Chair of Imaging and Computer Vision

RWTH AACHEN UNIVERSITY

Master-Thesis

Deep Learning–Based Image Enhancement for Low-Field MRI Using Simulated Degradations

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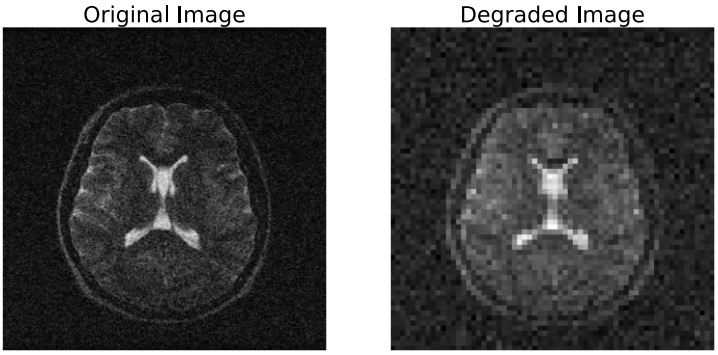
Background

Low-field magnetic resonance imaging (MRI) has gained increasing interest due to its lower cost, improved accessibility, and reduced infrastructure requirements compared to conventional high-field systems. However, the reduced magnetic field strength leads to lower signal-to-noise ratio and limited spatial resolution, which can significantly degrade image quality and restrict clinical applicability. Recent advances in deep learning have shown strong potential for image super-resolution and quality enhancement, offering a promising approach to mitigate these limitations by learning to recover high-resolution image details from low-resolution MRI data.

Tasks

- Literature Research and Problem Analysis.
- Evaluation of Baseline Methods.
- Simulation of Low-Field MRI Data.
- Comparative Evaluation and Analysis of the state-of-the-art Enhancement Methods.
- Evaluation of Enhancement Algorithms in combination with standard Reconstruction vs complete Deep Learning Reconstruction.

M4Raw[1]



[1] M4Raw: A multi-contrast, multi-repetition, multi-channel MRI k-space dataset for low-field MRI research

Your Profile

- Strong programming experience in Python.
- First deep learning and machine learning experience (frameworks: Pytorch, Lightning, Numpy, Pandas).
- Experience with Git, Github, Gitlab.
- Preferably understanding of the MRI imaging technique.

Our Offer

The call for applications is aimed at master's students with a technical background (e.g. physics, informatics, electrical engineering) and is carried out in cooperation with Fraunhofer MEVIS. Our institute has state-of-the-art IT infrastructure and its own HTCondor Cluster. A workstation can be provided at the Chair of Imaging and Computer Vision Processing. As a supervisor I will consult and guide you through the work, through regular discussions. At the end of the thesis the work could be published in a top-tier conference. Feel free to contact me via email.