



Thesis Project Form

Title (tentative): Measuring brain computations with miniaturized two-photon microscopes

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Description

Motivation and application domain

Two-photon fluorescence microscopy is a revolutionary technique in experimental neuroscience because it allows measuring the activity of hundreds/thousands of anatomically identified neurons with subcellular resolution in the intact brain. However, to date two-photon microscopy has been limited to experimental preparations in which the sample is fixed under the microscope objective.

General objectives and main activities

This thesis work will contribute to implement in the Fellin laboratory at the Istituto Italiano di Tecnologia a new lightweight miniaturized two-photon microscope (MINI2P, <https://www.sciencedirect.com/science/article/pii/S0092867422001970?via%3Dihub>) which enables two-photon functional imaging in freely moving animals. The work includes design, assembly, and testing of the optical system as well as experimental measurements of neuronal activity and consequent data analysis using custom code. The work is part of an international collaboration.

Training Objectives (technical/analytical tools, experimental methodologies)

The thesis will allow training in applied optics, fluorescence microscopy, experimental neuroscience, neurophysiology, data analysis, and code writing.

Place(s) where the thesis work will be carried out: Istituto Italiano di tecnologia, via Morego 30, Genova

Additional information

Pre-requisite abilities/skills: Coding expertise is recommended for the data analysis part

Maximum number of students: 1