PhD in Physics Scholarship Title	Neural network model of memory engram consolidation via astrocyte-neuron interaction
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Synthetic description of the activity and expected research outcome	The behavior of complex biological networks can be locally reproduced by fundamental physics laws and globally by statistical properties. The aim of this project is to develop a computational model of the formation of memory engrams. By leveraging on the experimental biological data collected within the BACKUP - ERC project and the computational expertise of the Statistical and Biological Physics Group, the project will model the neuron and the astrocyte networks interaction to consolidate a memory engram. In the context of the available biological data by the BACKUP project, we propose to generate computational models to abstract out as many biological details as possible while capturing functionality and maintaining a faithful representation of neuron-astrocytes interaction in memory consolidation The PhD topic is about the development of statistical and machine learning models to understand the interplay among neurons and astrocytes networks in engram formation. The PhD student will collaborate with the proponent groups to: 1. Acquire neuronal activity maps via light activated neuron-astrocyte networks within optical microscope imaging using optogenetics and electrophysiological techniques. 2. Develop a model based on statistical mechanics and machine learning methods to describe the acquired experimental data. 3. Provide simulations to plan new biological experiments to verify the model predictions. This PhD will be part of the ERC-funded BACKUP project (P.I. Prof. Lorenzo Pavesi, Dept. of Physics). More info at https://r1.unitn.it/back-up/
Ideal candidate (skills and competencies):	We are seeking for a highly-motivated and passionate student, with a strong attitude to work in a collaborative and interdisciplinary team, and with a background in computational physics.