Mahdi Soltanolkotabi

CONTACT INFORMATION

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RESEARCH INTERESTS

- Mathematical foundations of data science
- Foundations of deep learning and representation learning
- Theoretical and mechanistic understanding of foundation models (LLMs, VLMs, etc.)
- AI for healthcare and medicine with a particular focus on multi-modal foundation models
- Artificial intelligence for the basic sciences including computational imaging, microscopy, light-field sensing, and MR/medical imaging
- Optimization, signal processing and machine learning.
- Learning with limited labels and transfer learning
- Large-scale distributed training
- Federated and continual learning
- High-dimensional probability and statistics
- Iterative algorithms and non-convex optimization
- Theory of algorithms, applied probability, random matrix theory, empirical process theory and chaining, geometric functional analysis.
- Sparse/low-rank recovery, compressive sensing, and phase retrieval.
- Coded computing, edge computing, low-precision computing, and large-scale data analytics over cloud infrastructure
- Machine learning for wireless and internet of things

ACADEMIC EMPLOYMENT

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

- Director of Center on Foundations for Science (AIF4S)
  August 2022-present
- Andrew and Erna Viterbi Early Career Chair
  Ming Hsieh Department of Electrical and Computer Engineering
  August 2019-present.
- Associate Professor
  Ming Hsieh Department of Electrical and Computer Engineering
  May 2021-present.
- Associate Professor (by courtesy)
  Thomas Lord Department of Computer Science
  May 2021-present.
- Associate Professor (by courtesy)
  Epstein Department of Industrial and Systems Engineering
  May 2021-present.
- Assistant Professor
  Ming Hsieh Department of Electrical and Computer Engineering
  August 2015-April 2021.
- Assistant Professor (by courtesy)
  Department of Computer Science
  January 2017-April 2021.

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

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

Mentors: Benjamin Recht and Martin Wainwright.

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.

DISTINCTIONS

- 2023 NIH Director's New Innovator Award for building reliable AI for medical imaging **Brief Description:** "Part of the High-Risk, High-Reward Research program, the award supports exceptionally creative early career investigators who propose innovative, high-impact projects in the biomedical, behavioral or social sciences within the NIH mission."
- 2019 Information Theory Society best paper award
  Brief Description:"given annually for an outstanding publication in the fields of interest to the IEEE information theory society appearing anywhere during the preceding four calendar years. The purpose of the Information Theory Paper Award is to recognize exceptional publications in the field and to stimulate interest in and encourage contributions to fields of interest of the Society".
- 2018 Packard Fellowship in Science and Engineering
  Brief Description: awarded to the 18 most innovative early career researchers across all areas of science and engineering in the US given to "inquisitive, passionate scientists and engineers who take a creative approach to their research, dare to think big and follow new ideas wherever they lead".
- 2018 Sloan Fellowship in Mathematics
  Brief Description: "fellowships are awarded annually to early-career researchers whose creativity, innovation, and research accomplishments make them stand out as the next generation of leaders".
- NSF Career Award
- Air-force Office of Scientific Research 2018 Young Investigator Award.
- Kavali Fellow and participant in the Frontiers of Science Symposium (hosted by National Academy of Sciences)
- Participant in the Frontiers of Engineering Symposium (hosted by National Academy of Engineering)
- Amazon 2020 & 2024 Faculty Research Award.
- Google 2018 Faculty Research Award.
- 2021 Viterbi school of engineering junior researcher award
- Stanford **BENCHMARK** Graduate Fellowship in Science and Eng. (2009-2012).
- Department and Institute **rank 1/800**, Sharif University of Technology (2009).

SUMMARY OF
RESEARCH
SUPPORT AT USC

Total Funding: ≈ $7 million (total of direct funding awarded to our group)
- Portion of Funding as solo-PI: ≈ $5.25 million
- Portion of Funding as co-PI: ≈ $1.75 million

ACTIVE RESEARCH
SUPPORT

- **NIH Director's New Innovator Award**
  National Institute of Health
  Role: <u>solo-PI</u>. Dates: 1/09/2023 -1/09/2028.
  Amount: $2,400,000.
- **Amazon Faculty Research Award**
  Amazon
  Role: <u>PI, co-PI: Adel Javanmard</u>. Dates: 1/06/2024 -1/06/2025.
  Amount: $100,000 of $120,000.

- **Towards responsible diffusion models: enhanced reasoning and harmful content moderation**
  Google
  Role: <u>solo-PI</u>. Dates: 05/01/2024 -05/01/2025.
  Amount: $30,000$.
- **Medical Q&A with Foundation Models**
  Microsoft
  Role: <u>solo-PI</u>. Dates: 1/09/2023 -1/09/2024.
  Amount: $20,000$.
- **Packard Fellowship in Science and Engineering**
  David and Lucile Packard Foundation
  Role: <u>solo-PI</u>. Dates: 11/09/2018 -11/08/2026.
  Amount: $875,000$.
- **Sloan Fellowship in Mathematics**
  Alfred P. Sloan Foundation
  Role: <u>solo-PI</u>. Dates: 09/15/2019 -09/14/2024.
  Amount: $70,000$.
- **NSF CAREER Award: "CAREER: Guaranteed Nonconvex Optimization for High-Dimensional Learning"**
  National Science Foundation
  Role: <u>solo-PI</u>. Dates: 02/01/2019-01/31/2025.
  Amount: $551,596$. Percentage of time: %11 academic effort.
- **Packard DEI Fellowship**
  David and Lucile Packard Foundation
  Role: <u>solo-PI</u>. Dates: 011/01/2022 -12/31/2024.
  Amount: $170,000$.
- **DURIP**
  DOD
  Role: <u>co-PI</u>. Dates: 1/09/2023 -1/09/2024.
  Amount: $730,000$.
- **DARPA FastNICs: DIAMOND: Distributed Training of Massive Models at Bandwidth Frontiers**
  Role: <u>Co-Investigator</u> (PI: S. Avestimehr, other co-PI: M. Annavaram). Dates: 04/01/2020-05/31/2024.
  Amount: $512,375$ of $2,200,000$.
- **CIF: Small: Machine Learning for Wireless Propagation Channels**
  Role: <u>Co-Investigator</u> (PI: A. Molisch). Dates: 10/01/2020-09/30/2024.
  Amount: $250,000$ of $500,000$.

