

Motivation Letter

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Dear Selection Committee,

I am writing to express my strong interest in the advertised position at the Computational Neurophysics Lab, which focuses on the organization and optimization of flexible information processing in neural networks with an emphasis on the visual system. I am confident that my academic background, research experience, and passion for computational neuroscience make me an ideal fit for this role.

I hold a Master's degree in biomedical engineering and computational neuroscience, and I am currently a researcher at the International Center for Translational Eye Research (ICTER) at the Polish Academy of Sciences. My recent work involves biophysical modeling of the retina, specifically investigating direction selectivity and the role of inhibitory neurons, particularly starburst amacrine cells (SAC). This work complements my earlier research on cortical columns in the primary visual cortex, where I developed a biophysical model to explore the role of interneurons in forming orientation selectivity. My experience aligns closely with the goals of your project, as I have used network modeling, numerical simulations, and data analysis to investigate complex neural systems. I am proficient in tools such as the NEURON simulator, Brain Modeling Toolkit (BMTK), Python, and Matlab, which will allow me to contribute effectively to studying task-dependent coordination and flexible computation in neural networks.

One of the key attractions of computational neuroscience for me is its potential to bridge complex biological systems with computational models, allowing us to decipher the underlying principles of brain function. I am particularly fascinated by how neural circuits adapt and optimize to support flexible computation, especially in sensory systems like the visual cortex. My research on addiction, where I modeled the impact of drugs of abuse on synaptic plasticity, has further fueled my interest in understanding how flexibility and dysfunction manifest in neural circuits. These experiences have given me a strong foundation in dynamical systems, neural networks, and data analysis, which will be invaluable in your project.

The motivation to join this project stems from its unique focus on selective attention and task-dependent coordination in the visual system—an area I am deeply interested in. The opportunity to combine mathematical analysis with biophysically realistic modeling, in collaboration with experimental work, excites me. I believe this project will allow me to apply my knowledge of computational modeling while also pushing the boundaries of my understanding of flexible neural circuits. Moreover, the chance to work alongside world-class researchers in an international environment aligns perfectly with my career goals.

In the long term, I aspire to pursue an academic career, contributing to cutting-edge research, applying for grants, and eventually leading my own lab. I am passionate about teaching and have experience as a lecturer in biological signal processing, C++ programming, and systems neuroscience, which I hope to continue. I see this position as an essential step in building the expertise necessary for establishing my own research group, where I can further explore the brain's computational capabilities and contribute to the scientific community.

I am available to begin working in this role within 3-5 months, but I am also willing to contribute remotely in the interim, conducting literature reviews and engaging in preliminary studies without salary expectations. My eagerness to dive into this work stems from my genuine passion for understanding the brain and advancing research in this exciting field.

Thank you for considering my application. I look forward to the possibility of contributing to your lab and advancing research on flexible information processing in the visual system.

Sincerely,
Mehdi Borjkhani