Abstract

In this paper, we introduce a new framework for interpreting the existing theoretical stability results of sparse signal recovery algorithms in practical terms. Our framework is built on the theory of constrained minimal singular values of Gaussian sensing matrices. Adopting our framework, we study the stability of two algorithms, namely LASSO and Dantzig selector. We demonstrate that for a given stability parameter (noise sensitivity), there exits a minimum undersampling ratio above which the recovery algorithms are guaranteed to be stable.

References

- Barry C. Arnold, N. Balakrishnan, and H. N. Nagaraja. A First Course in Order
Statistics. SIAM, Philadelphia.
- Emmanuel J. Candès. The restricted isometry property and its implications for
- Emmanuel J. Candès and Terence Tao. Decoding by linear programming. IEEE
  Transactions on Information Theory.
- Emmanuel J. Candès and Terence Tao. Decoding by linear programming. IEEE
  Transactions on Information Theory.
- Enrique Castillo, Ali S. Hadi, N. Balakrishnan, and Jose M. Sarabia. Extreme Value
  and Related Models with Applications in Engineering and Science. John Wiley and Sons, New
  York.
- L. Canto E Castro. Uniform rates of convergence in extremevalue theory: Normal and
  gamma models. Annales de la Facult des sciences de l'Université de Clermont, Série
  Probabilités et applications.
- Paul Embrechts, Claudia Kluppelberg, and Thomas Mikosch. Modeling Extremal Events
  for Insurance and Finance. Springer Verlag, New York.
- I. S. Gradshteyn and I. M. Ryzhik. Table of Integrals, Series, and Products.
Academics Press, San Diego.
- Hwan-Chol Jang, Chang-Hyeong Yoon, Eui-Heon Chung, Won-Shik Choi, and
  Heung-No Lee. Speckle suppression via sparse representation for wide-field imaging through
  turbid media. Optics Express.
- Gongguo Tang and Arye Nehorai. Performance analysis of sparse recovery based on
  constrained minimal singular values. IEEE Transactions on Signal Processing.
- Brendt Wohlberg. Noise sensitivity of sparse signal representations: Reconstruction
- Hui Zhang and Lizhi Cheng. On the constrained minimal singular values for sparse

Index Terms

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Keywords

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