COMPLETED RESEARCH SUPPORT

- **Amazon Faculty Research Award**
  Amazon
  Role: <u>solo-PI</u>. Dates: 1/06/2019-1/06/2020.
  Amount: $50,000$.
- **Amazon Center Grant**
  Amazon
  Role: <u>co-PI</u>, PI: Xiang Ren. Dates: 1/06/2021-1/06/2022.
  Amount: $25,000$ of $50,000$.
- **NSF CIF Small: "Precise Computational and Statistical Tradeoffs for Iterative Signal Estimation and Supervised Learning"**
  National Science Foundation
  Role: <u>solo-PI</u>. Dates: 07/01/2018-06/30/2022.
  Amount: $450,000$. Percentage of time: %11 academic effort.
- **DARPA LwLL: " INTEGRAL: A Foundational Approach to Label Complexity via Information Theory and Graph Signal Processing"**
  Role: <u>Co-Investigator</u> (PI: S. Avestimehr, other co-PIs: A. Ortega and I. Diakoniko-

las). Dates: 09/19/2019-09/18/2022.
Amount: $462,000 of $1,498,146.

- **AFOSR 2018 Young Investigator Award: "Learning data representations via nonconvex optimization"**
  Air force office of scientific research
  Role: <u>solo-PI</u>. Dates: 01/02/2018-31/01/2021.
  Amount: $450,000. Percentage of time: %16.5 academic effort.
- **Google Faculty Research Award: "Towards understanding extreme classification"**
  Google Institute
  Role: <u>solo-PI</u>. Dates: 03/05/2018-03/05/2019.
  Amount: $52,190.
- **AFRL FA8650-17-C-9112: "Ptychography based Rapid Imaging of Nano-Structures with Multi-layer Assemblies (PRISMA)"**
  Air Force Research Laboratory
  Role: <u>Co-Investigator</u> (PI: J. Damoulakis). Dates: 11/2016-2/2018.
  Amount: $221,922 of $10,287,412. Percentage of time: %20 academic effort.
- **Northrop Grumman contract: "DENO: Distributed Encoded Optimization for Cybersecurity Data Analytics"**
  Role: <u>Co-Investigator</u> (PI: S. Avestimehr). Dates: 09/01/2017-08/31/2018.
  Amount: $50,000 of $100,000. Percentage of time: %8 academic effort.

SCHOLARLY
IMPACT

All numbers based on google scholar as of March 31, 2024.
- Total citations to articles: 9170.
- Total citations accrued while at USC (2015-present): 8823.

PUBLICATIONS

Prepared according to USC (UCAPT) policy which requires the ordering of the authors to be explained and candidate's student or post-doc to be highlighted with an asterisk.

notation	stands for
*	candidate's student or postdoc
underline	senior author
($\alpha\beta$ order)	alphabetic ordering of names (norm in math/theory publications)
(random order)	order of the authors chosen at random using a computer program
$\mathcal{S}$	substantial technical contribution to the paper typically at the same level as (near equal/equal/or exceeding) other coauthors. This is indicated only for papers where the coauthors hold the same/higher academic rank than the candidate.
no specification	authors ordered according to contribution

- Dissertation

  [1] **M. Soltanolkotabi.** Algorithms and Theory for Clustering and Nonconvex Quadratic Programming. Stanford University Ph.D. Dissertation August 2014.

- Preprints

  [2] C. He*, S. Zheng, A. Zhang, G. Karypis, T. Chilimbi, <u>**M. Soltanolkotabi**</u>, <u>S. Avestimehr</u>. SMILE: Scaling Mixture-of-Experts with Efficient Bi-level Routing. Preprint available at arXiv:2212.05191.

  [3] J. Wang, Z. Charles, Z. Xu, G. Joshi, H. B. McMahan, B. Arcas, M. Al-Shedivat, G. Andrew, S. Avestimehr, K. Daly, Deepesh Data, Suhas Diggavi, H. Eichner, A.Gadhikar, Z. Garrett, A. M. Girgis, F. Hanzely, A. Hard, C. He*, S. Horvath, Z. Huo, A. Ingerman, M. Jaggi, T. Javidi, P. Kairouz, S. Kale, S. P. Karimireddy, J. Konecny, S. Koyejo, T. Li, L. Liu, M. Mohri, H. Qi, S. J. Reddi, P. Richtarik, K. Singhal, V. Smith, **M. Soltanolkotabi**, W. Song, A. T. Suresh, S. U. Stich, A. Talwalkar, H. Wang, B. Woodworth, S. Wu, F. X. Yu, H. Yuan, M. Zaheer, M. Zhang, T. Zhang, C. Zheng, C. Zhu, W. Zhu. A field guide to federated optimization. Preprint available at arXiv:2107.06917.

  [4] C He*, Z Yang, E Mushtaq, S Lee, <u>**M Soltanolkotabi**</u>, S Avestimehr. SSFL: Tackling Label Deficiency in Federated Learning via Personalized Self-Supervision. Preprint available at arXiv:2110.02470. .

  [5] C. He*, A. D. Shah, Z. Tang, D. Fan, A. N. Sivashunmugam, K. Bhogaraju, M. Shimpi, L. Shen, X. Chu, **M. Soltanolkotabi**, <u>S. Avestimehr</u>. FedCV: A Federated Learning Framework for Diverse Computer Vision Tasks. Preprint available at arXiv:2111.11066.

  [6] R. Cosentino*, S. Shekkizhar, <u>**M. Soltanolkotabi**</u>, <u>S. Avestimehr</u>, A. Ortega. The geometry of self-supervised learning models and its impact on transfer learning. Preprint available at arXiv:2209.08622.

  [7] S. Oymak, Z. Fabian*, M. Li, and <u>**M. Soltanolkotabi**</u>. Generalization Guarantees for Neural Networks via Harnessing the Low-rank Structure of the Jacobian. Preprint available at arXiv:1906.05392.

[8] D. V. Veen, A. Jalal, **M. Soltanolkotabi**, E. Price, S. Vishwanath, and <u>A. G. Dimakis</u>. Compressed Sensing with Deep Image Prior and Learned Regularization. Preprint available at arXiv:1806.06438.

[9] Z. Fabian*, R. Xu, **M. Soltanolkotabi**, J. P. Haldar, W. Unglaub, J. Zusman, A. F. Levi, R. Leahy. Accelarated Wirtinger Flow: A fast algorithm for ptychography. Preprint available at arXiv:1806.05546.

- Referee process not complete

Journal Submissions

[10] S. Fridovich-Keil, F. Valdivia, G. Wetzstein, B. Recht, <u>**M. Soltanolkotabi**</u>. Gradient Descent Provably Solves Nonlinear Tomographic Reconstruction. To be submitted to IEEE Transactions on Information Theory.

