

Open Master Thesis Project

Towards automated real-time analysis of tissue samples next to the operating room

Neuro Robotics Group at the ARTORG Center for Biomedical Engineering Research

University of Bern

The **ARTORG** Center creates innovative healthcare technology by bringing together the biomedical engineering and medicine departments of the University of Bern. The **Neuro Robotics Group** focuses on the development of surgical instruments for neurosurgery based on robotics and micromechanics.

Project background: New methods for tissue sample analysis such as Polarimetry [1] are on the rise. The future promises systems that allow performing analysis of resected tissues right next to the operating room in real-time. Application examples include the analysis of tumour borders where a real-time feedback is essential as it influences the decision whether more tissue should be resected or not. The resected tissue samples have sizes and thicknesses that not necessarily match the field of view of the imaging system, making scanning of the sample a necessity. Thus, we are developing an automated positioning stage that will allow placement of the tissue sample with respect to an imaging system in 4 degrees of freedom (3 translation, 1 rotation), reducing manual workload and increasing efficiency.

Project Aim: In this project, you will develop a motorized stage that automatically places tissue samples with respect to the imaging system and allow for an automated image acquisition process.

Materials and Methods: You will collaborate with other members of the Neuro Robotics Group and the Artificial Intelligence in Medical Imaging Group to set up the hardware, including design and assembly (Solidworks) of the 4D-stage hardware components as well as developing the software to control the motors and sensors (Python). You will develop an algorithm for automated sample positioning and image stitching based on the feedback of a camera mounted above the stage. You will analyze the accuracy of the image acquisition and analyze the potential influence of sample motion due to acceleration and deceleration of the stage.

Your profile:

- You are pursuing a master's degree in mechanical engineering or a closely related discipline
- You have solid basics in mechanics and are familiar with CAD design
- You have experience in mechatronics and are familiar with Python coding and software development
- You have experience with image acquisition and analysis
- You are a hands-on person who likes to work with hardware
- You are curious, motivated and self-driven
- You want to work in and contribute to an interdisciplinary and applied research environment

Supervisor:

Prof Dr. Manuela Eugster and Prof. Dr. Raphael Sznitman

Institutions:

ARTORG Center for Biomedical Research, University of Bern
Department of Neurosurgery, Inselspital Bern

References:

- [1] Sampaio et al., Müller matrix polarimetry for pancreatic tissue characterization, Scientific reports, 2023

Start date: June 2024 or upon agreement.

Workplace: ARTORG Center (Murtenstrasse 50) on the InselSpital Campus.

Apply for this project by sending your CV, diplomas and course transcripts to manuela.eugster@unibe.ch.

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