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Graphs, Codes, and Compressed Sensing

The Interval-passing algorithm (IPA) used in compressed sensing is an iterative process that is used to recover a k-sparse signal $\mathbf{x} \in \mathbb{R}^n$ from a linear measurement vector $\mathbf{y}$ where $\mathbf{y} = H\mathbf{x}$. The matrix H is called the measurement matrix. Similar to the iterative decoder used in decoding low-density parity-check (LDPC) codes, the IPA may be modeled by a bipartite graph called a Tanner graph. Yakimenka and Rosnes showed that graphical substructures called trapping sets characterize when the IPA fails; the size of the smallest trapping set is called the trapping distance. In this talk, we present new results on the structure of different types of trapping sets as well as bounds on the sizes of trapping sets that exist in the graphs corresponding to certain classes of measurement matrices. This work gives new insight to designing good graphs (and corresponding measurement matrices) for compressed sensing.