

## Samet Oymak

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## ACADEMIC EXPERIENCE

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- **University of California, Riverside** (Feb. 2018–Present)  
Assistant Professor in Electrical and Computer Engineering
- **University of California, Berkeley** (Sept. 2014–June 2015)  
Postdoctoral Scholar at AMPLab  
Sponsor: Prof Benjamin Recht
- **California Institute of Technology** (June 2011–Aug. 2014)  
PhD in Electrical Engineering  
Advisor: Prof Babak Hassibi  
Thesis title: *Convex relaxation for low-dimensional representation: Phase transitions and limitations*
- **California Institute of Technology** (Sept. 2009–June 2011)  
MS in Electrical Engineering
- **Bilkent University** (Sept. 2005–June 2009)  
BS in Electrical Engineering

## RESEARCH INTERESTS

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(non)convex optimization, reinforcement learning, deep learning, semi-supervised learning, high-dimensional problems, statistical learning theory, inverse problems

## HONORS AND AWARDS

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- **Wilts Prize for Best Thesis in Electrical Engineering** Caltech, June 2015.
- **Simons-Berkeley Research Fellowship** on Information Theory, Spring 2015.
- **Ranked 1<sup>st</sup>** in Electrical Engineering Qualifying Exam, Caltech, January 2010.
- Recipient of **Caltech's Division Fellowship**, 2009-2010.
- Bilkent University **Undergraduate Fellowship**, 2005-2009.
- **Presidential Fellowship** awarded to **Top 100** students, 2005-2009, Turkey.
- **Silver Medalist** in International Mathematical Olympiad (IMO), Mexico, 2005.
- **Silver Medalist** in Balkan Mathematical Olympiad (BMO), Romania, 2005.
- **Silver Medalist** in National Mathematical Olympiad, Turkey, 2004.

## WORK EXPERIENCE

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- **The Voleon Group** (*Member of Research Staff*) (Jan 2017–Feb 2018)  
Development of machine learning models and pipelines for predicting various features of financial instruments. Designing and building end to end systems. Time series analysis for financial markets.
- **Google Inc.** (*Software Engineer*) (June 2015–Jan 2017)  
Worked in the YouTube Search team. Developed ranking algorithms and design large-scale pipelines to acquire various signals for ranking. The core focus of the projects were freshness where the goal is surfacing high-quality and relevant content with minimal latency.
- **D. E. Shaw & Co.** (*Quantitative analyst intern*) (June 2013–Sept. 2013)

Developed machine learning algorithms for the Futures group to automate the rollover of futures contracts while maximizing certain utilities.

• **NEC Labs – Princeton** (*Research Intern*) (June 2012–Sept. 2012)

Worked on the improvement of power allocation schemes for mobile communication and computationally efficient precoder design subject to various constraints.

## PROFESSIONAL ACTIVITIES

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• **Reviewer**

NIPS 2016/2017, ICML 2017, ICLR 2017/2019, COLT 2018, IEEE Trans. on Info. Theory, Annals of Statistics, Journal of Machine Learning Research, IEEE Trans. on Signal Proc., Bernoulli, Information and Inference, Mathematical Programming, Applied and Computational Harmonic Analysis, ISIT 2014/2015, SampTA 2013-2015, SIAM-SIMAX, SIAM-SIIMS.

• **Teaching**

Instructor for “Probability and Stochastic Processes”, UC Riverside, Spring 2018.

TA for “Communication–System Fundamentals,” Caltech, Winter 2010-2013.

TA for “Stochastic and Adaptive Signal Processing,” Caltech, Spring 2014.

Instructor for Turkish Math Olympiad Team, Winter 2008.

## PUBLICATIONS

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### Journal papers

1. **Samet Oymak**, Mahdi Soltanolkotabi, and Benjamin Recht “*Sharp Time–Data Tradeoffs for Linear Inverse Problems*,” Transactions on Information Theory, June 2018.
2. **Samet Oymak** and Mahdi Soltanolkotabi “*Fast and Reliable Parameter Estimation from Nonlinear Observations*,” SIAM Journal on Optimization, Oct 2017.
3. **Samet Oymak** and Joel Tropp “*Universality Laws for Randomized Dimension Reduction, with Applications*,” Information & Inference, Nov 2017.
4. **Samet Oymak**, Mahdi Soltanolkotabi, and Benjamin Recht “*Isometric sketching of any set via the Restricted Isometry Property*,” Information & Inference, March 2018.
5. **Samet Oymak**, Amin Jalali, Maryam Fazel, Yonina Eldar, and Babak Hassibi, “*Simultaneously Structured Models with Application to Sparse and Low-rank Matrices*,” Information Theory, IEEE Transactions on, 61(5), 2886-2908, 2015.
6. **Samet Oymak** and Babak Hassibi, “*Sharp MSE Bounds for Proximal Denoising*,” Foundations of Computational Mathematics, October 2015.
7. Kishore Jaganathan, **Samet Oymak**, and Babak Hassibi, “*Sparse Phase Retrieval: Uniqueness Guarantees and Recovery Algorithms*,” Signal Processing, IEEE Transactions, May 2017.

### In submission

1. **Samet Oymak**, “*Stochastic Gradient Descent Learns State Equations with Nonlinear Activations*,” preprint available at arXiv:1809.03019, Sept 2018.
2. **Samet Oymak** and Necmiye Ozay, “*Non-asymptotic Identification of LTI Systems from a Single Trajectory*,” preprint available at arXiv:1806.05722, June 2018.
3. Amir Taheri, **Samet Oymak**, Kevin Coombes, and Arindam Banerjee, “*High Dimensional Data Enrichment: Interpretable, Fast, and Data-Efficient*”, arXiv:1806.04047, June 2018.
4. **Samet Oymak** and Mahdi Soltanolkotabi, “*End-to-end Learning of a Convolutional Neural Network via Deep Tensor Decomposition*,” preprint available at arXiv:1805.06523, May 2018.
5. **Samet Oymak**, Jiasi Chen, and Mehrdad Mahdavi, “*Learning Feature Nonlinearities with Non-Convex Regularized Binned Regression*,” preprint available at arXiv:1311.0830 June 2017.
6. Yahya Sattar and **Samet Oymak**, “*Quickly finding the best linear estimator in high-dimensions*”, Oct 2018.
7. **Samet Oymak** and Salman Asif, “*Exactly decoding a vector through ReLU activation*”, Oct 2018.

### Conference papers

1. **Samet Oymak**, “*Learning Compact Neural Networks with Regularization*,” International Conference on Machine Learning, 2018.
2. **Samet Oymak**, Christos Thrampoulidis and Babak Hassibi, “*Near-Optimal Sample Complexity Bounds for Circulant Binary Embedding*,” ICASSP 2017 Special Session.
3. Christos Thrampoulidis, **Samet Oymak**, and Babak Hassibi, “Regularized linear regression: A precise analysis of the estimation error,” Proceedings of The 28th Conference on Learning Theory. 2015.
4. **Samet Oymak** and Babak Hassibi, “*The proportional mean decomposition: A bridge between the Gaussian and Bernoulli ensembles*,” ICASSP 2015.
5. Xinghao Pan, Dimitris Papailiopoulos, **Samet Oymak**, Benjamin Recht, Kannan Ramchandran, Michael I. Jordan, “Parallel Correlation Clustering on Big Graphs”, NIPS 2015.
6. Ramya Vinayak Korlakai, **Samet Oymak**, and Babak Hassibi, “*Graph Clustering With Missing Data: Convex Algorithms and Analysis*,” NIPS 2014.
7. **Samet Oymak** and Babak Hassibi, “*A Case for Orthogonal Measurements in Linear Inverse Problems*,” ISIT 2014.
8. Christos Thrampoulidis, **Samet Oymak**, and Babak Hassibi, “*Simple Error Bounds for Regularized Noisy Linear Inverse Problems*,” ISIT 2014, available at arXiv:1401.6578.
9. Ramya Vinayak Korlakai\*, **Samet Oymak\***, and Babak Hassibi, “*Sharp Performance Bounds for Graph Clustering via Convex Optimization*,” ICASSP 2014, (\* equal contribution).
10. **Samet Oymak**, Amin Jalali, Maryam Fazel, and Babak Hassibi, “*Noisy Estimation of Simultaneously Structured Models: Limitations of Convex Relaxation*,” 52nd IEEE Conference on Decision and Control (CDC 2013).
11. **Samet Oymak**, Christos Thrampoulidis, and Babak Hassibi, “*The Squared-Error of Generalized LASSO: A Precise Analysis*,” 51st Annual Allerton Conference on Communication, Control and Computing, 2013, extended paper at arXiv:1311.0830.
12. Kishore Jaganathan, **Samet Oymak**, and Babak Hassibi, “*Sparse Phase Retrieval: Convex Algorithms and Limitations*,” International Symposium on Information Theory (ISIT) 2013.
13. **Samet Oymak** and Babak Hassibi, “*On a Relation between the Minimax Risk and the Phase Transitions of Compressed Recovery*,” 50th Annual Allerton Conference on Communication, Control and Computing, 2012.
14. Kishore Jaganathan, **Samet Oymak**, and Babak Hassibi, “On Robust Phase Retrieval for Sparse Signals,” 50th Annual Allerton Conference on Communication, Control and Computing, 2012.
15. **Samet Oymak**, Amin Khajehnejad and Babak Hassibi, “*Recovery Threshold for Optimal Weight  $\ell_1$  Minimization*,” International Symposium on Information Theory (ISIT) 2012.
16. Kishore Jaganathan, **Samet Oymak**, and Babak Hassibi, “*Recovery of Sparse 1-D Signals from the Magnitudes of their Fourier Transform*,” International Symposium on Information Theory (ISIT) 2012.
17. Kishore Jaganathan, **Samet Oymak**, and Babak Hassibi, “*Phase Retrieval for Sparse Signals Using Rank Minimization*,” International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2012.
18. Cheuk Ting Li, **Samet Oymak**, and Babak Hassibi, “*Deterministic Phase Guarantees for Robust Recovery in Incoherent Dictionaries*,” International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2012.
19. Anilesh K. Krishnaswamy, **Samet Oymak**, and Babak Hassibi, “*A Simpler Approach to Weighted  $\ell_1$  Minimization*,” International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2012.
20. **Samet Oymak**, Karthik Mohan, Maryam Fazel, and Babak Hassibi, “*A Simplified Approach to Recovery Conditions for Low Rank Matrices*,” International Symposium on Information Theory (ISIT) 2011.

