University of Basel

Department of
Biomedical Engineering

Master of Science – Biomedical Engineering
Thesis Proposal
Title:
Development of a Predictive Model for Postoperative BMI and Related Diseases
Start: 01.07.2025

Overview:
Obesity and its associated complications—such as Type 2 Diabetes Mellitus (T2DM) and Obstructive Sleep Apnea Syndrome (OSAS)—pose significant challenges to global health and place substantial burdens on healthcare systems. Bariatric surgery is an established intervention for severe obesity; however, patient outcomes can vary significantly.
Accurate prediction of postoperative BMI trajectories and the likelihood of developing comorbidities like T2DM is essential for personalized patient care and improved long-term outcomes. The aim of this master's thesis is to develop an advanced deep learning model capable of predicting postoperative BMI as well as associated health risks based on preoperative and early postoperative data.
The model will be trained on a large, annotated dataset of clinical tabular data from multiple collaborating hospitals. The data include preoperative characteristics and postoperative outcomes for over 90,000 patients, labeled by medical experts. The goal is to ensure that the model generalizes well across various clinical environments and provides a reliable decision-support tool for healthcare professionals. Additionally, the model's performance will be validated against manually segmented datasets to assess predictive accuracy.

Nature of the Thesis:
- Programming: 80%
- Documentation: 20%
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Specific Requirements:
- Experience in machine learning
- Strong programming skills (especially in Python)

Supervisors:
- Dr. Shantanu Roy, University of Basel, Department of Biomedical Engineering
- Dr. med. Anas Taha, University of Basel, Department of Biomedical Engineering
- Prof. Philippe Cattin, University of Basel, Department of Biomedical Engineering

Scientific Collaborators:
- Dr. Lars Kollmann, University of Würzburg, Germany
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