University of Basel
Department of Biomedical Engineering

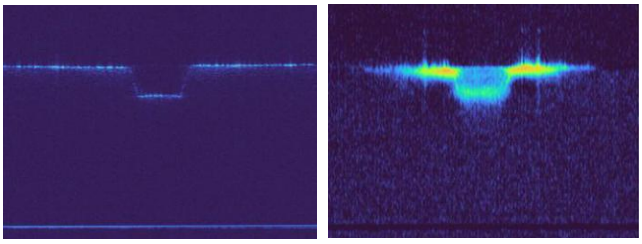
Center for Intelligent Optics (CIO)
Center for medical Image Analysis & Navigation (CIAN)

Deep-learning assisted photo-thermal optical coherence tomography

Background:

Laser surgery is increasingly valued for its precision and ability to perform non-contact incisions. However, to make it safer and more effective, additional feedback systems are required, leading to the concept of SMART laser surgery. At the Center for Intelligent Optics (CIO), several feedback mechanisms—such as spectral, sound-based, and image-based methods—have already been developed to assist laser osteotomy. However, a temperature feedback system is still missing to prevent unwanted thermal damage to critical surrounding tissues during laser surgery.

This project aims to develop a deep learning–assisted photo-thermal optical coherence tomography (OCT) system to provide real-time temperature feedback. The ultimate goal is to detect tissue thermal expansion and create algorithms that allow OCT to accurately estimate tissue temperature during surgery.



Intensity-Based OCT | Photo-Thermal OCT

Task Description:

- Performing controlled laser ablation experiment using integrated OCT and Er:YAG laser
- Developing a neural network to correlate temperature rise of bone tissue with measured thermal expansion using OCT
- Integration of the developed model to OCT's software for real-time temperature measurements

Your profile:

- You are pursuing a master's degree in biomedical engineering, physics, computer science, or a related discipline
- Experience in scientific programming (preferably Python)
- Basic knowledge of optics

Supervisors:

Dr. Arsham Hamidi
Dr. Sidaty El Hadramy

Apply to this project by e-mail with subject "MT-1260" to (arsham.hamidi@unibas.ch) with the following documents:

- **CV**
- **Diplomas and Course Transcripts**

For a virtual tour to our department watch this video!

University of Basel
Department of Biomedical Engineering
Hegenheimermattweg 167b/c
4123 Allschwil, Switzerland