Majid Janzamin

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Education

Doctor of Philosophy in Electrical Engineering & Computer Science (expected) *June 2016*
University of California, Irvine, CA, USA
Advisor: Prof. Anima Anandkumar

Master of Science in Electrical Engineering *Jan. 2010*
Sharif University of Technology, Tehran, Iran

Bachelor of Science in Electrical Engineering *Sept. 2007*
Sharif University of Technology, Tehran, Iran

Areas of Interest

- Large-Scale Machine Learning and High-Dimensional Statistics
- Convex and Non-convex Optimization: Analysis and Applications
- Inference and Learning in Graphical Models and Latent Variable Models
- Spectral Methods: Tensor Decomposition Analysis and Applications

Awards and Honors

- EECS **Department Fellowship** (tuition waiver and 20K stipend for 9 months), UC Irvine, 2010-2011.
- **Exceptional Graduate Student Fellowship**, National Elite Foundation, Iran, 2007-2009.
- **Financial Research Award**, Iran Telecommunication Research Center (ITRC), 2009.
- **Ranked 8th** among nearly 15000 participants in the nationwide entrance exam for graduate degree in Electrical Engineering, Iran, 2007.
- Recognized as a **National Elite** (top %0.01) by National Elite Foundation, Iran, 2006.
- **Ranked 12th** among nearly 450000 participants in the universities entrance exam in the field of **Mathematics and Physics**, Iran, 2003.

Academic & Industrial Experience

Research Intern *July 2014 - Sept. 2014*
Microsoft Research Silicon Valley, Mountain View, CA.
Efficient Learning of Sparse Polynomials, with Rina Panigrahy and Li Zhang.

Visiting Graduate Student *April 2014 - June 2014*
Microsoft Research New England, Cambridge, MA.
Learning Overcomplete Latent Variable Models via Tensor Methods, with Anima Anandkumar and Rong Ge.

Visiting Graduate Student *Sept. 2012 - Nov. 2012*
ICERM (Institute for Computational and Experimental Research in Mathematics), Brown University, Providence, RI.
Semester program on *Computational Challenges in Probability*, mentored by Prof. Kavita Ramanan.

Visiting Graduate Student *Sept. 2012 - Oct. 2012*
Microsoft Research New England, Cambridge, MA.
Identifiability of Overcomplete Topic Models, with Anima Anandkumar, Daniel Hsu and Sham Kakade.

Member of Technical Staff *Nov. 2007 - Sept. 2010*
Parman Co., Tehran, Iran.
Optical Network Design and Analysis, Design and Development of SDH Systems.

Selected Research Experience

- Training *neural networks* using Method-of-Moments [1]:
  - ▷ I worked on designing and analyzing a new method for training neural networks based on tensor decomposition techniques.
  - ▷ For the first time, we proposed a training method for neural networks with provable *risk bound*.
  - ▷ The method can be generalized to learning other models such as mixture of GLMs [2, 8, 9].
- *Unsupervised* learning of latent variable models (LVMs) [3, 10]:
  - ▷ I worked on tensor decomposition methods for learning LVMs. The focus of my work was on the overcomplete regime where the latent dimensionality is larger than the observed dimensionality.
  - ▷ We provided tight sample complexity results for learning several latent variable models such as multiview mixture model, ICA and sparse coding.
- Tensor Decomposition Analysis: Algorithm and Identifiability
  - ▷ I analyzed the convergence guarantees of tensor decomposition algorithms in the overcomplete regime where the tensor rank is larger than the tensor dimension [4, 5, 10].
  - ▷ I worked on the overcomplete representation analysis via tensor algebra. In particular, I provided conditions under which the parameters of overcomplete *topic models* are uniquely learnable [6, 11].
- Learning the structure of graphical models in the *high-dimensional* regime [7, 12]:
  - ▷ It is popular to impose sparsity assumption to make the learning problem tractable in the high-dimensional regime. I expanded the class of models that can be learned by extending sparsity to multiple domains. I worked on convex optimization techniques for this task.

Publications

Note: authorship order of specified publications by **asterisk symbol** * follows the convention in theoretical computer science of **alphabetical author order**.

Preprints (available on webpage and arXiv)

[1] **M. Janzamin**, H. Sedghi, and A. Anandkumar. Beating the Perils of Non-Convexity: Guaranteed Training of Neural Networks using Tensor Methods. *Submitted: Preprint available on arXiv:1506.08473*, June 2015.

[2] **M. Janzamin**, H. Sedghi, and A. Anandkumar. Score Function Features for Discriminative Learning: Matrix and Tensor Frameworks. *Preprint available on arXiv:1412.2863*, Dec. 2014.

[3] A. Anandkumar, R. Ge, and **M. Janzamin***. Sample Complexity Analysis for Learning Overcomplete Latent Variable Models through Tensor Methods. *Preprint available on arXiv:1408.0553*, Aug. 2014.

[4] A. Anandkumar, R. Ge, and **M. Janzamin***. Guaranteed Non-Orthogonal Tensor Decomposition via Alternating Rank-1 Updates. *Preprint available on arXiv:1402.5180*, Feb. 2014.

Journal Publications

[5] A. Anandkumar, R. Ge, and **M. Janzamin***. Analyzing Tensor Power Method Dynamics in Overcomplete Regime. Accepted for publication in *Journal of Machine Learning Research*. available on arXiv:1411.1488.

[6] A. Anandkumar, D. Hsu, **M. Janzamin***, and S. Kakade. When are Overcomplete Topic Models Identifiable? Uniqueness of Tensor Tucker Decompositions with Structured Sparsity. *Journal of Machine Learning Research*, 16:2643–2694, Dec. 2015.

[7] **M. Janzamin** and A. Anandkumar. High-Dimensional Covariance Decomposition into Sparse Markov and Independence Models. *Journal of Machine Learning Research*, 15:1549–1591, April 2014.

Conference Publications

[8] H. Sedghi, **M. Janzamin**, and A. Anandkumar. Provable Tensor Methods for Learning Mixtures of Generalized Linear Models. In *Proceedings of the International Conference on Artificial Intelligence and Statistics (AISTATS)*, Cadiz, Spain, May 2016.

[9] **M. Janzamin**, H. Sedghi, U.N. Niranjan, and A. Anandkumar. FEAST at Play: Feature ExtrAction using Score function Tensors. In *NIPS Feature Extraction: Modern Questions and Challenges workshop*, Montreal, Canada, Dec 2015.

[10] A. Anandkumar, R. Ge, and **M. Janzamin***. Learning Overcomplete Latent Variable Models through Tensor Methods. In *Proceedings of the Conference on Learning Theory (COLT)*, Paris, France, July 2015.

[11] A. Anandkumar, D. Hsu, **M. Janzamin***, and S. Kakade. When are Overcomplete Topic Models Identifiable? Uniqueness of Tensor Tucker Decompositions with Structured Sparsity. In *Proceedings of the Neural Information Processing Systems (NIPS) Conference*, Lake Tahoe, Nevada, USA, Dec 2013.

[12] **M. Janzamin** and A. Anandkumar. High-Dimensional Covariance Decomposition into Sparse Markov and Independence Domains. In *Proceedings of the 29th International Conference on Machine Learning (ICML)*, Edinburgh, Scotland, June 2012.

[13] **M. Janzamin**, M. R. Pakravan, and H. Sedghi. A Game-Theoretic Approach for Power Allocation in Bidirectional Cooperative Communication. In *Proceedings of IEEE Wireless Communications and Networking Conference (WCNC)*, Sydney, Australia, April 2010.

Workshop/Conference Presentations

- Generalization Bounds for Neural Networks through Tensor Factorization. *ISMP (International Symposium on Optimization)*, Pittsburgh, PA, July 2015.
- Score Function Features for Discriminative Learning. *ICLR (International Conference on Learning Representations)*, San Diego, CA, May 2015.
- Provable Learning of Overcomplete Latent Variable Models: Semi-supervised and Unsupervised Settings. *NIPS: Workshop on Optimization for Machine Learning*, Montreal, Canada, Dec. 2014.
- Provable Learning of Overcomplete Latent Variable Models: Semi-supervised and Unsupervised Settings. *New England Machine Learning Day*, Microsoft Research, Cambridge, MA, May 2014.
- Guaranteed Non-Orthogonal Tensor Decomposition through Alternating Rank-1 Updates. *Workshop on Electrical Flows, Graph Laplacians, and Algorithms: Spectral Graph Theory and Beyond*, ICERM, Brown University, Providence, RI, April 2014.

- When are Overcomplete Topic Models Identifiable? Uniqueness of Tensor Tucker Decompositions with Structured Sparsity. *GlobalSIP: Symposium on Optimization in Machine Learning and Signal Processing*, Austin, TX, Dec. 2013.
- High-Dimensional Covariance Decomposition into Sparse Markov and Independence Domains. *50th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, IL, Oct. 2012.

Related Graduate Coursework

Machine Learning, High Dimensional Statistics, Design and Analysis of Algorithms, Convex Optimization, Numerical Optimization, Statistical Learning Theory, Graphical Models, Detection & Estimation Theory, Data Networks, Stochastic Processes, Information Theory, Discrete-Time Signal Processing.

Machine Learning Summer School (MLSS): two-week program, UC Santa Cruz, July 2012.

Skills

Technical: C/C++, MATLAB & Simulink, LaTeX.

Interpersonal: Team working, Time management, Problem-solving skills, Making effective presentations, Adaptability, Written & Spoken communication, Inter-disciplinary research.

Professional Activities and Services

Reviewer:

Journals: Journal of Artificial Intelligence, IEEE Trans. on Cybernetics, IEEE Trans. on Wireless Communications.
Conferences: COLT 2016, ICML 2015, NIPS 2015, FOCS 2015, COLT 2015, ICML 2015, ICML 2014, IEEE ISIT 2014, ICML 2013, AAAI 2013, ACM MOBIHOC 2013, IEEE INFOCOM 2012, IEEE ISITA 2012, IEEE MILCOM 2011.

Teaching:

- Detection and Estimation Theory (Grad. level), Co-instructor, Winter 2014 and Fall 2015.
- Random Processes (Grad. level), Teaching Assistant, Fall 2011.
- Communication Systems I, Teaching Assistant, Fall 2008.
- Discrete-Time Signal Processing (Grad. level), Teaching Assistant, Fall 2007.
- Probability and Statistics, Teaching Assistant, Fall 2005.
- Introduction to 8051 Microcontrollers, Instructor, Fall 2005.

Last updated: March 3, 2016