Conference Submissions

[11] M. S. Sepehri*, Z. Fabian*, <u>**M. Soltanolkotabi**</u>. Serpent: Scalable and Efficient Image Restoration via Multi-scale Structured State Space Models. To be submitted to Neural Information Processing Systems (Neurips 2024).

[12] L. Collins, H. Hassani, **M. Soltanolkotabi**, <u>A. Mokhtari</u>, <u>S. Shakkottai</u>. Provable multi-task representation learning by two-layer relu neural networks. Submitted to International Conference on Machine Learning Research (ICML 2024).

[13] Z. Fabian*, B. Tinaz*, <u>**M. Soltanolkotabi**</u>. Adapt and Diffuse: Sample-adaptive Reconstruction via Latent Diffusion Models. Submitted to International Conference on Machine Learning Research (ICML 2024). Authors

[14] Z. Fabian*, B. Tinaz*, <u>**M. Soltanolkotabi**</u>. Diracdiffusion: Denoising and incremental reconstruction with assured data-consistency. Submitted to International Conference on Machine Learning Research (ICML 2024).

[15] O. Zamzam, H. Akrami, **M. Soltanolkotabi**, <u>R. Leahy</u>. Learning A Disentangling Representation For PU Learning. Submitted to International Conference on Machine Learning Research (ICML 2024).

- Refereed Publications

Journal papers

[16] S. Tu, R. Frostig, and **M. Soltanolkotabi**($\mathcal{S}$). Learning from many trajectories. To appear in Journal on Machine Learning Research (JMLR), 2024.

[17] Y Niu, Z Fabian*, S Lee, **M Soltanolkotabi**, S Avestimehr. mL-BFGS: A Momentum-based L-BFGS for Distributed Large-Scale Neural Network Optimization Transactions on Machine Learning Research (TMLR), 2023.

[18] A. Javanmard and **M. Soltanolkotabi** ($\alpha\beta$ order/$\mathcal{S}$). Precise Statistical Analysis of Classification Accuracies for Adversarial Training. Annals of Statistics, 2022.

[19] B. Lin, C. He*, Z. Zeng, H. Wang, Y. Huang, **M. Soltanolkotabi**, X. Ren, S. Avestimehr. FedNLP: A Research Platform for Federated Learning in Natural Language Processing. *Pro- cessing Tasks. Findings of the Association for Computational Linguistics: NAACL 2022.*

[20] S. Oymak and **M. Soltanolkotabi** ($\alpha\beta$ order/$\mathcal{S}$). End-to-end Learning of a Convolutional Neural Network via Deep Tensor Decomposition. Information and Inference, Volume 10, Issue 3, September 2021, preprint available at arXiv:1805.06523.

[21] S. Oymak and **M. Soltanolkotabi** ($\alpha\beta$ order/$\mathcal{S}$). Towards moderate overparameterization: global convergence guarantees for training shallow neural networks. Journal on Selected Areas of Information Theory, Deep Learning: Mathematical Foundations and Applications to Information Science, 2020. Preprint available at arXiv:1902.04674.

[22] H. Mohammadi, **M. Soltanolkotabi**, M. R. Jovanovic. On the linear convergence of random search for discrete-time LQR. IEEE Control Syste. Lett., 5(3):989-994, July 2021.

[23] H. Mohammadi, A. Zare, **M. Soltanolkotabi**, M. R. Jovanovic. Convergence and sample complexity of gradient methods for the model-free linear quadratic regulator problem. IEEE Transactions on Automatic Control , 2020. Preprint available at arXiv:1912.11899.

[24] S. Avestimehr, M. Mousavi Kalan*, and **M. Soltanolkotabi** ($\alpha\beta$ order). Fundamental Resource Trade-offs for Encoded Distributed Optimization. Information and Inference, 2020. Preprint available at arXiv:1804.00217.

[25] **M. Soltanolkotabi**. Structured signal recovery from quadratic measurements: Breaking sample complexity barriers via nonconvex optimization. IEEE Transactions on Information Theory, Volume: 65 , Issue: 4 , April 2019.

[26] **M. Soltanolkotabi**, A. Javanmard and J. D. Lee. Theoretical insights into the optimization landscape of over-parameterized neural networks. IEEE Transactions of Information Theory, Volume: 65 , Issue: 2 , Feb. 2019.

[27] S. Oymak and **M. Soltanolkotabi** *($\alpha\beta$ order/$\mathcal{S}$)*. Fast and Reliable Parameter Estimation from Nonlinear Observations. *SIAM Journal on Optimization, 27(4), 2276-2300, 2017.*

[28] R. Heckel and **M. Soltanolkotabi** *($\alpha\beta$ order/$\mathcal{S}$)*. Generalized Line Spectral Estimation. *IEEE Transactions on Information Theory, vol. PP, no. 99, pp. 1-1, 2017.*

[29] S. Oymak, <u>B. Recht</u>, and **M. Soltanolkotabi** *($\alpha\beta$ order/$\mathcal{S}$)*. Sharp Time-data tradeoffs for linear inverse problems. *IEEE Transactions on Information Theory, vol. PP, no. 99, pp. 1-1, 2017.*

[30] S. Oymak, <u>B. Recht</u>, and **M. Soltanolkotabi** *($\alpha\beta$ order/$\mathcal{S}$)*. Isometric sketching of any set via the Restricted Isometry Property. *Information and Inference, 2017.*

[31] R. Heckel, V. I. Morghenstern, and **M. Soltanolkotabi** *($\alpha\beta$ order/$\mathcal{S}$)*. Super-Resolution Radar. *Information and Inference 5 (1): 22-75, 2016.*

[32] Experimental robustness of Fourier Ptychography phase retrieval algorithms L. Yeh, J. Dong, J. Zhong, L. Tian, M. Chen, G. Tang, **M. Soltanolkotabi**, <u>L. Waller</u>. *Optics Express Vol. 23, Issue 26, pp. 33214-33240, 2015.*

[33] <u>E. J. Candés</u>, X. Li, and **M. Soltanolkotabi** *($\alpha\beta$ order/$\mathcal{S}$)*. Phase Retrieval via Wirtinger Flow: Theory and Algorithms. *IEEE Transactions on Information Theory, Vol.61, No.4, pp.1985-2007, April 2015.*

[34] <u>E. J. Candés</u>, X. Li, and **M. Soltanolkotabi** *($\alpha\beta$ order/$\mathcal{S}$)*. Phase Retrieval from coded diffraction patterns. *Applied and Computational Harmonic Analysis 39(2), 2015.*

[35] **M. Soltanolkotabi**, E. Elhamifar, and <u>E. J. Candés</u>. Robust subspace clustering. *Annals of Statistics 42(2), 669-699, 2014.*

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

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

[38] <u>F. Marvasti</u>, 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 44, 2012.*

Conference papers

[39] <u>**M Soltanolkotabi**</u>, D Stoger*, C Xie* *($\alpha\beta$ order/$\mathcal{S}$)*. Implicit balancing and regularization: Generalization and convergence guarantees for overparameterized asymmetric matrix sensing. Conference on Learning Theory (COLT 2023). (Acceptance rate: $\approx 25\%$, Length: 91 pages).

