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Generalized Multi-Channel MRI Reconstruction using Deep Neural Networks

Multi-channel coil receivers for magnetic resonance imaging (MRI) accelerate the scan for fast imaging. Acceleration is typically achieved by subsampling the data acquisition and leveraging the localized spatial profiles of each coil element to reconstruct the images. Though powerful, this multi-channel MR image reconstruction is impeded by the need to acquire calibration data and to accurately model the multi-channel array. This process adds time to the MR exam, limits possible subsampling factors, and is prone to calibration error. Motivated by these challenges, Stanford researchers have developed a technique based on a generalized deep convolutional neural network that leverages historical data to accurately predict and apply the multi-channel information for image reconstruction. The advocated technology can bring significant scan time reduction, patient comfort, and more accurate reconstruction for diagnostic and therapeutic applications.

Applications

- Enables the ability for rapid and robust MRI image reconstruction.
- Useful for applications where a calibration scan is infeasible to perform, such as for time-resolved imaging and real-time imaging.

Advantages

- Eliminates the need to perform calibration scans for multi-channel reconstruction.

- Eliiminates the need to acquire a calibration region as part of the data acquisition.
- Acquisition of the calibration region decreases the scan efficiency and limits the possible subsampling factors.
- Generalizes deep neural networks to handle different coil hardware configurations.
- Enables faster image reconstruction.

Patents

- Issued: 10692250 (USA)

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