Combinatorial compressed sensing with expanders

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Abstract: In spite of the square-root bottleneck for doing compressed sensing with binary matrices, the computational benefits of such sparse matrices triggered a lot interest in this area dubbed combinatorial compressed sensing. This talk will start from the introduction of the l1-norm restricted isometry property, which allows for optimal sampling rates but weaker instance optimality conditions to my most recent work on model-based combinatorial compressed sensing. There will be discussion on construction of expander graphs and hence expander matrices, both deterministic and random constructions. Recent improvements in random constructions and their implications for compressed sensing will also be discussed. Algorithms motivated by linear sketching for both standard compressed sensing and model-based compressed sensing with tree-sparse and loopless overlapping group-sparse model will be presented. The current state-of-the-art with more general models (overlapping group models for groups with bounded treewith and low frequency) and more efficient algorithms using head and tail approximations with model projections done via bender's decomposition will also be presented.