Project Proposals for Doctoral Researcher Positions 2025

ID05: Multimodal decision support for postoperative monitoring after brain tumor surgery (Klaus Maier-Hein, Jan-Oliver Neumann)

Heidelberg, DKFZ, Medical Image Computing

After brain tumor surgery, patients are typically admitted to an intensive care unit (ICU) in many healthcare settings. Economic pressures and concerns about unnecessary ICU admissions have led to a shift towards selectively admitting patients. While various decision aids have been proposed, the final decision often rests with the operating surgeon, who considers factors such as the patient's health status, surgery complexity, tumor characteristics, and any procedural complications. Surgeons tend to err on the side of caution, admitting even low-risk patients to the ICU or a step-down unit for close monitoring.

There is growing interest in developing automated approaches to support this decision-making process. Machine-learning models, trained on extensive patient data including surgical details and outcomes, have the potential to objectively predict postoperative complications. Leveraging data from Heidelberg University's Neurosurgical clinic, we propose a comprehensive decision support system using advanced techniques in joint image, language, and tabular data processing. By integrating preoperative imaging, clinical data, and patient records, this algorithm aims to predict ICU complications and provide a scoring system to guide clinicians in making informed decisions, minimizing patient risk and optimizing resource utilization.

Requirements:

- Master’s degree in Computer Science, Data Science, or a related field
- Strong programming skills in Python
- Experience with machine learning and deep learning
- Experience with (medical) imaging data analysis or language processing are beneficial
- Excellent English communication skills, German is beneficial
- Ability to work independently and as part of a team
- Strong motivation and commitment to research

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