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Exploiting Structural Complexity for Robust and Rapid Hyperspectral Imaging

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This paper presents several strategies for spectral de-noising of hyperspectral images and hypercube reconstruction from a limited number of tomographic measurements. In particular we show that the non-noisy spectral data, when stacked across the spectral dimension, exhibits low-rank. On the other hand, under the same representation, the spectral noise exhibits a banded structure. Motivated by this we show that the de-noised

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spectral data and the unknown spectral noise and the respective bands can be simultaneously estimated through the use of a low-rank and simultaneous sparse minimization operation without prior knowledge of the noisy bands. This result is novel for for hyperspectral imaging applications. In addition, we show that imaging for the **Computed Tomography Imaging** Systems (CTIS) can be improved under limited angle tomography by using low-rank penalization. For both of these cases we exploit the recent results in the theory of low-rank matrix completion using nuclear norm minimization.

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