[40] S. Oymak, A. S. Rawat, **M. Soltanolkotabi**, C. Thrampoulidis *($\alpha\beta$ order/$\mathcal{S}$)*. On the Role of Attention in Prompt-tuning. International Conference on Machine Learning Research (ICML 2023) (Acceptance rate: $\approx 20\%$, Length: 45 pages).

[41] A Krainovic, **M Soltanolkotabi**, R Heckel *($\mathcal{S}$)*. Learning Provably Robust Estimators for Inverse Problems via Jittering. Neural Information Processing Systems (NeuRIPS 2023) (Acceptance rate: $\approx 20\%$, Length: 36 pages).

[42] S Babakniya, Z Fabian*, C He*, <u>**M Soltanolkotabi**</u>, S Avestimehr. A Data-Free Approach to Mitigate Catastrophic Forgetting in Federated Class Incremental Learning for Vision Tasks. Neural Information Processing Systems (NeuRIPS 2023) (Acceptance rate: $\approx 20\%$, Length: 18 pages).

[43] V. S. Sadasivan, **M. Soltanolkotabi**, S. Feizi ($\alpha\beta$ order/$\mathcal{S}$). Cuda: Convolution-based unlearnable datasets. Conference on Computer Vision and Pattern Recognition (CVPR 2023). (Acceptance rate: $\approx 25\%$, Length: 20 pages)

[44] Z. Fabian*, B. Tinaz*, and **M. Soltanolkotabi**. HUMUS-Net: Hybrid unrolled multi-scale network architecture for accelerated MRI reconstruction. Neural Information Processing Systems (NeuRIPS 2022). (Acceptance rate: $\approx 20\%$, Length: 18 pages).

[45] A. Damian, J. D. Lee, and **M. Soltanolkotabi**. Neural Networks can Learn Representations with Gradient Descent. Conference on Learning Theory (COLT 2022). (Acceptance rate: $\approx 25\%$, Length: 45 pages).

[46] Y. Cheng, I. Diakonikolas, D. M. Kane, R. Ge, S. Gupta, **M. Soltanolkotabi** ($\alpha\beta$ order/$\mathcal{S}$). Outlier-Robust Sparse Estimation via Non-Convex Optimization. Neural Information Processing Systems (NeuRIPS 2022) (Acceptance rate: $\approx 20\%$, Length: 35 pages).

[47] M. Mousavi Kalan*, **M. Soltanolkotabi**, A. S. Avestimehr. Statistical Minimax Lower Bounds for Transfer Learning in Linear Binary Classification. IEEE International Symposium on Information Theory (ISIT 2022).

[48] X. Mai*, <u>S. Avestimehr</u>, <u>A. Ortega</u>, **M. Soltanolkotabi**. On the effectiveness of active learning by uncertainty sampling in classification of high-dimensional gaussian mixture data. EEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2022).

[49] D. Stoger* and **M. Soltanolkotabi**. Small random initialization is akin to spectral learning: Optimization and generalization guarantees for overparameterized low-rank matrix reconstruction. *In Proceedings of Neural Information Processing Systems (NeuRIPS 2021)* (Acceptance rate: $\approx 20\%$, Length: 83 pages).

[50] S. Oymak, M. Li, and **M. Soltanolkotabi** ($\mathcal{S}$). Generalization Guarantees for Neural Architecture Search with Train-Validation Split. International Conference on Machine Learning Research (ICML 2021). (Acceptance rate: $\approx 20\%$, Length: 69 pages).

[51] C. He*, S. Li, **M. Soltanolkotabi**, and <u>S. Avestimehr</u>. PipeTransformer: Automated Elastic Pipelining for Distributed Training of Transformers. International Conference on Machine Learning Research (ICML 2021) (Acceptance rate: $\approx 20\%$, Length: 16 pages double column).

[52] Z. Fabian*, R. Heckel, and **M. Soltanolkotabi**. Data augmentation for deep learning based accelerated MRI reconstruction. International Conference on Learning Representations (ICLR 2021) (Acceptance rate: $\approx 20\%$, Length: 15 pages).

[53] Yogesh Balaji, Mohammadmahdi Sajedi*, Neha Mukund Kalibhat, Mucong Ding, Dominik Stoger*, **Mahdi Soltanolkotabi**, Soheil Feizi. Understanding Over-parameterization in Generative Adversarial Networks. International Conference on Learning Representations (ICLR 2021), (Acceptance rate: $\approx 20\%$, Length: 33 pages).

[54] C. Thrampoulidis, S. Oymak, and **M. Soltanolkotabi** ($\mathcal{S}$). Theoretical Insights Into Multiclass Classification: A High-dimensional Asymptotic View. *In Proceedings of Neural Information Processing Systems (NeuRIPS 2020)* (Acceptance rate: $\approx 20\%$, Length: 63 pages).

[55] M. Mousavi Kalan*, Z. Fabian*, A. S. Avestimehr and **M. Soltanolkotabi** (students according to contribution/$\alpha\beta$ faculty authors). Minimax Lower Bounds for Transfer Learning with Linear and One-hidden Layer Neural Networks. *In Proceedings of Neural Information Processing Systems (NeuRIPS 2020)*, (Acceptance rate: $\approx 20\%$, Length: 25 pages).

[56] R. Heckel and **M. Soltanolkotabi** ($\alpha\beta$ order/$\mathcal{S}$). Compressive sensing with un-trained neural networks: Gradient descent finds the smoothest approximation. In proceedings of International Conference on Machine Learning (ICML 2020). (Acceptance rate: $\approx 20\%$, Length: 32 pages)

[57] Y. Cheng, I. Diakonikolas, R. Ge, and **M. Soltanolkotabi** ($\alpha\beta$ order/$\mathcal{S}$). High-dimensional Robust Mean Estimation via Gradient Descent. In proceedings of International Conference on Machine Learning (ICML 2020). (Acceptance rate: $\approx 20\%$, Length: 33 pages)

[58] A. Javanmard, **M. Soltanolkotabi**, and H. Hassani ($\mathcal{S}$). Precise Tradeoffs in Adversarial Training for Linear Regression. Proceeding of international Conference on Learning Theory (COLT 2020). (Acceptance rate: $\approx 25\%$, Length: 46 pages).

