Compressed Sensing and Medical Applications

An Optimal Sampling-Reconstruction Scheme for MRI using Compressed Sensing and Dualizable Shearlets

Gitta Kutyniok

Technische Universität Berlin

kutyniok@math.tu-berlin.de

Abstract:
One fundamental problem in Magnetic Resonance Imaging (MRI) is the slow acquisition of the data. In mathematical terms, this is typically modeled by acquiring point samples of the associated Fourier transform. In this talk, we will present a sparse subsampling strategy of Fourier samples alongside with an efficient reconstruction algorithm. For this, we will introduce a dualizable shearlet frame as a sparsifying representation system for the data. The sampling scheme utilizes compressed sensing ideas combined with a coherence-adaptive sampling density based on the coherence between the selected elements of the Fourier basis and the shearlet frame. We will then prove optimality of this scheme in terms of asymptotic approximation accuracy and discuss various numerical results. This is joint work with W.-Q Lim (TU Berlin).