Master Thesis Description- Simulation training workflow for functional neurosurgery and neuro radiosurgery

Mimicking functional neurosurgery and neuro radiosurgery procedures and designing simulation training software workflow

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 patient-specific training models for procedures with complex surgical cases. In addition, the work will establish a strong foundation for in-depth neurosurgical workflow and simulation training requirements.

Thesis goals:

- Clinical Need Identification, Ideation, and Design of Solution. Rapid methods of manufacturing allow the creation of functional phantoms that are in a personalized way compared to a patient
- Evaluation of the training concept and implementation of clinical workflow into the simulation software. Testing and pre-clinical validation of a small cluster of patient models with expert neurosurgeons. Derive training performance assessment metrics and quantitatively assess the surgeon's skills
- Conducting experiments with neurosurgeons and validation of the results

Skillsets:

- Strong anatomical knowledge and previous experience in 3D modeling, 3D printing, and material science
- Interest in learning systematic literature review and translation of clinical workflow into a software
- Experiment creation, design, and validation of results. Hands-on experience with Image processing and computer vision. Good programming skills.

Minimum Requirements to Apply:

- Field of Study: Material science, physical effects, Biomedical, Computer, Mechanical Engineering, or other related areas

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