

## Master Thesis - Job Description- Surgery Navigation System

### Integration and validation of state-of-the-art microsurgery optical navigation system with a mixed-reality training simulator

This project is part of a larger ongoing project, collaborating with the ARTORG Image Guided Therapy 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 virtual and physical models from the patients are part of the commercially existing neurosurgical simulator. The simulation tool requires integration with the existing microsurgical navigation software to improve the precision of surgery.

The proposed thesis will focus on establishing hardware and software integration of the navigation and guidance system used inside the operation theatre and the training simulator. The results of the thesis will be finally validated by clinicians and shall be seamlessly integrated into the existing patient-specific case planning for complex surgeries.

#### Thesis goals:

- Literature Review and integration plan. Coupling software architectures with existing workflow
- Positional landmarks of navigation markers in the simulation models, coordination with an operating surgical microscope and other imaging modalities like hybrid Computed Tomography
- Integrating the virtual models with optical navigation trackers and simulation models
- Quantifying guidance accuracy and calibration of the tools
- Develop GUI for integrating patient dataset, virtual model, physical model, and quantifiable validation metrics. Implement navigation approaches and incorporation of the workflow.
- Cross-validate the developed methods with state-of-the-art navigation systems

#### Skillssets:

- 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, design, robotic navigation control, and validation of precision tools are a plus

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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>