# Abstract

Dynamic MRI (DMRI) has become a favored imaging modality because it produces high spatio-temporal resolution scans of various physiological phenomenon. However, the long scan times due to hardware and physiological constraints have made DMRI acquisition costly. Over the last decade, various techniques that perform reconstruction from undersampled k-space have permitted accelerated acquisition. This thesis explores combining two such important reconstruction techniques: compressed sensing and deep learning.

Unlike most reconstruction techniques, especially those discussed in deep learning literature, this thesis presents an online multi-coil reconstruction method, SISTA-MRI, that performs sequential recovery of Dynamic MRI within a parallel imaging framework. SISTA-MRI is constructed as an interpretable deep learning network that explicitly unrolls the steps of a traditional compressed sensing algorithm across both time and iterations. The proposed SISTA-MRI method is evaluated by measuring, both qualitatively and quantitatively, the reconstruction of free-breathing and breath-hold cardiac cine.