[59] I. Diakonikolas, S. Goel, S. Karmalkar, A. Klivans, and **M. Soltanolkotabi** ($\alpha\beta$ order/$\mathcal{S}$). Approximation Schemes for ReLU Regression. Proceeding of international Conference on Learning Theory (COLT 2020). (Acceptance rate: $\approx 25\%$, Length: 33 pages)

[60] R. Heckel and **M. Soltanolkotabi** ($\alpha\beta$ order/$\mathcal{S}$). Denoising and Regularization via Exploiting the Structural Bias of Convolutional Generators. To appear in International Conference on Learning Representations (ICLR 2020). (Acceptance rate: $\approx 30\%$, Length: 38 pages).

[61] M. Li, **M. Soltanolkotabi**, and S. Oymak. Gradient Descent with Early Stopping is Provably Robust to Label Noise for Overparameterized Neural Networks. Proceedings of International Conference on Artificial Intelligence and Statistics (AISTATS 2020). (Acceptance rate: $\approx 30\%$, Length: 37 pages).

[62] Z. Fabian*, J. Haldar, R. Leahy, **M. Soltanolkotabi** ($\alpha\beta$ order). 3D Phase Retrieval at Nano-Scale via Accelerated Wirtinger Flow. To appear in proceedings of EUSIPCO 2020. (Acceptance rate: $\approx 50\%$, Length: 15 pages).

[63] S. Oymak and **M. Soltanolkotabi** ($\alpha\beta$ order/$\mathcal{S}$). Overparameterized Nonlinear Learning: Gradient Descent Takes the Shortest Path? International Conference on Machine Learning (ICML 2019). (Acceptance rate: $\approx 20\%$, Length: 43 pages).

[64] H. Mohammadi, **M. Soltanolkotabi**, and M. Jovanovic. Learning the model-free linear quadratic regulator via random search. In Proceedings of Machine Learning Research, 2nd Annual Conference on Learning for Dynamics and Control, volume 120, pages 1-9, Berkeley, CA, 2020.

[65] H. Mohammadi, A. Zare, **M. Soltanolkotabi**, and M. Jovanovic. Random search for learning the linear quadratic regulator. In Proceedings of the 2020 American Control Conference, pages 4798-4803, Denver, CO, 2020.

[66] Q. Yu, S. Li, N. Raviv, M. Mousavi Kalan*, **M. Soltanolkotabi**, and S. Avestimehr. Lagrange Coded Computing: Optimal Design for Resiliency, Security and Privacy. International Conference on Artificial Intelligence and Statistics (AISTATS 2019). (Acceptance rate: $\approx 30\%$, Length: 18 pages).

[67] H. Mohammadi, A. Zare, **M. Soltanolkotabi**, and <u>M. Jovanovic</u>. Global Exponential Convergence of Gradient Methods Over the Nonconvex Landscape of the Linear Quadratic Regulator. 58th IEEE Conference on Decision and Control (CDC 2019)

[68] M. Mousavi Kalan*, <u>**M. Soltanolkotabi**</u>, and S. Avestimehr. Fitting ReLUs via SGD and Quantized SGD. International Symposium on Information Theory (ISIT 2019)

[69] **M. Soltanolkotabi**. Phaseless Imaging at Nano-scale: Challenges and Possible Solutions. International Conference on Sampling Theory and Applications (SAMPTA 2019).

[70] E. Bostan, **M. Soltanolkotabi**, D. Ren, and <u>L. Waller</u>. Accelerated Wirtinger Flow for Multiplexed Fourier Ptychographic Microscopy. IEEE International Conference on Image Processing (ICIP 2018).

[71] S. Li, M. Mousavi Kalan*, <u>S. Avestimehr</u>, and **M. Soltanolkotabi**. ($\alpha\beta$ order students/faculty) Near-Optimal Straggler Mitigation for Distributed Gradient Methods. 2018 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW)

[72] **M. Soltanolkotabi.** Learning ReLUs via gradient descent. *Proceedings of Neural Information Processing Systems (NeuRIPS 2017).* (Acceptance rate: $\approx 20\%$, Length: 17 pages).

[73] H. Hassani, **M. Soltanolkotabi**, and A. Karbasi ($\mathcal{S}$). Gradient methods for submodular maximization. *Proceedings of Neural Information Processing Systems (NeuRIPS 2017).* (Acceptance rate: $\approx 20\%$, Length: 25 pages).

[74] S. Tu, R. Boczar, Max Simchowitz, **M. Soltanolkotabi**, and <u>B. Recht</u>($\mathcal{S}$). Low-rank Solutions of Linear Matrix Equations via Procrustes Flow. *Proceedings of International Conference on Machine Learning, (ICML 2016).* (Acceptance rate: $\approx 20\%$, Length: 23 pages).

- Old publications (during undergrad)
[75] P. Pad, **M. Soltanolkotabi**, S. Hadikhanlou, A. Enayati and F. Marvasti. Errorless Codes for Over-loaded Wireless CDMA with Active User Detection. *Proc. of the International Conference on Communications (ICC 2009), Dresden, Germany.*

[76] **M. Soltanolkotabi**, A. Amini and F. Marvasti. OFDM Channel Estimation based on Adaptive Thresholding for Sparse Signal Detection. *Proc. European Signal Processing Conference (EUSIPCO 2009).*

[77] **M. Soltanolkotabi** and F. Ashtiani. Throughput Capacity of a Multi-channel Multi-hop Mobile Ad-hoc Networks. *Proc. International Conference on Telecommunications (ICT 2009).*

[78] **M. Soltanolkotabi**, M. Soltanalian, A. Amini and F. Marvasti. A Practical Sparse Channel Estimation for Current OFDM Standards. *Proc. International Conference on Telecommunications (ICT 2009).*

[79] S. Feizi-Khankandi, S. Zahed Pour, **M. Soltanolkotabi**, A. Amini and F. Marvasti. Salt and Pepper Noise Removal for Images. *Proc. International Conference on Telecommunications (ICT 2008).*

