Mahdi Soltanolkotabi

Contact Information

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Research Interests

- Mathematical optimization, machine learning and signal processing.
- Iterative algorithms and non-convex optimization
- Theory of algorithms, high-dimensional statistics, applied probability, random matrix theory, empirical process theory and chaining, geometric functional analysis
- Computational imaging, machine intelligence, and healthcare.
- Sparse/low-rank recovery, compressive sensing, and phase retrieval

Academic Employment

University of Southern California (USC), Los Angeles, CA.

- Assistant Professor, Ming Hsieh Department of Electrical Engineering August 2015-present.

University of California Berkeley (UCB), Berkeley, CA.

- Postdoctoral Researcher, Department of Electrical Engineering and Computer Science, August 2014-July 2015.

Education

Stanford University, Stanford, CA.

- PhD in Electrical Engineering, 2009-August 2014.
  Advisor: Emmanuel J. Candès.
- M.Sc. in Electrical Engineering, Sept. 2009-June 2011.

Sharif University of Technology, Tehran, Iran.

- B.Sc. in Electrical Engineering, Sept. 2005-June 2009.

Grants and awards

- *Ptychography based Rapid Imaging of Nano-Structures with Multi-layer Assemblies (PRISMA).* Intelligence Advanced Research Projects Activity (IARPA). $30,862,236 with Richard Leahy, Tony Levi, Justin Haldar, and collaborators at USC ISI, Northwestern University, Argonne National Labs and the Paul Scherrer Institute.
- Simon's Institute fellowship and long term visitor on foundations of learning.
- Stanford **BENCHMARK** Graduate Fellowship in Science and Engineering (2009-2012).
- Stanford **teaching fellowship** in Electrical Engineering (Summer 2011).
- Department and Institute **rank 1/800**, Sharif University of Technology (2009).

Invited Talks

- Nonconvex Optimization for High-Dimensional Learning: From neural networks to submodular maximization
  - *Workshop on Fast Iterative Methods in Optimization, Simons Institute, Berkeley, CA, October 2017*
  - *Workshop on Beyond Convexity: Emerging Challenges in Data Science, Banff international research station, Oaxaca, Mexico, October 2017*
- Leveraging prior knowledge in phase retrieval: From theory to practice
  - *Workshop on Phaseless Imaging in Theory and Practice: Realistic Models, Fast Algorithms, and Recovery Guarantees, Institute for Mathematics and its Applications, Minneapolis, MN, August 2017*

- Nonconvex Optimization for High-Dimensional Learning: From Phase Retrieval to Submodular Maximization
  - *EE Systems Seminar, California Institute of Technology, Pasadena, CA, May 2017*
  - *EE Systems Seminar, North Carolina State, Durham, CA, June 2017*
- Breaking sample complexity barriers via non-convex optimization,
  - *Joint Mathematical Meeting, Special Session on Mathematics of Signal processing, Atlanta, GA, January 2017.*
  - *SIAM conference on Optimization, May 2017. Vancouver, Canada*
- Structured signal recovery without the shackles of convexity. Claremont Mckenna College, Math department September, 2016.
- Breaking sample complexity barriers via non-convex optimization, *International Conference on Continuous Optimization (ICCOPT), Tokyo, August 2016.*
- *NII Shonan Meeting on "Recent Advances in Randomized Numerical Linear Algebra", NII Shonan Meeting, Tokyo, July 2016.*
- Generic Chaining meets (non)convex optimization, *Chaining Methods and their Applications to Computer Science, Harvard University, June 2016.*
- Phase Retrieval: Theory, Algorithms, and Applications, *International Conference on Acoustics, Speech and Signal Processing (ICASSP), Shanghai, China, March 2016.*
- Finding Low-complexity models without the shackles of convexity, *Workshop on Low complexity models in signal processing, Hausdorff research institute for mathematics (HIM), Bonn, Germany, Feb. 2016.*
- Towards universality for randomized dimension reduction, *Frontiers in Mathematical Sciences, Sharif University of Technology, December 2015.*
- Mathematics of Data, *Advanced Topics in Computer Science and Engineering, Department of Computer Engineering, Sharif University of Technology, December 2015.*
- Structured signal recovery without the shackles of convexity
  - *Statistics Seminar, University of California, Los Angeles(UCLA), May 2016.*
  - *International Matheon Conference on Compressed Sensing and its Applications, Berlin, Dec 2015.*
  - *SIAM Conference on Applied Linear Algebra, Atlanta, October 2015.*
  - *Sharif University of Technology, Department of Electrical Engineering, Tehran, Iran, December 2015.*
- Sharp time–data tradeoffs for linear inverse problems
  - *International Symposium on Optimization, Pittsburg, July 2015.*
- Phase Retrieval via non-convex optimization: Theory and Algorithms
  - *INFORMS, San Francisco, November 2014.*
  - *John Hopkins Center for Imaging Science, October 2014.*
  - *UC Berkeley, Networking, Communications, and DSP seminar, September 2014.*
- Robust Subspace Clustering
  - *Stanford Biostatistics seminar, Feb. 2014.*
  - *Asilomar Conference on Signals, Systems and Computers, Oct. 2013.*
  - *ICML workshop on spectral learning, June 2013.*
  - *Information Theory and Applications workshop, Feb. 2013.*
  - *Princeton: MURI annual meeting, October 2012.*
- A geometric analysis of subspace clustering with outliers
  - *Georgia Tech.: High-Dimensional Phenomena in Statistics and Machine Learning Seminar, July 2012.*
  - *Stanford: Workshop on Modern Massive Data Sets (MMDS), July 2012.*
  - *UC Berkeley: Berkeley robotics lab, Feb 2012.*

PUBLICATIONS

- Dissertation

[1] Algorithms and Theory for Clustering and Non-convex Quadratic Programming. Stanford University Ph.D. Dissertation August 2014.

- Recent publications

[2] M. Soltanolkotabi, A. Javanmard and J. D. Lee. Theoretical insights into the optimization landscape of over-parameterized shallow neural networks. Submitted 2017.

[3] M. Soltanolkotabi. Learning ReLUs via gradient descent. Submitted 2017.

[4] H. Hassani, M. Soltanolkotabi, and A. Karbasi. Gradient methods for submodular maximization. Submitted 2017.

[5] M. Soltanolkotabi. Structured signal recovery from quadratic measurements: Breaking sample complexity barriers via nonconvex optimization. Submitted 2017.

[6] S. Oymak and M. Soltanolkotabi. Fast and reliable parameter estimation from nonlinear observations. Accepted in SIAM Journal on optimization 2017.

[7] R. Heckel and M. Soltanolkotabi. Generalized line spectral estimation. Accepted in IEEE Transactions on Information theory 2017.

[8] S. Oymak, B. Recht, and M. Soltanolkotabi. Sharp time-data tradeoffs for linear inverse problems. Accepted in IEEE Transactions on Information theory 2017.

[9] S. Oymak, B. Recht, and M. Soltanolkotabi. Isometric sketching of any set via the Restricted Isometry Property. Accepted in Information and Inference 2017.

[10] S. Tu, R. Boczar, M. Soltanolkotabi, and B. Recht. Low-rank Solutions of Linear Matrix Equations via Procrustes Flow. Proceedings of International Conference on Machine Learning, 2016.

[11] R. Heckel, V. I. Morgenshtern, and M. Soltanolkotabi. Super-Resolution Radar. Information and Inference, March 2016.

[12] E. J. Candés, X. Li, and M. Soltanolkotabi. Phase Retrieval via Wirtinger Flow: Theory and Algorithms. IEEE Transactions on Information Theory, vol.61, no.4, pp.1985-2007, April 2015.

[13] E. J. Candés, X. Li, and M. Soltanolkotabi. Phase Retrieval from coded diffraction patterns. *to appear in Applied and Computational Harmonic Analysis. 2014.*

[14] M. Soltanolkotabi, E. Elhamifar, and E. J. Candés. Robust subspace clustering. *to appear in Annals of Statistics, Preprint Jan. 2013.*

[15] M. Soltanolkotabi and E. J. Candés. A geometric analysis of subspace clustering with outliers. *Annals of Statistics 40(4), 2195–2238, 2012.*

[16] E. J. Candés and M. Soltanolkotabi. Discussion of "Latent Variable Graphical Model Selection via Convex Optimization", *Annals of Statistics 40(2), 1997–2004, 2012.*

[17] F. Marvasti, A. Amini, F. Haddadi, M. Soltanolkotabi, B. Khalaj, A. Aldroubi, S. Sanei and J. Chambers. A Unified Approach to Sparse Signal Processing. *EURASIP Journal on Advances in Signal Processing.*

Professional Service

Referee Service

- *Annals of Statistics.*
- *IEEE Transactions on Information Theory.*
- *Journal of Machine Learning Research.*
- *Constructive Approximation.*
- *Foundations of Computational Mathematics.*
- *IEEE Transactions on Signal Processing.*
- *International Journal of Computer Vision.*
- *SIAM Imaging science.*
- *Statistical Analysis and Data Mining.*
- *IEEE Signal Processing Letters.*
- *Neural Information Processing Systems (NIPS 2014, 2015, 2016).*
- *International Conference on Learning theory (COLT 2015).*
- *International Conference on Machine Learning (ICML 2015).*
- *IEEE International Symposium on Information Theory (ISIT 2012, 2015).*
- *Sampling Theory and Applications (SampTA 2015).*
- *Signal Processing with Adaptive Sparse Structured Representations. (SPARS 2013).*