

Mehdi Borjkhani

Computational Neuroscientist

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Location: Warsaw, Poland

Languages: Azerbaijani, Turkish, English, Persian, Polish

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Professional Summary

A computational neuroscientist with extensive experience in biophysical modeling, mathematical analysis, and neural networks. Currently researching at the International Center for Translational Eye Research (ICTER) with a focus on retina modeling and cortical column studies. Expertise in combining computational techniques with biological data to understand neural mechanisms underlying sensory processing and synaptic plasticity. Proficient in Python, C++, MATLAB, and various neuroscience simulation tools, with a passion for bridging computational models with experimental data.

Education

- **M.Sc. Biomedical Engineering** – Tehran Polytechnic, Iran (2009)
- **B.Sc. Electronic and Electrical Engineering** – Urmia University, Iran (2005)

Work Experience

Researcher

International Center for Translational Eye Research (ICTER), Polish Academy of Sciences – Warsaw, Poland (2021–Present)

- Developing biophysical models of the retina, focusing on direction selectivity and the role of inhibitory neurons.
- Leading projects involving realistic cortical column modeling in the primary visual cortex, using the NEURON simulator, BMTK, Matlab, and Python.
- Collaborating on data analysis with experimentalists to explore orientation selectivity and task-dependent neural mechanisms.

Research Associate

Nanyang Technological University – Singapore (2019–2020)

- Conducted experiments with rodents and developed computational models of addiction, analyzing how drugs of abuse impact synaptic plasticity.
- Designed experiments and signal acquisition systems for biomedical research.

Research Assistant

University of Tehran – Iran (2012–2018)

- Developed computational models of opioid-induced synaptic plasticity and its impact on memory formation.
- Analyzed fMRI and EEG data for neuroimaging projects related to addiction and schizophrenia.

Lecturer

Urmia University of Technology – Iran (2010–2011)

- Taught graduate and undergraduate courses in biomedical signal processing, system identification, and control systems.

Research Interests

- **Computational Neuroscience:** Neural networks, biophysical modeling, synaptic plasticity, visual processing.
- **Mathematical Modeling:** Dynamical systems, chaos theory, signal processing, and machine learning.
- **Neurophysiological Data Analysis:** EEG, fMRI, fNIRS, handwriting kinematics.

Technical Skills

- **Programming Languages:** Python, C++, MATLAB
 - **Neuroscience Tools:** NEURON, pySONATA, Brain Modeling Toolkit (BMTK), Visual Neuronal Dynamics (VND), Xppaut, Matcont
 - **Signal Processing Software:** EEGLAB, FSL, ICALAB, Kubios
 - **Hardware/Design:** CW-NIRS systems, HRV analyzers, robot arm, and autonomous vehicle design
 - **Other Tools:** Git, Arduino
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Publications

(Selected peer-reviewed articles)

1. **Investigating the role of inhibitory interneurons in shaping orientation selectivity in the primary visual cortex** – *M. Borjkhani, B. Balamut, A. Posłuszny, A.T. Foik* (Submitted to PLoS One, 2024).
2. **Amplified hybrid surface plasmon polaritons in partially reduced graphene oxide supported on gold** – *S. Mohajer, M.A. Sharif, A. H. Aghdam, M. Borjkhani, M.H.N. Assadi* (Applied Surface Science, 2023).
3. **Computational modeling of opioid-induced synaptic plasticity in hippocampus** – *M. Borjkhani, F. Bahrami, M. Janahmadi* (PloS One, 2018).
4. **Formation of opioid-induced memory and its prevention: A computational study** – *M. Borjkhani, F. Bahrami, M. Janahmadi* (Frontiers in Computational Neuroscience, 2018).
5. **Chaotic fractional-order model for muscular blood vessel and its control via fractional control scheme** – *MP. Aghababa, M. Borjkhani* (Complexity, 2014).

For a full list of publications, please visit [Google Scholar](#).

Conference Presentations

(Selected)

- **A biophysical computational model of a cortical column in the primary visual cortex** – *M. Borjkhani, A. T. Foik* (5th Neurons in Action Conference, Warsaw, 2023).
 - **Investigating the role of PV-related lateral connections in shaping orientation tuning curves** – *M. Borjkhani, A. T. Foik* (Annual IPC PAS Micro-symposium, Warsaw, 2022).
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Design and Implementations

- Developed a **24-channel NIRS system** for light propagation studies (2020).
 - Implemented **HRV analyzers** for stress assessment (2018).
 - Designed robotic arms and systems for competitive robotics (2014).
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Teaching Experience

- **Graduate Courses:** Biomedical Signal Processing, Dynamical Systems in Neuroscience, System Identification, Digital Signal Processing, Intelligent Control Systems, Pattern Recognition, Artificial Neural Networks.

- **Undergraduate Courses:** Electrical Circuits, Process Control, Physics, Advanced Engineering Mathematics.
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References

- **Prof. Morteza A. Sharif** – Assistant Professor, Urmia University of Technology, Iran
- **Prof. Mahyar Janahmadi** – Professor, Neuroscience Research Center, Shahid Beheshti University of Medical Sciences, Iran
- **Prof Fariba Bahrami** – Professor, Computational Neuroscience Laboratory, School of Electrical and Computer Engineering, College of Engineering, University of Tehran, Tehran, Iran
- **Prof Mehdi Eskandarzade** – Professor, Mechanical Engineering Department, Mohaghegh Ardabili University, Ardabil, Iran
- **Dr. Hadi Borjkhani** – Research Assistant, Hochschule für Technik und Wirtschaft Berlin, Germany

(Full contact details available on request.)