PLENARY TALKS	• Theoretical Underpinnings of Foundation Models. Plenary talk at International Workshop on Theory of Computational Sensing and its applications to Radar, Multimodal Sensing, and Imaging (Cosera September 2024). • Theoretical Foundations for Feature Learning via Gradient Descent. Plenary talk at Conference on Information Sciences and Systems (CISS March 2023) at Johns Hopkins
INVITED TALKS	• New frontiers in Imaging. Workshop on phase retrieval in mathematics and applications (PRiMA), at Lorentz Center, Leiden, Netherlands, August 2024. • Adapt and Diffuse: Sample-adaptive Reconstruction via Latent Diffusion Models. Applied Harmonic analysis workshop. Oberwolfach, Germany. April 2024. • Fundamentals of Transformers: A signal processing view. ICASSP Tutorial, Seoul, South Korea, April 2024. • Feature Learning in Simple Neural Networks and Prompt-tuned Transformers. UCLA Statistics and Data Science Seminar. UUCLA. April 2024. • Feature Learning in Simple Neural Networks and Prompt-tuned Transformers. LLMs meet theory. UCSD HDSI-TILOS. March 2024. • Learning Simple functions via neural network. Informs Optimization Conference. March 2024, Houston, Texas. • Your prompt attention is needed: On the role of attention in prompt-tuning. Workshop on Mathematical Information Science, October 2023, Lagrange Mathematical Center, Paris, France. • Your prompt attention is needed: On the role of attention in prompt-tuning. Informas, October 2023. Phenoix, Arizona. • Theoretical Foundations for Feature Learning via Gradient Descent with Applications to medical imaging. 35th anniversary of the Packard research fellowship in science and engineering. October 2023, Colorado Spring. • Theoretical Foundations for Feature Learning via Gradient Descent. Northwestern Statistics Department. April 2023, Chicago. • Theoretical Foundations for Feature Learning via Gradient Descent. Plenary talk at Conference on Information Sciences and Systems (CISS March 2023) at Johns Hopkins • Musings on theoretical foundations of AI. NSF-IEEE Workshop: Toward explainable, reliable, and sustainable Machine Learning in Signal and Data Science March 20, 2023. • Your prompt attention is needed: On the role of attention in prompt-tuning. Information Theory and Applications workshop, Feb 2023. San Diego. • Theoretical Foundations for Feature Learning via Gradient Descent. The AI Quorum: SLowDNN. January, 2023. Mbuzi AI, Abu Dhabi. • Demystifying Feature learning via gradient descent with applications to medical image reconstruction Structured Optimization Models in High-Dimensional Data Analysis Optimization in the Big Data Era Institute for Mathematical Sciences, National University of Singapore, Singapore, December 2022. • Medical image reconstruction via deep learning: new architectures, data reduction and robustness IPAM workshop on Multi-Modal Imaging with Deep Learning and Modeling, UCLA 2022. • Medical image reconstruction via deep learning: new architectures, data reduction and robustness IPAM workshop on Multi-Modal Imaging with Deep Learning and Modeling, UCLA

2022.

- Overparameterized learning beyond the lazy regime
  Informs Annual Meeting October 2022.

- Tutorial on Computation Imaging Meets Machine Learning
  Program on Computational Microscopy, Institute for Pure and Applied Mathematics (IPAM), September 2022.

- Feature learning via gradient descent
  Maryland Machine Learning Seminar, September 2022.

- Overparameterized learning beyond the lazy regime
  SIAM conference on Mathematics of Data, September 2022.

- Overparameterized learning beyond the lazy regime
  Workshop on Foundations of Deep Learning. Chalmers University, Gottenburg, Sweden. September 2022.

- Overparameterized learning beyond the lazy regime
  International Conference on Continuous Optimization. Lehigh University, Lehigh, PA. June 2022.

- Overparameterized learning beyond the lazy regime
  Robustness and Resilience in Stochastic Optimization and Statistical Learning: Mathematical Foundations. Ettore Majorana Foundation and Centre for Scientific Culture, Erice, Italy, May 2022.

- Towards Stronger Foundations of AI and its applications to the Sciences.
  Department of Applied Mathematics and Statistics, Johns Hopkins, May 2022.

- Towards Stronger Foundations of AI and its applications to the Sciences.
  Department of Electrical and Computer Engineering, Carnegie Mellon University, March 2022.

- Towards Stronger Foundations of AI and its applications to the Sciences.
  Department of Computer Science, University of Texas at Austin, February 2022.

- Towards Stronger Foundations of AI and its applications to the Sciences.
  Departments of Statistics and Computer Science, University of Chicago, February 2022.

- Overparameterized learning beyond the lazy regime
  TU Munich, November 2021.

- Learning via early stopping and untrained neural networks
  KU Eichstätt-Ingolstadt, November 2021.

- Overparameterized learning beyond the lazy regime
  University of Maryland, October 2021.

- Overcoming the data bottleneck in AI for the sciences
  USC physics informed AI symposium, October 2021.

- Learning via early stopping and untrained neural networks
  University of Michigan, November 2020.

- Learning via early stopping and untrained neural networks
  MAD+Seminar, Courant Institute of Mathematical Sciences, July 2020.

- Denoising via Early Stopping. TRIPODS Summer School and Workshop on the Foundations Graph and Deep Learning
  SIAM Conference on Data Science 2020.

- Denoising via Early Stopping. Workshop on Solving inverse problems with deep networks: New architectures, theoretical foundations, and applications
  Neural Information Processing Systems (Neurips 2019) workshop,
  Vancouver, Canada, December 2019.
- Towards demystifying neural networks: Optimization, robustness and denoising
  Conference on Optimization, Fields Institute for Research in Mathematical Sciences,
  Toronto, Canada, November 2019.
- Theoretical Foundations for Nonconvex Learning and Optimization
  Packard Foundation, Monterey, CA, September 2019.
- Demystifying Generalization and Early Stopping in Deep Learning via Harnessing the Low-rank Structure of the Jacobian
  AI Institute Geometry of Deep Learning, Microsoft Research, Seattle, WA, August 2019.
- Towards demystifying over-parameterization and early stopping in deep learning
  International Conference on Continuous Optimization (ICCOPT 2019), Berlin, Germany, August 2019.
- Over-parameterized nonlinear learning - Gradient descent follows the shortest path?
  International Conference on Stochastic Programming, Trondheim, Norway, July 2019.
- Towards demystifying over-parameterization and early stopping in deep learning
  Joint Statistical Meeting (JSM 2019), Denver, CO, July 2019.
- 3D Phaseless Imaging at Nano-scale: Challenges and Possible Solutions
  International Conference on Sampling Theory and Applications (SAMPTA 2019), Bordeaux, France, July 2019.
- Overparameterization without Overfitting: Jacobian-based Generalization Guarantees for Neural Networks
  Understanding and Improving Generalization in Deep Learning, International Conference on Machine Learning (ICML 2019), Long Beach, CA, June 2019.
- Towards demystifying over-parameterization and early stopping in deep learning
  WNGC Seminar, University of Texas, Austin, May 2019.
- Towards demystifying over-parameterization in deep learning
  Geometry of Big Data, Institute for Pure and Applied Mathematics (IPAM), Los Angeles, CA, May 2019.
- Towards demystifying over-parameterization in deep learning
  Imaging and Machine Learning Workshop, Henri Poincare Institute, Paris, France, April 2019.
- Over-parameterized nonlinear learning - Gradient descent follows the shortest path?
  Data Science Insitute, San Francisco, CA, March, 2019.
- Over-parameterized nonlinear learning - Gradient descent follows the shortest path?
  Theory and Practice in Machine Learning and Computer Vision, Institute for Computational and Experimental Research in Mathematic (ICERM), Providence, Rhode Island, February 2019.
- Towards demystifying over-parameterization in deep learning
  Information Theory and Applications Workshop (ITA),San Diego, CA, February

2019.

