A Penalty Function Promoting Sparsity Within and Across Groups

Abstract:

We introduce a new penalty function that promotes signals composed of a small number of active groups, where within each group, only a few high magnitude coefficients are non-zero. We derive the threshold function associated with the proposed penalty and study its properties. We discuss how the proposed penalty threshold function can be useful for signals with isolated non zeros, such as audio with isolated harmonics along the frequency axis, or reflection functions in exploration seismology where the non zeros occur on the boundaries of subsoil layers. We demonstrate the use of the proposed penalty threshold functions in a convex denoising and a non convex deconvolution formulation. We provide convergent algorithms for both formulations and compare the performance with state-of-the-art methods.