



## Thesis Project Form

**Title (tentative):** Development of an ultrasound neuromodulation system for in-vivo applications

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### Description

#### Motivation and application domain

Transcranial Ultrasound Stimulation (TUS) can noninvasively and reversibly perturb neuronal activity, but the mechanisms by which ultrasound engages brain circuits to induce functional effects remain unclear. To elucidate these interactions, TUS can be applied to the cortex of awake mice and concurrently local neural activity at the acoustic focus can be monitored with two-photon calcium imaging. On-line analysis of neuronal activation would allow a controlled (closed-loop) stimulation system. This, together with a deep understanding of the working mechanism of TUS on brain cells will allow to develop efficient neuromodulation techniques to be applied in different neurological pathologies.

#### General objectives and main activities

The thesis project will focus on one or more of the following objectives:

- improve the experimental setup for in vivo TUS stimulation and calcium imaging

• collect experimental data

- extend the computational model of circuit mechanisms, including detailed aspects of cortical microcircuits, and validate it against the experimental data

Activities will include either/both experimental work and the development of software algorithms/hardware that builds up the existing set-up in order to get a closed-loop neurostimulation system

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

**Place(s) where the thesis work will be carried out:** Langone Health™s Tech4Health Institute, New York University

### Additional information

**Maximum number of students:** 1