Titolo (provvisorio): Developing Granger Causality algorithm for inferring functional connectivity in in vitro networks

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Motivazione e campo di applicazione

Complex network topologies represent the necessary substrate to support complex brain functions. Thanks to the multi-unit recordings, neuronal assemblies can be considered the physiological units of the brain which generate and sustain the functional properties as well as the dynamical states of the entire system. For these reasons, it is crucial to estimate the topological properties of such networks.

Obiettivi generali e principali attività

Goal of this thesis is to develop and evaluate the Granger Causality approach to infer structural connections from functional-effective ones in dissociated neuronal cultures coupled to Micro-Electrode Arrays (MEAs). Firstly, the devised algorithm will be tested on in silico networks, mimicking different experimental conditions, then comparing the Granger Causality’s performances with a gold-standard method like Cross-Correlation. Finally, the developed algorithm will be used to estimate the topological properties of biological in vitro networks.

Obiettivi di apprendimento (strumenti tecnici e analitici, metodologie sperimentali)

The activities of the thesis will require the development of a Granger Causality algorithm to infer functional connectivity in large-scale network models. Matlab and C# will be the software platforms to use for developing and testing such an algorithm.

Luogo/i in cui si svolgerà il lavoro: NBT Lab @ Via Opera Pia 11A

Abilità e capacità richieste: computational neuroscience, neuroengineering

Curriculum: Bioengineering

Numero massimo di studenti: 1

Supporto finanziario/borse di studio: -