University of Basel, Department of Biomedical Engineering, Gewerbestrasse 14, 4123 Allschwil

Master of Science – Biomedical Engineering, Thesis Proposal

Navigated Knee Surgery

The human knee has a complex anatomical structure consisting of four bones, cartilage, muscular tissue, and ligaments. When the knee is moved beyond its natural range of motion, these ligaments might be stretched or in extreme cases even ruptured. The anterior cruciate ligament or in short ACL is one such ligament that can rupture, requiring surgical treatment. Performing this surgery is very demanding and requires substantial experience from the surgeon. It has been reported in the literature that misplacements of the tendon transplants often lead to rotary instability possibly requiring re-surgery.
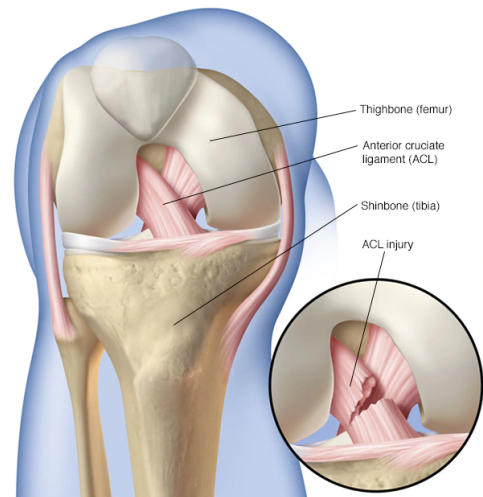
This master thesis aims to support ACL surgery by developing intraoperative navigation support. More specifically the aim is to provide this navigation support using chiefly the tools/devices readily available in the already crowded operating room environment. To achieve this goal, a measurement set-up to acquire ground truth videos including the tracking information of the arthroscope needs to be built and the capturing software written. Based on this ground truth data the student will then develop a deep learning approach able to estimate the tracking information based on the video image only.

This project is in close collaboration with the department of orthopedics and traumatology of the University Hospital of Basel.

Nature of the Thesis
Experimental: 30%, Programming: 60%, Documentation: 10%

Specific Requirements
- Experience in Deep Learning
- Good programming skills

Supervisor
Prof. Dr. Philippe Cattin, University of Basel, Center for medical Image Analysis and Navigation CIAN

Scientific Collaborators
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