Jan 2018	Scholarship by the Ministry of Science of Iran for research at the *Department of Electromagnetism and Matter Physics, Universidad de Granada, Spain*;
2014	Rank 26th among about 5,000 people in entrance exams for the Ph.D.;

Languages

- English: reading, writing, listening — Very good
- French — A2
- Persian — Native

References

Viktor Jirsa, *Professor of Physics*, viktor.jirsa@univ-amu.fr.
Tel: +33 0491324224

Mina Zarei, *Assistant Professor of Physics*, mina.zarei@iasbs.ac.ir.
Tel: +98 24 33152017

Alireza Valizadeh, *Associate Professor of Physics*, valizade@iasbs.ac.ir.
Tel: +98 24 33152120

Meysam Hashemi, *Senior Researcher*, meysam.hashemi@univ-amu.fr.
Tel: +33 695573212