

Title: Efficient Sparsifying Transform Learning and its Applications

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Abstract:

Many applications in signal processing and medical imaging benefit from the sparsity of signals in a certain transform domain or dictionary. Synthesis sparsifying dictionaries that are directly adapted to data have been popular in applications such as image denoising, and medical image reconstruction. In this poster, we focus instead on the sparsifying transform model, and study the learning of well-conditioned sparsifying transforms from data. The proposed transform learning algorithms solve the non-convex transform learning problems by alternating minimization. We provide local convergence guarantees for our sparsifying transform learning algorithms. In practice, these algorithms are insensitive to initialization, and thus, may be globally convergent.

Furthermore, we also present results illustrating the promising performance and significant speed-ups of transform learning over adaptive synthesis dictionary-based methods in image denoising, and magnetic resonance (MR) image reconstruction. Our MR image reconstruction scheme simultaneously adapts the sparsifying transform and reconstructs the image from highly undersampled k-space measurements. Owing to its computational efficiency compared to previous methods, the proposed MR image reconstruction scheme may be well-suited for large data volumes and real time reconstruction.