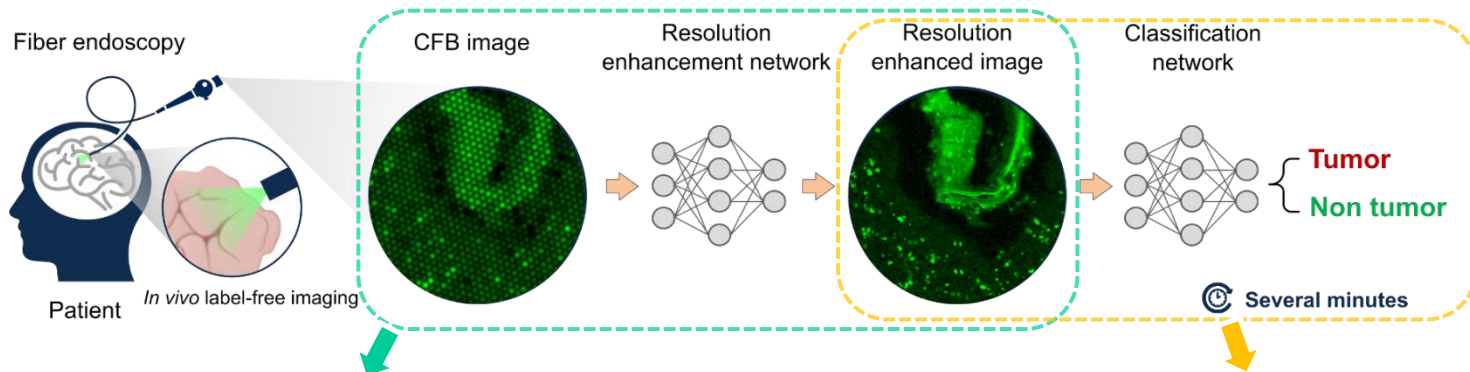


High-resolution endoscopic imaging using deep learning for intraoperative tumor diagnosis

Motivation

Conventional tumor diagnosis using pathological biopsy is time-consuming (days to one week) and no direct feedback exists during biopsy. Coherent fiber bundle (CFB)-based endoscopy makes real-time visualization of tumor with minimal invasiveness possible. However, honeycomb artifacts and low-resolution introduced by multi-core hinder its application in neurosurgery.



Topic 1: CFB imaging reconstruction

In order to remove the artifacts, an image processing algorithm framework based on deep neural networks (DNNs) is to be developed. With resolution improvement and label-free imaging techniques (e. g. auto-fluorescence), an artifact-free image with an enhanced resolution can be reconstructed.

Task

- Improvement of resolution by applying advanced models
- Investigation of multiple images for resolution enhancement
- Evaluation of reconstruction quality

Topic 2: tumor classification and explainable AI

AI-assisted binary classification enables experience-independent and intraoperative tumor diagnostics. Additionally, the classification accuracy can be further improved, and extending to multi-class tissue recognition is possible. For a reliable tumor diagnosis, the explainable artificial intelligence is necessary.

Task

- Improving classification performance of tumor images
- Investigating multi-class classification
- Investigating explainability by using LIME, Grad-CAM, ...

Contact

Dipl.-Ing. Tijue Wang, BAR 116

E-mail: tijue.wang@tu-dresden.de