Abolfazl ZIAEE MEHR

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

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.

List of Publications

Mar 2023 G. Rabuffo, H. Armelle, Z. Li, **A. Ziaeemehr**, M. Hashemi, P. Sorrentino, A. Ghestem, P. Quilichini, K. Chuang, T. Perles-Babacaru, V. Jirsa and C. Bernard, **Inferring the mechanisms of resting-state mouse network reconfiguration upon focal region silencing**, Conference poster, NetSci 2023.

Mar 2023 **A. Ziaeemehr**, M. Hashemi, A. Vattikonda, V. Sip, H. Wang, S. Petkoski, M. Woodman and V. Jirsa, **Efficient Bayesian Inference for Virtual Brain Modeling: Incorporating Prior Information and automatic Algorithms for Disorder Prediction**, Conference poster, HBP Summit 2023.

Mar 2023 M. Woodman, M. Hashemi, **A. Ziaeemehr**, A. Vattikonda, J. Fousek and V. Jirsa **Accelerated inference on fields: virtual brains in JAX.**, Conference paper, HBP Summit 2023.

Mar 2023 Sorrentino P, Pathak, **Ziaeemehr**, Lopez, Cipriano, Bonavita, Quarantelli, Banerjee, Hashemi, Jirsa, **The virtual multiple sclerosis patient: on the clinical-radiological paradox**, Submitted to Brain.

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Feb 2023 Yalcinkaya, B.H., **Ziaeemehr**, A., Fousek, J., Hashemi, M., Lavanga, M., Solodkin, A., McIntosh, R., Jirsa, V. and Petkoski, S., 2023. **Personalized virtual brains of Alzheimer's Disease link dynamical biomarkers of fMRI with increased local excitability**. medRxiv, pp.2023-01.

Feb 2021 **A. Ziaeemehr**, and A. Valizadeh, 2020. **Frequency-resolved functional connectivity: Role of delay and the strength of connections**, Frontiers in neural circuits, 2021 Mar.

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

Feb 2020 **A. Ziaeemehr**, M. Zarei, A. Sheshbolouki, **Emergence of global synchronization in directed excitatory networks of type I neurons**. *Scientific Reports. 2020 Feb 24;10(1):1-1.*

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 disease*.

Apr 2019-Feb 2020 Research assistance 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 the Chimera-like states on the human connectome*.

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

Jun 2011-May 2014 spent 2 years for compulsory military service and preparing for Ph.D. period entrance exam.

Teaching Experience

Jul 2020 **TA** at Neuromatch Academy 3 weeks summer school.

2016-2017 **Workshop Lecturer**, Holding workshops at IASBS on Python scripting for scientific programming several times, and also some other 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.

Jal 2020 Neuromatch Academy summer school.

Jan 2018 Comprehensive Workshop on Analysis and Interpretation of Primate Electrophysiological data, Institute for Research in Fundamental Science(**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 Science(**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 most cited papers on modeling BG with spiking and rate models for Parkinson disease..
- **ModelingNeuraldynamics** and **mndynamics**, I wrote the codes 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 is created for weekly sessions of Python scripting course at IASBS and including many example and application from simple to complex.
- **workshop julia** The source code and examples for the Julia workshop including benchmarking simple and generalized Kuramoto model.
- **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 26 th among about 5000 people in entrance exames of Ph.D.;

Languages

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

References

Viktor Jirsa, *Professor of Physics*, viktor.jirsa@univ-amu.fr.
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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.
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