



Master Thesis Proposal

Better, faster, stronger: Improving the utility of an open-source, 3D-printed microscope for cancer diagnostics

Context

When a doctor suspects disease, examining tissue under a microscope remains one of the most reliable ways to confirm a diagnosis, particularly in cancer diagnostics. Digitizing samples into whole slide images (WSI) enables remote sharing, quantitative analysis, and AI-assisted diagnosis. Yet WSI scanners are expensive (>CHF 100k), putting them out of reach for many settings. Open-source alternatives like the OpenFlexure microscope offer a ~CHF 500 option, but face limits in scanning time and area. This thesis asks how far those limits can be pushed.

Task Description

The aim of this master's thesis is to establish how far an open-source 3D-printed microscope ([OpenFlexure](#)) can realistically be pushed: what it can already do, where the biggest "knobs" for improvement are, and which limitations are inherent to the platform.

The project will focus on:

- Reducing scan time, starting with faster autofocus
- Enabling full-slide coverage without redesigning the stage (currently only 12mm x 12mm area can be captured at once)
- Own ideas by the student for improving the microscope over the course of the project

Nature of the Thesis

Programming and software: 40%
Experimental/Hardware work: 40%
Documentation: 20%

Specific Requirements

- Motivation to improve access to diagnostic tools for low-resource settings.
- Hardware/embedded-systems experience (e.g. Raspberry Pi, motor/stage control, 3D printing).
- Strong programming skills (Python); experience with signal processing/ computer vision (e.g. predictive focus algorithms) is a plus.
- Experience with optics or imaging systems is a plus.

What We Offer

- Opportunity to characterize and push the engineering limits of an open-source diagnostic imaging platform.
- An interdisciplinary, international team committed to open science and mentorship (and afternoon tea breaks ☕).

Supervision

Lydia Schönplüg (PhD Student), Dr. Maxime Lafarge (PostDoc), Prof. Dr. Viktor Kölzer (Professor), CTP Lab, Department of Biomedical Engineering, University of Basel

Contact

Send one PDF with your motivation letter, CV, and transcripts to lydia.schoenplug@unibas.ch. Applications are reviewed on a rolling basis; early submission is encouraged. We are planning to start the project by the earliest end of September 2026.