University of Basel
Department of
Biomedical Engineering

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Master of Science – Biomedical Engineering
Thesis Proposal

AI Generation of Cerebral Perfusion Maps

Stroke is a leading cause of death in Switzerland and can result in severe disability. Effective patient management is critical to minimize brain damage and improve patient outcomes. When a patient presents to the emergency department with a suspected stroke lesion, imaging is one of the first steps. For non-large vessel occlusions, radiologists use perfusion threshold maps to assess the region of the brain with ischemia and determine whether intervention is needed.

To create perfusion maps, contrast is injected into the patient and multiple CT or MRI scans are taken to create a time series image. From these time series, model-based approaches are used to reconstruct different maps representing the state of the vascular circulation of the brain. This approach used in clinical routine present some disadvantages such as the radiation dose to the patient when the imaging modality is CT scan and the reconstruction time.

In the past, researchers have shown that it might be possible to generate these maps from the angiography images for MRI images of large vessel occlusions using deep learning approaches instead of actually performing perfusion.

We would like to investigate whether a similar approach is possible for CT scans of distal occlusions.

1. Tabea Kossen, Vince I Madai, Felix Lohrke, Orhun Utku Aydin, Jonas Behland, Adam Hilbert, Matthias A Mutke, Martin Bendszus, Jan Sobesky, Dietmar Frey
medRxiv 2023.08.22.23294405; doi: https://doi.org/10.1101/2023.08.22.23294405

Nature of the Thesis

Programming: 80%
Documentation: 20%

Specific Requirements

Python

Group Leader / Supervisor

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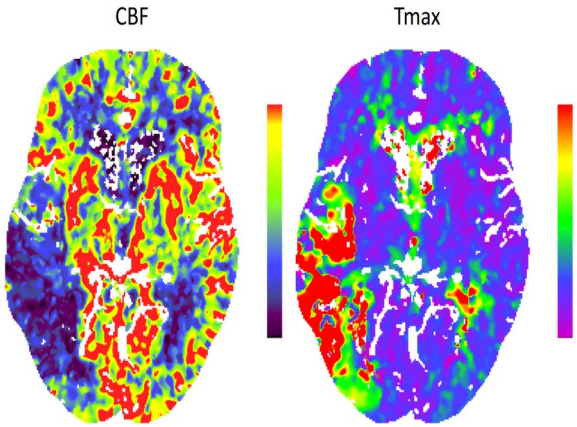
Center for medical Image Analysis and Navigation CIAN
https://dbe.unibas.ch/en/research/imaging-modelling-diagnosis/center-for-medical-image-analysis-navigation/



Perfusion maps example with Tmax (time to maximum) and CBF (cerebral blood flow)

Collaborators

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