Master's Thesis Project Call:
Recognizing Surgical Motion Patterns in Training using Touchless Ultraleap Technology

Introduction and Objective

Developing surgical skills requires structured training and objective feedback, yet traditional methods rely heavily on expert supervision, which is often subjective and time-consuming. This master's thesis explores the use of Ultraleap touchless motion tracking to analyze and recognize hand motion patterns during surgical training exercises such as cardiac anastomosis and micro bypass. The project's goal is to design and validate a framework that captures hand kinematics, identifies characteristic motion patterns, and distinguishes between exercises and skill levels, ultimately providing objective, real-time feedback to enhance surgical training.

Research Questions

1. How can Ultraleap technology be applied to reliably track and analyze hand movements in surgical training scenarios?
2. Which motion features and patterns best characterize different surgical procedures?
3. Can recognized motion patterns be correlated with training performance and skill acquisition?

Methods and Approach

- Conduct a review of existing literature on motion tracking and skill assessment in surgical training.
- Collaborate with surgeons and trainers to identify exercises and define relevant motion features.
- Develop a motion analysis pipeline using Ultraleap data (e.g., trajectory analysis, pattern recognition, machine learning classifiers).
- Validate the system through pilot experiments comparing novices and experienced users on selected training tasks.

Timeline and Deliverables

- Completion time of the project: 6–9 months for Master's thesis.
- Deliverables include a comprehensive thesis, a validated motion analysis framework, classification results of surgical training exercises, and a presentation of findings.

Requirements and Eligibility

- Background in biomedical engineering, computer science, or related field.
- Strong interest in human–computer interaction, motion analysis, and surgical training technologies.
- Basic knowledge of programming and data analysis (e.g., Python, MATLAB) is an advantage.
- Motivation to collaborate with healthcare professionals and participate in training settings.

Supervision and Support

- Access to Ultraleap technology and expert supervision will be provided.

Application Process

Interested candidates should submit their CV, a brief statement of interest to lorenzo.civilla@meduniwien.ac.at by **30.11.2025**. Shortlisted candidates will be invited for an interview.

Contact Information For inquiries and further information, please contact

Assoc. Prof. Dipl.-Ing. Francesco Moscato, PhD at francesco.moscato@meduniwien.ac.at
Lorenzo Civilla, MSc at lorenzo.civilla@meduniwien.ac.at.