Collaborative, Structured, and Hierarchical Sparse Image Models

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In this talk I will show the importance of moving beyond standard sparse modeling for image processing applications. After motivating the need for new models, I will present a structured sparse model based on a collection of PCA models, leading to state-of-the-art image enhancement results at a fraction of the computational time needed by standard techniques. This will be followed by a model for collaboratively learning dictionaries for data clustering. We conclude with a new model for collaborative hierarchical sparse representations, with applications ranging from source separation to missing data recovery. While differently motivated, all three components of the talk are closely related and based on the same need of adding collaboration and structure to sparse modeling. The presentation of the models will be accompanied by numerous experimental and theoretical results.