Characterization of the network dynamics of interconnected neuronal populations

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Motivation and application domain

Brain is made up of different regions characterized by different neuronal types. Such heterogeneity contributes to generate peculiar dynamics at the network level. Goal of this project is to characterize the dynamics originated by the mutual interaction of homogeneous (before) and heterogeneous networks coupled to Micro-Electrode Arrays containing 120 microelectrodes.

General objectives and main activities

The project will contain the following steps: 1. Experiments and characterization of network dynamics of homogeneous cortical neuronal populations segregated by means of PDMS confinements; 2. Experiments and characterization of network dynamics of heterogeneous neuronal populations made up of cortico-striatal-thalamic neurons; 3. Characterization of the avalanche distribution of the cortical population when connected or not with the other cell types.

Training Objectives (technical/analytical tools, experimental methodologies)

The activities of the thesis will require the use of an innovative experimental set-up which allows to simultaneously record the electrophysiological activity of hundreds of microelectrodes. In addition, in order to interconnect different neuronal populations, the master student will realize PDMS mask to clusterize such networks.

Place(s) where the thesis work will be carried out: NBT Lab, Via Opera Pia 13, floor -1

Pre-requisite abilities/skills: Neuroengineering and Computational Neuroscience

Maximum number of students: 1

Financial support/scholarship: none