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Efficient Reconstruction Algorithms for Fast MRI

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In this dissertation, we focus on the problems of fast and accurate reconstruction of under sampled dynamic MRI data sets. Our approaches make use of the natural scarcity of images and belong to the family of compressed sensing algorithms. The compressed sensing theory relies on random sampling. In reality, people prefer non-Cartesian MRI sampling trajectory's such as radial or spiral ones in order to mimic random cases. First, we propose a novel NUFFT schemes to reconstruct Non-Cartesian MRI dataset with high accuracy and low memory demands. Secondly, we developed a unified framework for nonlocal mean regularization algorithms to finely recover the MRI images from under sampled dataset. Finally, we show that our algorithms significantly improved the Cardiac MRI reconstruction in both signal to noise ratio and visual effects.