Cardiovascular MRI with Data-Driven Sparsifying Transform
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Introduction: Dynamic cardiovascular MRI facilitates the assessment of the structure and function of the cardiovascular system. One of the challenges in dynamic MRI is the prolonged data acquisition time. In order to fit the data acquisition time inside the motion cycles of the imaging subject, the data must be highly undersampled. Compressed sensing or sparsity-based MR reconstruction [1] takes advantage of the fact that the image is compressible in some transform domain, and enables reconstruction based on under-sampled k-space data thereby reducing the acquisition time. The design of such transform is a key to the success of the reconstruction. In this paper, we propose to use tight frame learning for computing data-driven transforms. Empirical results demonstrate improvement over the transform associated with the redundant Haar Waveset.

Methods: Our proposed approach comprises of the following steps: 1) Acquire training images using similar acquisition protocols for dynamic cardiac imaging or generate a reference image from the acquired data itself. 2) Learn a tight frame from the reference or training images. 3) Perform the sparsity enforcing reconstruction using the learnt tight frame in an analysis formulation. In the remainder of this abstract we shall focus on generating a reference image from the acquired data itself.

References: