

The projects in the course “compressed sensing and random matrixes”

1. Deterministic RIP matrix: Construct a deterministic RIP matrix Φ . Analysis its RIP property and also show its performance by numerical experiments.

[1] R. DeVore, Deterministic constructions of compressed sensing matrices, *Journal of Complexity* 2007, 23: 918-925.

[2] Z. Xu, Deterministic sampling of sparse trigonometric polynomials, *Journal of Complexity* 2011, 27: 133-140.

[3] J. Bourgain, S. J. Dilworth, K. Ford, S. Konyagin and D. Kutzarova, Explicit constructions of RIP matrices and related problems. *Duke Math. J.*, 2011, 159: 145-185.

[4] Guangwu Xu, Zhiqiang Xu, Compressed Sensing Matrices from Fourier Matrices, arXiv:1301.0373.

2. Make the numerical experiment in Section 3 in the paper “Stable signal recovery from incomplete and in accurate measurements”.

3. Make the numerical experiment for comparing the different decoding method, such as Bregman iterative [1] and OMP algorithm [2] etc.

[1] W. Yin, S. Osher, D. Goldfarb, and J. Darbon, Bregman iterative algorithms for ℓ_1 -minimization with applications to compressed sensing, *SIAM Journal on Imaging Sciences*, 2008, 1: 143-168.

[2] Z. Xu, A remark about orthogonal matching pursuit algorithm, arXiv:1005.3093.

4. Make the numerical experiment for comparing the ℓ_1 decoding with the algorithm suggested in [1]. Also, try to extend the algorithm in [1] to the deterministic matrix in [2].

[1] Lorne Applebauma , Stephen D. Howard, Stephen Searle, Robert Calderbank, Chirp sensing codes: Deterministic compressed sensing measurements for fast recover, *Appl. Comput. Harmon. Anal.* 26 (2009) 283-290.

[2] Z. Xu, Deterministic sampling of sparse trigonometric polynomials, *Journal of Complexity* 2011, 27: 133-140.

5. Make the numerical experiment for the *phase retrieval* problem.

[1] E. Candes, Y. Eldar, T. Strohmer and v. Voroninski, Phase retrieval via matrix completion, arXiv: 1109.0573.

[2] E. Candes, T. Strohmer and V. Voroninski. PhaseLift: exact and stable signal recovery from magnitude measurements via convex programming, arXiv: 1109.4499.

[3] Yang Wang, Zhiqiang Xu, Phase Retrieval for Sparse Signals, arXiv:1310.0873.

6. Make the numerical experiment for comparing the algorithms for one-bit compressed sensing in [1] and [2]

[1] Yaniv Plan, Roman Vershynin, One-bit compressed sensing by linear programming, arXiv:1109.4299.

[2] Wenhui Liu, Da Gong, Zhiqiang Xu, One-Bit Compressed Sensing by Greedy Algorithms, arXiv:1312.3418.