Studien- / Diplom- / Masterarbeit, ET / MT / IST / Physik / Biomedizintechnik

AI-enabled virtual staining technologies for fiber bundle-based tumor diagnosis

Motivation

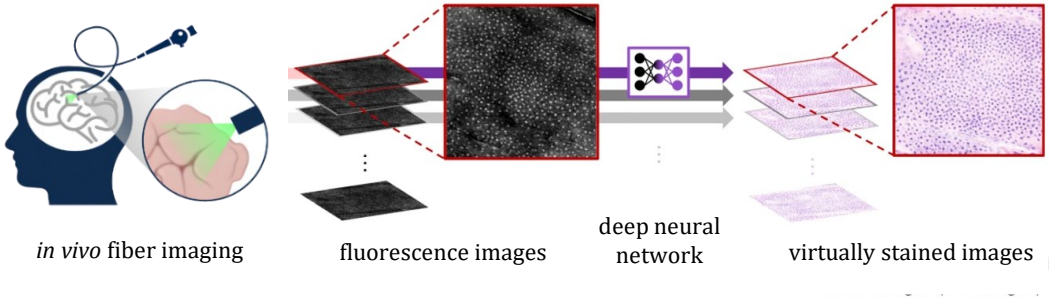
Autofluorescence imaging offers a label-free method to recognize and localize the biomarkers of tumor tissues. Due to its non-invasiveness, autofluorescence is becoming one of the most important imaging techniques in biomedicine. However, currently almost all pathologists are only trained with histologically stained images. AI-driven virtual staining technologies provide a bridge between fluorescence modalities with the current gold standard - histological staining.

In this project, an image processing algorithm framework is to be developed for virtual staining. Secondly, for realizing in vivo fluorescent imaging in neurosurgeries, virtual staining is expected to perform on imaging through multi-core fibers, which transfer fluorescent patterns in real-time with minimal invasiveness .

(a) Conventional pathology

Li, …, Ozcan. Light: Science & Applications. 2021

(b) Fiber-based diagnosis with virtual staining



Keywords

Deep learning, virtual staining, medical image processing, cancer diagnosis, python, pytorch

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Task

- Training data preparation by image registration and pre-processing
- Building neural networks to convert fluorescence images to “histological images”
- Implementation with an additional fine-registration module
- Model optimization, result evaluation and documentation