21. **Samet Oymak**, Amin Khajehnejad, and Babak Hassibi, “*Subspace Expanders and Matrix Rank Minimization*,” International Symposium on Information Theory (ISIT) 2011.
22. **Samet Oymak** and Babak Hassibi, “*Tight Recovery Thresholds and Robustness Analysis for Nuclear Norm Minimization*,” International Symposium on Information Theory (ISIT) 2011.
23. Amin Khajehnejad, **Samet Oymak**, and Babak Hassibi, “*Subspace Expanders and Fast Recovery of Low rank Matrices*,” International Conference on Sampling Theory and Applications, 2011.
24. **Samet Oymak**, Amin Khajehnejad, and Babak Hassibi, “*Improved Thresholds for Rank Minimization*,” International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2011.
25. Mainak Chowdhury, **Samet Oymak**, Amin Khajehnejad, and Babak Hassibi, “*Robustness Analysis of A List Decoding Algorithm For Compressed Sensing*,” International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2011.
26. **Samet Oymak**, Amin Khajehnejad, and Babak Hassibi, “*Weighted Compressed Sensing and Rank Minimization*,” International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2011.
27. Xin Liu, **Samet Oymak**, Athina Petropulu, and Kapil R. Dandekar “*Collision Resolution Based on Pulse Shape Diversity*,” Signal Processing Advances in Wireless Communications (SPAWC), 2009.

#### Technical reports

1. **Samet Oymak** “*Near-Optimal Sample Complexity Bounds for Circulant Binary Embedding*,” arXiv:1603.03178, short version published at ICASSP 2017.
2. **Samet Oymak** and Benjamin Recht “*Near-Optimal Bounds for Binary Embeddings of Arbitrary Sets*,” arXiv:1512.04433, Dec 2016.
3. **Samet Oymak**, Christos Thrampoulidis, and Babak Hassibi, “*Simple Bounds for Noisy Linear Inverse Problems with Exact Side Information*,” arXiv:1312.0641, related work published at ISIT 2014.
4. **Samet Oymak** and Babak Hassibi, “*Finding Dense Clusters via Low Rank + Sparse Decomposition*,” arXiv:1104.5186, related work published at ICASSP 2014.
5. **Samet Oymak** and Babak Hassibi, “*New Null Space Results and Recovery Thresholds for Matrix Rank Minimization*,” arXiv:1011.6326, short version published at ISIT 2011.

#### Book chapters

1. Christos Thrampoulidis, **Samet Oymak**, and Babak Hassibi. ”Recovering Structured Signals in Noise: Least-Squares Meets Compressed Sensing.” as a part of “Compressed Sensing and its Applications” Springer 2014.

#### Patents

1. Guosen Yue, Narayan Prasad, Sampath Rangarajan, and **Samet Oymak**. ”Low-complexity precoder design for large-scale mimo communication systems.” US 20150063254, March 2015.

#### TALKS

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- “Learning from Big but Finite Data: Algorithms and Insights for Neural Networks,” University of Michigan, Sept 2018.
- “Learning from big but finite data: From neural networks to linear dynamical systems,” Data Science Seminar, UC Riverside, May 2018.
- “Sharp tradeoffs for high-dimensional estimation: Overcoming nonconvex and nonlinear constraints,” UC Riverside, CU Boulder, Bilkent University, 2017.
- “Universality laws for randomized dimension reduction,” World Congress of Probability and Statistics, July 2016.
- “Universality of Compressed Sensing Phase Transitions,” Simons Institute, May 2015.

- “A General Theory of Noisy Linear Inverse Problems,” Renaissance Technologies, February 2014.
- “A General Theory of Noisy Linear Inverse Problems,” University of Washington, January 2014.
- “On a Relation between the Minimax Risk and the Phase Transitions of Compressed Recovery,” Allerton 2012 at UIUC, Monticello, IL.
- “Recovery Threshold for Optimal Weight  $\ell_1$  Minimization,” ISIT 2012 at MIT, Boston, MA.
- “A Simpler Approach to Weighted  $\ell_1$  Minimization,” ICASSP 2012, Kyoto, Japan.
- “Subspace Expanders and Matrix Rank Minimization,” ISIT 2011, St. Petersburg.
- “A Simplified Approach to Recovery Conditions for Low Rank Matrices,” ISIT 2011.
- “Tight Recovery Thresholds and Robustness Analysis for Nuclear Norm Minimization,” ISIT 2011.
- “Subspace Expanders and Fast Recovery of Low Rank Matrices,” SampTa 2011, Singapore.