

BBB Seminar (BMED382)



Thursday, June 4. 14:30. **NB! In the auditorium at AHH**

Expanding the reach of MRI using Generative AI and Foundation Models

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Magnetic Resonance Imaging (MRI) is a key imaging modality to manage brain diseases, from detection and characterization to treatment planning and monitoring. Yet, its full potential remains constrained by long scan times, artifacts, and the absence of direct functional or molecular readouts. Generative AI and Foundation Models offer new opportunities to address these challenges, notably with applications in image reconstruction, quality improvement and synthesis of missing contrasts and functional images from multi-parametric MRI.

Diffusion models and transformer-based architectures enable accelerated MRI acquisitions by generating high-fidelity images from under-sampled k-space data, reducing scan times while preserving diagnostic detail. Our work attempts to simultaneously speed up acquisitions and correct for common artifacts, while preserving high quality images, evaluated by a new reference-free image quality metric we proposed for that purpose.

We have also used these technologies to expand the range of traditional MRI applications, more focused on anatomical imaging, to also perform molecular and physiological imaging as Positron Emission Tomography (PET) or advanced MRI sequences would do. We have evaluated whether large multimodal Foundation Models can also be leveraged by improving the performance of these models, assessed by traditional image quality and clinical metrics. I will present the results obtained with the generative models developed by the BRAINE group of LIH, with applications in brain oncology and neurodegenerative diseases, and discuss the potential of these technologies in the preventive medicine of the future.

Chairperson: Frits Thorsen, Department of Biomedicine