- Overparameterized Nonlinear Learning: Gradient Descent Takes the Shortest Path? *CMStatistics, Pisa, Italy, December 2018.*
- Overparameterized Nonlinear Learning: Gradient Descent Takes the Shortest Path? *Canadian Mathematical Society winter meeting, Vancouver, Canada, December 2018.*
- From shallow to deep: learning neural networks via gradient descent. *Department of Electrical Engineering, University of Pennsylvania, Philadelphia, PA, October 2018.*
- From shallow to deep: learning neural networks via gradient descent. *International Symposium on Mathematical Programming (ISMP), Bordeaux, France, July 2018.*
- Nonconvex optimization meets suprema of stochastic process: From phase retrieval to deep learning. *IPAM culminating workshop on Quantitative Linear Algebra, Lakearrowhead, CA, June 2018.*
- From shallow to deep: Learning neural networks via gradient descent. *Simons Foundations of Machine Learning Reunion Workshop, Berkeley, CA, June 2018.*
- Nonconvex optimization for high-dimensional learning: ReLUs, neural nets and beyond, *Workshop on Applied Harmonic Analysis and Data Processing, Oberwolfach Research Institute for Mathematics, German Black Forest, March 2018.*
- Nonconvex optimization for high-dimensional learning: ReLUs, neural nets and beyond, *Courant Institute of Mathematical Sciences, Math and Data Seminar, New York, NY, March 2018.*
- Nonconvex optimization for high-dimensional learning: ReLUs, neural nets and beyond, *Program in Applied and Computational Mathematics (PACM) colloquim, Princeton, NJ, March 2018.*
- Learning from signals and data via nonconvex optimization: ReLUs, neural nets and beyond, *ARO Workshop on data science, a unified vision towards structured and unstructured data analysis, Raleigh, NC, November 2017.*
- Directions and open problems in elements of non-convex optimization, *Workshop on Beyond Convexity: Emerging Challenges in Data Science, Banff International Research Station, Oaxaca, Mexico, October 2017.*
- Nonconvex optimization meets supremum of stochastic processes, *Probability Seminar, UC Irvine, CA, October 2017.*
- Discrete submodular optimization via continuous nonconvex optimization, *Asilomar invited session, Asilomar, CA, October 2017.*
- 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.*
- 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.*
- Nonconvex optimization for high-dimensional learning: From phase retrieval to submodular maximization, *EE Systems Seminar, North Carolina State, Durham, CA, June 2017.*
- Breaking sample complexity barriers via non-convex optimization, *Conference on Nonconvex Statistical Learning, USC, Los Angeles, CA, 2017.*
- Breaking sample complexity barriers via non-convex optimization, *SIAM conference on Optimization, Vancouver, Canada, May 2017.*
- *Information Theory and Applications workshop, San Diego, CA, February 2017 .*
- Breaking sample complexity barriers via non-convex optimization, *Joint Mathematical Meeting, Special Session on Mathematics of Signal processing, Atlanta, GA, January 2017.*

- Breaking sample complexity barriers via non-convex optimization, *BIRS Workshop on Applied Harmonic Analysis, Massive Data Sets, Machine Learning, and Signal Processing, Oxaca, Mexico, October 2016.*
- 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.*
- Structured signal recovery without the shackles of convexity, *Statistics Seminar, University of California, Los Angeles(UCLA), May 2016.*
- Phase Retrieval: Theory, Algorithms, and Applications, *tutorial presentation at 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.*
- Structured signal recovery without the shackles of convexity, *Statistics Seminar, University of California, Los Angeles(UCLA), May 2016.*
- Structured signal recovery without the shackles of convexity, *International Matheon Conference on Compressed Sensing and its Applications, Berlin, Dec 2015.*
- Structured signal recovery without the shackles of convexity, *SIAM Conference on Applied Linear Algebra, Atlanta, October 2015.*
- Structured signal recovery without the shackles of convexity, *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.*
- Phase Retrieval via non-convex optimization: Theory and Algorithms, *John Hopkins Center for Imaging Science, October 2014.*
- Phase Retrieval via non-convex optimization: Theory and Algorithms, *UC Berkeley, Networking, Communications, and DSP seminar, September 2014.*
- Robust Subspace Clustering, *Stanford Biostatistics seminar, Feb. 2014.*
- Robust Subspace Clustering, *Asilomar Conference on Signals, Systems and Computers, Oct. 2013.*
- Robust Subspace Clustering, *ICML workshop on spectral learning, June 2013.*
- Robust Subspace Clustering, *Information Theory and Applications workshop, Feb. 2013.*
- Robust Subspace Clustering, *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.*
- A geometric analysis of subspace clustering with outliers, *Stanford: Workshop on Modern Massive Data Sets (MMDS), July 2012.*
- A geometric analysis of subspace clustering with outliers, *UC Berkeley: Berkeley robotics lab, Feb 2012.*

- **Instructor,** EE 588: Optimization for the information and data sciences, University of Southern California, Fall 2016, Fall 2017, Fall 2018, Fall 2019, Fall 2020, Fall 2022, Fall 2023.
  (Course I created/developed).

- **Instructor,** EE 546: Mathematics of high-dimensional data, University of Southern California, Fall 2015, Fall 2016, Fall 2018, Fall 2019, Fall 2020, Fall 2022, Fall 2023.
  (Course I created/developed).

- **Instructor,** EE 599: High-dimensional probability and statistics for data scientists, University of Southern California, Fall 2017. (Course I created/developed).

- **Instructor,** EE 364a: Convex Optimization, Stanford University, Summer 2011.

- **Guest lecture,** CSCI599: Effective Algorithms in Machine Learning and Statistics, University of Southern California, Spring 2016.

