Masterthesis

Erklärbare künstliche Intelligenz für die Echtzeit-Unterstützung in der minimal-invasiven Chirurgie

Explainable Artificial Intelligence for Real-time Assistance in Minimally Invasive Surgery

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Background

Recent advances in artificial intelligence (AI) and computer vision have led to their use in surgery in the form of decision support systems (DSS) to improve surgical procedures, revolutionizing decision-making, workflow optimization and overall patient outcomes. However, clinical DSSs based on AI are still regarded as critical, as opacity is a major concern. Therefore, explainable AI (XAI) methods are intended to enable the interpretability of AI-based decisions and, above all, to create transparency during intraoperative real-time usage.

Task

The aim of the thesis is to develop an XAI method to generate explanations for an AI-based DSS that anticipate the need for surgical instruments during minimally invasive surgery. For this purpose, a detailed literature review on XAI methods and their design space is to be conducted. Expert interviews with surgeons at the Klinikum rechts der Isar are intended to provide information about the necessary explanations. Subsequently, a methodology for the generation of explanations will be developed, considering the requirements of surgeons. The methodology will then be implemented in the existing AI-based DSS system. Lastly, the algorithm will be implemented in the operating room and evaluated together with surgeons.

Subtasks

The following points are to be addressed within the course of the work:

- Literature research on existing XAI methods and their translation into clinical practice so far
- Requirements analysis by means of expert interviews and user observation
- Development of a methodology for the generation of explanations during minimally invasive surgeries
- Implementation of the methodology in the existing AI-based DSS system
- Evaluation of the methodology in the OR