

PhD research topic proposal
BME, Doctoral School of Mathematics and Computer Science

Name of supervisor :

Gergő Orbán

Degree:

PhD

Title of the topic:

Neural code in the visual system: characterization of population using machine learning

Short description:

Novel recording techniques provide novel opportunities for neuroscience: in contrast to traditional approaches, which attempted to discover the properties of the neural code through the characterization of the responses single neurons, recordings relying on dozens provide opportunities to understand the synergies between neurons. The complex, high-dimensional data provided by the experiments, however, require novel technologies for analysis. In this context, the tools of machine learning and artificial intelligence turn out to be helpful: exploiting the synergies between neurons, we can establish links between neuron population activity and the decision of the animal. Building on collaborations with our partners at UCLA and Frankfurt we can investigate in awake behaving mice and monkeys how neural activity in visual cortices lead to decisions.

The research topic yields training in cutting-edge methods in machine learning, including latent variable models, Bayesian inference, information theory. The trainee will learn the most advanced methodologies in computational neuroscience and and will access cutting-edge recordings in neuroscience (electrophysiology, optogenetics) through collaboration with world-leading laboratories. The project is part of a high-prestige HFSP collaboration.

Requirements:

calculus, linear algebra, probability theory, introduction to machine learning, coding in a scientific programming language

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Place of work:

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Statement: *The conditions of the research above are satisfied, the theme is confirmed by the Head of the Department/Institute*