Title (tentative): Connecting biological and artificial neurons to restore injured neuronal networks

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### Motivation and application domain

The goal of this project is to test the capability of a hybrid neuromorphic device to either modulate the dynamics of a biological neuronal system or to restore its functionality in case of an injury. This thesis falls within the multidisciplinary domain named ‘neuroengineering’.

### General objectives and main activities

The general objectives and activities are following:
1. To learn how to prepare and maintain in vitro experimental models, in particular multi-modular patterned neuronal cultures.
2. To perform experiments on the developed experimental model aimed at demonstrating two hypotheses: i) the neuromorphic device, where an artificial neural network is implemented, can modulate the dynamics of a biological neural network; ii) the neuromorphic device can ‘replace’ one biological sub-network which is not functioning any more due to an injury.
3. To analyze and interpret the results obtained during the experiments, also developing specific pieces of code.

### Training Objectives (technical/analytical tools, experimental methodologies)

- Manipulation and maintenance of biological tissue
- Learn how to program a neuromorphic device
- Testing neuronal in vitro model systems
- Data analysis and statistical testing

### Place(s) where the thesis work will be carried out:

Istituto Italiano di Tecnologia

### Additional information

Pre-requisite abilities/skills: basic MATLAB programming skills

Maximum number of students: 1