PROFESSIONAL
SERVICE

Internal Service

- **Teaching and service committee**: 2021 & 2022.

  - I have been on five committees for hiring of adjunct and research assistant professors one as chair

- **Hiring committee service**

  - Chair of EE-SYS subcommittee 2024
  - Search committee member ECE department 2023 led the effort in successfully recruiting two top ML candidates Stephen Tu and Paria Rashidinejad

- **Board member USC-Amazon center:** 2023-present. As a board member I reviewed 18 proposals and 9 fellowship applicants in 2023.

- **Service related to the new school of advanced computing**

  - one of ECE representatives for senior hiring in the school
  - ECE representative (along with Antonio Ortega) in the teaching retreat

- **Workshop Organization at USC**

  - Organized the Frontiers of ML and AI workshop (with help from Bistra Dilkina and Yan Liu) I did most of the selection as well as all of the local organization and logistics with 18 invited speakers and more than 200 attendees.

- **Director of center on AI Foundations for the Sciences (AIF4S)**

  - The AIF4S center coordinates various outreach activities to local high school students, undergraduates and graduate students including the Research scholar programs in ML, AI, and Mathematics of Data with funding from the Packard foundation's inaugural DEI program and USC Viterbi School of engineering. The aim of this program is to create a research scholars program at the undergrad/master level to help increase the representation of Underrepresented Minority (URM) students (i.e. students of African-American, Hispanic/Latinx, and Native American background) among STEM Ph.D. students.

- We run the MLoverBagels series for students which is a weekly event for students to present their own research and/or new papers
- Worked on establishing connections with a variety of AI institutes abroad to be formalized soon

- **Junior faculty mentorship**
  I have performed various internal reviews for the university.

  - I served as an internal reviewer for the NSF CAREER proposal of Haipeng Luo and Vatsal Sharan (both CAREER applications were successful)
  - I have mentored four junior faculty for preparing their Sloan fellowship application
  - I have mentored five junior faculty across the school of engineering for their Packard fellowship submission

- **Internal reviewer for Packard Fellowship:** 2018-present (I was an internal reviewer for all years except one this often consists reviewing around 10 proposals per year)

- **Degree/course development**

  - Developed the new M.Sc. in Data Science
    (with Keith Chugg, Justin Haldar, and Keith Jenkins)
  - new course on Mathematics of High-dimensional Data
  - new course on Optimization for the Information and Data Sciences
  - new course on High-dimensional Probability and Statistics for Data Scientists

- **University-wide community building**

  - Mathematical Foundations of Learning from Signals and Data (Math-FLDS)
    Started a lunch reading group/seminar for graduate students (collaborators: Antonio Ortega and Salman Avestimehr)
  - Founding faculty of Machine Learning Center (led by Yan Liu)
    Helped with creation and planning of various center activities such as retreat, seminars and lunch series associated with center

- **Seminar organization**

  - Mathematical Foundations of Learning From Signals and Data (with colleagues in ECE department)
  - CommNets Seminar (with colleagues in ECE department)
  - Machine Learning Seminar (with colleagues in machine learning center)
  - Machine Learning Lunch (with colleagues in machine learning center)

- **Signal and Image Processing Institute (SIPI) Ph.D. screening**

  - Exam coordinator: Fall 2016, Spring 2016, and Fall 2017, Fall 2018, Spring 2019.
  - Examiner for EE 562a: Spring 2017, Fall 2019, Spring 2020.

External Service

- **Grant review**

  - Grant review for DARPA

- Grant review for ARMY Young Investigator Program 2021, 2023
- Grant review for AFOSR Young Investigator Program 2018 & 2019, 2022
- Grant review panelist for National Science Foundation (6 times during 2015-2024)

- **Outside dissertation Committees**

  - Member of dissertation committee at University of Waterloo
  - Member of dissertation committee at Ecole Polytechnique

- **Educational outreach to local USC neighborhoods**

  - High-school show case presentation judge: Orthopaedic Medical Magnet High School 2016.
  - Participated in Deloitte impact day and interacted with students of Nava College Prep Academy, June 2017.
  - Presented two lectures at Nava College Prep Academy (a local high school in Compton) on the societal impacts of mathematical data analysis based on applications/examples from signal processing, machine learning and artificial intelligence (December 2016 and 2018).

- **Session organization**

  - "Optimization meets statistics" with Ubli Mitra, Information Theory and Applications (ITA 2016)
  - "Bilinear inverse problems" with Felix Krahmer, Sampling Theory and Applications (SAMPTA 2017)
  - "Theory of deep learning" with Misha Belkin, Sampling Theory and Applications (SAMPTA 2019)

- **Area chair/technical program committee**

  - Area chair for Innagural Conference on Parsimony (CPAL 2024)
  - Area chair for Conference on Learning Theory (COLT 2021-2024).
  - Area chair for International Conference on Machine Learning (ICML 2021-2024).
  - Area chair for the Neural Information Processing Systems (NeurIPS 2020-2024).
  - Area chair for the International Conference on Learning Representations (ICLR 2020-2024).
  - Area chair for IEEE Transactions on Information Theory
  - Area chair for Journal on Machine Learning Research
  - Area chair for SIAM Data Science
  - Technical program committee member for the IEEE international conference on Sampling Theory and Applications (SAMPTA 2019).

- **Journal review**

  - *Proceedings of National Academy of Science (PNAS).*
  - *Foundations and Trends in Machine Learning.*
  - *Annals of Statistics.*
  - *IEEE Transactions on Information Theory.*

- *SIAM Journal on Mathematics of Data Science (SIMODS).*
  - *Journal of Machine Learning Research.*
  - *Constructive Approximation.*
  - *Foundations of Computational Mathematics.*
  - *SIAM Journal on Optimization.*
  - *IEEE Transactions on Signal Processing.*
  - *International Journal of Computer Vision.*
  - *SIAM Imaging science.*
  - *Statistical Analysis and Data Mining.*
  - *IEEE Signal Processing Letters.*

- **Conference review**

  - *Neural Information Processing Systems (NeurIPS 2014, 2015, 2016).*
  - *International Conference on Learning representations (ICLR 2018).*
  - *International Conference on Learning theory (COLT 2015, 2017, 2018).*
  - *International Conference on Machine Learning (ICML 2015, 2018).*
  - *IEEE International Symposium on Information Theory (ISIT 2012, 2015, 2017).*
  - *Sampling Theory and Applications (SampTA 2015, 2017).*
  - *Signal Processing with Adaptive Sparse Structured Representations. (SPARS 2013).*