

Tapping Into a Resource Hidden Behind MR Images: Learning Quantitative Imaging Biomarkers from Raw Big Data

Initiative: zukunft.niedersachsen (nur ausgewählte Ausschreibungen)

Ausschreibung: Big Data in den Lebenswissenschaften der Zukunft

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Laufzeit:

Magnetic Resonance Imaging (MRI) per se is a slow, non-quantitative imaging modality. The reason for its popularity within medical imaging is based on its superb soft tissue contrast and lack of ionizing radiation. Computational Magnetic Resonance Imaging is a new field that combines numerical reconstruction algorithms with novel data acquisition strategies to develop improved and highly accelerated imaging methods that overcome the limits of traditional MRI. One lesson learned from the research of highly accelerated MRI is the need for sophisticated signal models to fully recover all information hidden within the primary raw data – the radio-frequency signal sensed and digitized by the MRI scanner. These signals are called "k-space" data. When using traditional MRI algorithms a significant amount of information from the k-space data is lost during image reconstruction. One reason for this is that the required signal models that capture all correlations in the data are too complex to be used in the reconstruction. Historically computing power and storage capacity have been dominating factors, which barred retaining the full information and prevent application of current tools like deep learning on this raw data. Hence, there is a need for "big data" approaches to utilize this potential. In this project, it will create the necessary translational infrastructure to perform this kind of research in Göttingen – from numerical simulation up to clinical use. To start with the scientists will initially concentrate on heart and brain applications. This project will enable ultra-fast structural and functional imaging of heart and brain, novel multi-spectral quantitative image integration and development of machine-learning diagnostics for cardiac and neural diseases.

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