Internship offer

A aim of research in computational neuroscience is to understand how interactions between neurons, organized in networks, support the emergence of cognitive behaviors such as memory or decision making. Dynamical systems and statistical physics tools have proven to be well suited to account for this emergence and draw quantitative predictions regarding neuroscience experiments. At the Institute for Neurodegenerative Diseases at Bordeaux University, research focuses on a set of brain structures involved in cognitive control and which are impaired in e.g. Parkinson's disease. As a newly developing team in the institute, we combine recent advances in deep-learning and theoretical neuroscience to propose mechanistic models of interacting brain structures [1]. To participate in this effort, the intern will adapt reinforcement learning algorithms to train artificial neural networks [2] on behavioral tasks studied in the experimental part of the team. The intern will use statistical physics and dynamical systems tools to reduce these artificial neural networks to mathematically tractable sets of equations and extract network mechanisms supporting behavior. Inquiries for more information about the project are very welcome and can be addressed to Alexis Dubreuil at alexis.dubreuil@u-bordeaux.fr.

[1] Dubreuil, A., Valente, A., Beiran, M., Mastrogiuseppe, F. & Ostojic, S. Complementary roles of dimensionality and population structure in neural computations. bioRxiv 2020

[2] H Francis Song & Xiao-Jing Wang. Reward-based training of recurrent neural networks for cognitive and value-based tasks. *eLife* doi:10.7554/elife.21492.001.