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Abstract

We deal with a compressed sensing problem in the following the scenario. The signal is sparse and nonnegative. The measurement is sparse, i.e. only a few coordinates of the signal enter each measurement. Furthermore the measurement allows a positive combination of rows, i.e. there exists a linear combination of the rows that is positive in every entry. This allows us to formulate a compressed sensing problem that is different from the traditional case: we minimise over the l_1-distance with a nonnegativity constraint. The procedure is robust without a priori bounds on the noise. Expander graph based matrices exhibit both requirements of positive combination and sparsity. We prove a recovery guarantee depending on the number of measurements.

1 What are wo looking at?

- Compressed sensing problem
- Signal: nonnegative, sparse
- Measurements: adjacency matrix of bipartite expander
- Result: robust recovery guarantee

2 Why are we looking at this?

- Positivity occurs naturally in many applications
- Allows for robust recovery sans initial noise estimate
- Expander graphs naturally fulfill the positivity requirement
- The sparsity of the expander matrices leads o fast implementation
- Applications: Network error detection

3 Plan

1. Introduction: Expander Graphs, correspondence to L1, 1-RIP, 1-NSP
2. Introduction Nonnegative Constraints - where do they come from?
3. The positive row-combination - why is it important and which matrices have it?

4. 1-NSP + positive row-combination = recovery guarantee
5. Open problems - why is there no implementation yet?
6. Thunderous applause - how to stay humble?