



## Thesis Project Form

**Title (tentative):** Design, implementation, and testing of experimental techniques to investigate acoustic neuromodulation mediated by piezoelectric nanoparticles

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### Description

#### Motivation and application domain

The broad topic of this thesis project is the development of novel neuroprosthetics and treatments to compensate neurodegenerative diseases. In particular, the idea is to implement a neuromodulation technique based on ultrasound stimulation mediated by piezoelectric nanoparticles

#### General objectives and main activities

The aim of the thesis project is to gain a better understanding of the mechanism at the basis of a novel stimulation paradigm of in vitro neuronal networks. The paradigm is based on mechanical stimulation (pressure waves) transduced into a local electrical stimulation (by means of piezoelectric nanoparticles).

Toward such goal the student will develop and test two different approaches to investigate: 1. the effects of a selective deposition of piezoelectric nanoparticles and 2. the effects of a combined electrical and mechanical stimulation

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

The student will be trained in:

- 3D printing
- soft lithography
- electrophysiological recording using Micro Electrode Arrays (MEAs)
- microcontroller operation/programming

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

### Additional information

**Maximum number of students:** 1