

Variational Network for Image Enhancement of 3D Arterial Spin Labeling Perfusion Images

Master's Thesis

Arterial Spin Labeling (ASL) is a non-invasive MR technique for measuring perfusion in tissue. Instead of using a contrast agent, this technique uses arterial blood water as an endogenous tracer. One application field is to measure the Cerebral Blood Flow (CBF) in the brain. The CBF represents an important physiological parameter for the diagnosis of brain disorders, in particular cerebrovascular diseases.

Objective:

The SNR in ASL images is critically low. For robust quantification of the CBF in a clinically acceptable time it is essential to improve the SNR and image quality of the CBF maps. The aim of this thesis is to extend an existing variational network (VN), which was successfully applied on 2D ASL data¹, for 3D ASL data. The performance of the implemented 3D VN should be evaluated for different resolutions, SNR levels and on pathological datasets. The 3D ASL datasets will be acquired at the 3T MRI during the thesis.

Qualifications:

- Interest on Biomedical Imaging
- Basic knowledge in image processing and optimization
- Programming experience in Matlab, Python, Tensorflow
- Interest to work in an interdisciplinary team

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1. M. A. Schwarzbach, S. M. Spann, C. S. Aigner, K. Hammernik, T. Pock, and R. Stollberger: “Combining Variational Optimization and Deep Learning for efficient ASL image quality enhancement”, Magnetic Resonance Materials in Physics, Biology and Medicine (2019)