

Master Thesis - Job Description- Robotic Test Bench

Design and validation of an integrated stereotactic test bench for patient-specific pre-operative models using optical imaging techniques

This project is part of a larger ongoing project, collaborating with the ARTORG IGT Group University Bern and SurgeonsLab AG. The project aims to develop accurate pre-operative patient brain pathologies to aid neurosurgeons and neuro-interventionists in accurately planning therapies. The group had developed a dedicated 3D printing and modeling technology that precisely and realistically replicates the patient pathologies. The virtual and physical models are integrated into the existing commercially available neurosurgical simulator for training surgeons.

The proposed thesis will focus on creating a validated test bench mechanically constructed using optical imaging methods to quantify the virtual and patient models against patient DICOM (CT, MRI datasets). The results of the thesis will be finally validated by clinicians and shall be seamlessly integrated into the existing model generation algorithm.

Thesis goals:

- Literature Review and conceptual design for the precision-driven stereotactic frame and six axes motion control
- Measurement technique for quantifying the positional deviation using state-of-the-art 3D reconstruction algorithms
- Develop GUI for integrating patient dataset, virtual model, physical model, and quantifiable validation metrics. Implement cross-validation approaches and incorporation of workflow.
- Cross-validate the test bench for different patient datasets

Skillsets:

- Basic knowledge of C++ and/or other programming skills. Sound knowledge in the software-hardware integration process. Ability to build firmware libraries.
- Any embedded framework, image segmentation software, CAD tools.

Minimum Requirements to Apply:

- Field of Study: Electrical, Biomedical, Computer, Mechanical Engineering, or other related
- Past experiences in robotics, optical imaging, design, and validation of precision tools are a plus

Send to fredrick.joseph@unibe.ch, Dr. Fredrick Johnson Joseph, ARTORG IGT

1. Letter of Motivation (1-page, font size 10) [Format- About me, Past and Motivation, How I fit for this thesis, and what interests me?]
2. CV (Academic Track Record, Professional Experience)

Start Period: At the earliest possible

Learn More about the simulator: <https://www.surgeonslab.com/product-surgtrain/>

Research Group Page: <https://www.artorg.unibe.ch/research/igt>