**Intership sheet**

**Subject:** Out-of-plane displacement quantification for a 6DoF optical micro-robot using deep learning

**Project language is ENGLISH**

Supervisors: Ferhat Sadak et Sinan Haliyo

Starting date of the internship: February 2023

Duration of the internship: 4 to 6 months

Desired level of study: Master 2 or equivalent

Host laboratory: ISIR (Institut des Systèmes Intelligents et de Robotique), Campus Pierre et Marie Curie, 4 place Jussieu, 75005 Paris.

**Contact person**

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You are required to contact the supervisors BEFORE applying for the projet.

Send your application by email, with [internship subject] in the subject line, a CV and a cover letter.

**Description of the internship**

**Abstract:**

Micro-objects with dimensions ranging from 50nm to 10m can be manipulated using an optical tweezer (OT) [1]. OT can manipulate cells or other biological objects directly. Because direct manipulation of the OT can cause cell damage, it is critical to use indirect manipulation to avoid laser beam damage. The indirect manipulation can be achieved by using the microrobot as an effector. Automation is worth developing to reduce the workload of human operators by eliminating the manual manipulation of multiple microspheres or microrobots. To that end, localization and automatic trapping of multiple microrobots in OT is required. Many existing works focus on planning and control for automated cell manipulation [5], such as using a decision theoretic based path planning approach for real-time path planning [2] and graph search-based algorithms for automated cell transport in microfluidic chambers [3]. However, no attention has been paid to microrobots’ real-time out-of-plane displacement estimation. This information is critical for the automation of cell handling procedures, as it will improve efficiency and control over the process. The experimental setup for a 6DoF optical robot to estimate the out-plane plane displacement is shown as Figure 1.

In overall, the aim of this project is to precisely to predict the out-of-plane displacement estimation of a 6DoF micro robot using deep learning.
Figure 1: Optical-micromanipulation platform for dexterous single-cell handling [4].

References: