Yuxin Chen

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Appointments

01/2022–present	University of Pennsylvania
	Associate Professor, Statistics and Data Science, Wharton School
	Associate Professor, Electrical and Systems Engineering (secondary appointment)
02/2017–12/2021	Princeton University
	Assistant Professor, Electrical and Computer Engineering
	Associated Faculty, Computer Science
	Associated Faculty, Applied and Computational Mathematics
	Associated Faculty, Center for Statistics and Machine Learning

Education

Stanford University, Postdoc in Statistics, 01/2015 – 01/2017, Advisor: Emmanuel J. Candès.

Stanford University, Ph. D. in Electrical Engineering, 06/2010 – 01/2015, Advisor: Andrea J. Goldsmith.

Stanford University, M.S. in Statistics, 04/2011 – 12/2013.

Stanford University, Ph. D. minor in Management Science and Engineering, 06/2010 – 01/2015.

University of Texas at Austin, M.S. in Electrical and Computer Engineering, 08/2008 – 05/2010, Advisor: Jeffrey G. Andrews.

Tsinghua University, B.E. in Electronic Engineering / Microelectronics, 08/2004 – 07/2008 (graduated with high distinction).

Research interest

High-dimensional statistics, mathematical optimization, reinforcement learning, statistical machine learning, information theory, statistical signal processing

Monographs and overview articles

O1. <u>Yuxin Chen</u>, Yuejie Chi, Jianqing Fan, and Cong Ma, "Spectral Methods for Data Science: A Statistical Perspective," *Foundations and Trends for Machine Learning*, vol. 14: No. 5, pp. 566-806, 2021.

O2. Yuejie Chi, Yue Lu, and <u>Yuxin Chen</u>, "Nonconvex Optimization Meets Low-Rank Matrix Factorization: An Overview," *IEEE Transactions on Signal Processing*, vol. 67, no. 20, pp. 5239-5269, October 2019 **(invited overview article)**.

Journal articles

J1. Yuling Yan, Gen Li, <u>Yuxin Chen</u>, Jianqing Fan, "Model-Based Reinforcement Learning Is Minimax-Optimal for Offline Zero-Sum Markov Games," 2022.

J2. Gen Li, Laixi Shi, <u>Yuxin Chen</u>, Yuejie Chi, Yuting Wei, "Settling the Sample Complexity of Model-Based Offline Reinforcement Learning," 2022.

J3. Yuling Yan, Gen Li, <u>Yuxin Chen</u>, Jianqing Fan, "The Efficacy of Pessimism in Asynchronous Q-learning," arXiv preprint arXiv:2203.07368, 2022.

J4. Gen Li, Laixi Shi, <u>Yuxin Chen</u>, Yuantao Gu, Yuejie Chi, "Breaking the Sample Complexity Barrier to Regret-Optimal Model-Free Reinforcement Learning," arXiv preprint arXiv:2110.04645, 2021.

J5. Yuling Yan, <u>Yuxin Chen</u>, and Jianqing Fan, "Inference for Heteroskedastic PCA with Missing Data," arXiv preprint arXiv:2107.12365, 2021. **(ASA SLDS Student Paper Award, 2021)**

J6. Gen Li, Changxiao Cai, <u>Yuxin Chen</u>, Yuantao Gu, Yuting Wei, and Yuejie Chi, "Is Q-Learning Minimax Optimal? A Tight Sample Complexity Analysis," arXiv preprint arXiv:2102.06548, 2021.

J7. Gen Li, Yuting Wei, Yuejie Chi, Yuantao Gu, and <u>Yuxin Chen</u>, "Softmax Policy Gradient Methods Can Take Exponential Time to Converge," arXiv preprint arXiv:2102.11270, 2021.

J8. Wenhao Zhan*, Shicong Cen*, Baihe Huang, <u>Yuxin Chen</u>, Jason D. Lee, Yuejie Chi, "Policy Mirror Descent for Regularized Reinforcement Learning: A Generalized Framework with Linear Convergence," arXiv preprint arXiv:2105.11066, 2021 (*=equal contributions).

J9. Gen Li, Changxiao Cai, Yuantao Gu, H. Vincent Poor, and <u>Yuxin Chen</u>, "Minimax Estimation of Linear Functions of Eigenvectors in the Face of Small Eigen-Gaps," arXiv preprint arXiv:2104.03298, 2021.

J10. Gen Li, Yuting Wei, Yuejie Chi, Yuantao Gu, and <u>Yuxin Chen</u>, "Breaking the Sample Size Barrier in Model-Based Reinforcement Learning with a Generative Model," arXiv preprint arXiv:2005.12900, 2020.

J11. Changxiao Cai, H. Vincent Poor, and <u>Yuxin Chen</u>, "Uncertainty Quantification for Nonconvex Tensor Completion: Confidence Intervals, Heteroscedasticity and Optimality," arXiv preprint arXiv:2006.08580, 2020.

J12. Shicong Cen, Chen Cheng, <u>Yuxin Chen</u>, Yuting Wei, and Yuejie Chi, "Fast Global Convergence of Natural Policy Gradient Methods with Entropy Regularization," accepted to *Operations Research*, 2021 **(INFORMS George Nicholson Award Finalist, 2021)**.

J13. <u>Yuxin Chen</u>, Jianqing Fan, Bingyan Wang, and Yuling Yan, "Convex and Nonconvex Optimization Are Both Minimax-Optimal for Noisy Blind Deconvolution under Random Designs," accepted to *Journal of the American Statistical Association*, 2021.

J14. Changxiao Cai, Gen Li, H. Vincent Poor, and <u>Yuxin Chen</u>, "Nonconvex Low-Rank Tensor Completion from Noisy Data," *Operations Research*, vol. 70, no. 2, pp. 1219–1237, 2022.

J15. Gen Li, Yuting Wei, Yuejie Chi, Yuantao Gu, and <u>Yuxin Chen</u>, "Sample Complexity of Asynchronous Q-Learning: Sharper Analysis and Variance Reduction," *IEEE Transactions on Information Theory*, vol. 68, no. 1, pp. 448-473, Jan. 2022.

J16. Chen Cheng, Yuting Wei, and <u>Yuxin Chen</u>, "Tackling Small Eigen-gaps: Fine-Grained Eigenvector Estimation and Inference under Heteroscedastic Noise," *IEEE Transactions on Information Theory*, vol. 67, no. 11, pp. 7380-7419, Nov. 2021.

J17. <u>Yuxin Chen</u>, Jianqing Fan, Cong Ma, and Yuling Yan, "Bridging Convex and Nonconvex Optimization in Robust PCA: Noise, Outliers, and Missing Data," *Annals of Statistics*, vol. 49, no. 5, pp. 2948-2971, Oct. 2021.

J18. Yanxi Chen, Cong Ma, H. Vincent Poor, and <u>Yuxin Chen</u>, "Learning Mixtures of Low-Rank Models," *IEEE Transactions on Information Theory*, vol. 67, no. 7, pp. 4613-4636, July 2021.

J19. Changxiao Cai, Gen Li, Yuejie Chi, H. Vincent Poor, and <u>Yuxin Chen</u>, "Subspace Estimation from Unbalanced and Incomplete Data Matrices: $\ell_{2,\infty}$ Statistical Guarantees," *Annals of Statistics*, vol. 49, no. 2, pp. 944-967, 2021.

J20. Yuanxin Li, Cong Ma, <u>Yuxin Chen</u>, and Yuejie Chi, "Nonconvex Matrix Factorization from Rank-One Measurements," *IEEE Transactions on Information Theory*, vol. 67, no. 3, pp. 1928-1950, March 2021.

J21. <u>Yuxin Chen</u>, Chen Cheng, and Jianqing Fan, "Asymmetry Helps: Eigenvalue and Eigenvector Analyses Under Asymmetric Random Matrix Perturbation," *Annals of Statistics*, vol. 49, no. 1, pp. 435-458, 2021.

J22. <u>Yuxin Chen</u>, Yuejie Chi, Jianqing Fan, Cong Ma, and Yuling Yan, "Noisy Matrix Completion: Understanding the Stability of Convex Relaxation via Nonconvex Optimization," *SIAM Journal on Optimization*, vol. 30, no. 4, pp. 3098-3121, Oct. 2020.

J23. Boyue Li, Shicong Cen, <u>Yuxin Chen</u>, Yuejie Chi, "Communication-Efficient Distributed Optimization in Networks with Gradient Tracking and Variance Reduction," *Journal of Machine Learning Research*,

vol. 21, no. 180, pp. 1-51, 2020.

J24. Cong Ma and Kaizheng Wang, Yuejie Chi, and <u>Yuxin Chen</u>, "Implicit Regularization in Nonconvex Statistical Estimation: Gradient Descent Converges Linearly in Phase Retrieval, Matrix Completion, and Blind Deconvolution," *Foundations of Computational Mathematics*, vol. 20, no. 3, pp. 451-632, June 2020.

J25. <u>Yuxin Chen</u>, Jianqing Fan, Cong Ma, and Yuling Yan, "Inference and Uncertainty Quantification for Noisy Matrix Completion," *Proceedings of the National Academy of Sciences (PNAS)*, vol. 116, no. 46, pp. 22931-22937, Nov. 2019.

J26. Pragya Sur, <u>Yuxin Chen</u>, and Emmanuel J. Candès, "The Likelihood Ratio Test in High-Dimensional Logistic Regression Is Asymptotically a Rescaled Chi-Square," *Probability Theory and Related Fields*, vol. 175, no. 1-2, pp. 487-558, October 2019.

J27. <u>Yuxin Chen</u>, Jianqing Fan, Cong Ma, and Kaizheng Wang, "Spectral Method and Regularized MLE Are Both Optimal for Top-K Ranking," *Annals of Statistics*, vol. 47, no. 4, pp. 2204-2235, August 2019.

J28. <u>Yuxin Chen</u>, Yuejie Chi, Jianqing Fan, and Cong Ma, "Gradient Descent with Random Initialization: Fast Global Convergence for Nonconvex Phase Retrieval," *Mathematical Programming*, vol. 176, no.1-2, pp. 5-37, July 2019.

J29. <u>Yuxin Chen</u>, and Emmanuel J. Candès, "The Projected Power Method: An Efficient Algorithm for Joint Alignment from Pairwise Differences," *Communications on Pure and Applied Mathematics*, vol. 71, no. 8, pp. 1648-1714, August 2018.

J30. <u>Yuxin Chen</u> and Emmanuel J. Candès, "Solving Random Quadratic Systems of Equations Is Nearly as Easy as Solving Linear Systems," *Communications on Pure and Applied Mathematics*, vol. 70, no. 5, pp. 822-883, May 2017.

J31. Tao Zhang, <u>Yuxin Chen</u>, Shanshan Bao, Marcus Alley, John M. Pauly, Brian Hargreaves, Shreyas S. Vasanawala, "Resolving phase ambiguity in dual-echo Dixon imaging using a projected power method," *Magnetic Resonance in Medicine*, vol. 77, no. 5, pp. 2066-2076, May 2017.

J32. <u>Yuxin Chen</u>, Andrea J. Goldsmith and Yonina C. Eldar, "Minimax Capacity Loss under Sub-Nyquist Universal Sampling," *IEEE Transactions on Information Theory*, vol. 63, no. 6, pp. 3348-3367, June 2017.

J33. <u>Yuxin Chen</u>, Changho Suh and Andrea J. Goldsmith, "Information Recovery from Pairwise Measurements," *IEEE Transactions on Information Theory*, vol. 62, no. 10, pp. 5881-5905, Oct. 2016.

J34. Tao Zhang, Joseph Y. Cheng, <u>Yuxin Chen</u>, Dwight G. Nishimura, John M. Pauly, and Shreyas S. Vasanawala, "Robust Self-Navigated Body MRI Using Dense Coil Arrays," *Magnetic Resonance in Medicine*, vol. 76, no. 1, pp. 197-205, July 2016.

J35. <u>Yuxin Chen</u>, Yuejie Chi and Andrea J. Goldsmith, "Exact and Stable Covariance Estimation from Quadratic Sampling via Convex Programming," *IEEE Transactions on Information Theory*, vol. 61, no. 7, pp. 4034-4059, July 2015.

J36. Yuejie Chi, and <u>Yuxin Chen</u>, "Compressive Two-Dimensional Harmonic Retrieval via Atomic Norm Minimization," *IEEE Transactions on Signal Processing*, vol. 63, no. 4, pp. 1030-1042, Feb. 2015.

J37. <u>Yuxin Chen</u>, Andrea J. Goldsmith, and Yonina C. Eldar, "Backing off from Infinity: Performance Bounds via Concentration of Spectral Measure for Random MIMO Channels," *IEEE Transactions on Information Theory*, vol. 61, no. 1, pp. 366-387, January 2015.

J38. <u>Yuxin Chen</u>, and Yuejie Chi, "Robust Spectral Compressed Sensing via Structured Matrix Completion," *IEEE Transactions on Information Theory*, vol. 60, no. 10, pp. 6576-6601, Oct. 2014.

J39. <u>Yuxin Chen</u>, Andrea J. Goldsmith, and Yonina C. Eldar, "Channel Capacity under Sub-Nyquist Nonuniform Sampling," *IEEE Transactions on Information Theory*, vol. 60, no. 8, pp. 4739-4756, Aug. 2014.

J40. <u>Yuxin Chen</u>, Yonina C. Eldar, and Andrea J. Goldsmith, "Shannon Meets Nyquist: Capacity of Sampled Gaussian Channels," *IEEE Transactions on Information Theory*, vol. 59, no. 8, pp. 4889-4914 , Aug. 2013.

J41. <u>Yuxin Chen</u>, Sanjay Shakkottai, and Jeffrey G. Andrews, "On the Role of Mobility for Multimessage Gossip," *IEEE Transactions on Information Theory*, vol. 59, no. 6, pp. 3953-3970, June 2013.

J42. <u>Yuxin Chen</u>, and Jeffrey G. Andrews, "An Upper Bound on Multi-hop Transmission Capacity with Dynamic Routing Selection," *IEEE Transactions on Information Theory*, vol. 58, no. 6, pp. 3751-3765, June 2012.

Conference papers

C1. Laixi Shi, Gen Li, Yuting Wei, <u>Yuxin Chen</u>, Yuejie Chi, "Pessimistic Q-Learning for Offline Reinforcement Learning: Towards Optimal Sample Complexity," *International Conference on Machine Learning (ICML)*, July 2022.

C2. Haoran Li, Thomas Guillod, Evan Dogariu, Andrew Nadler, Shukai Wang, Min Luo, Yuxin Chen, Charlie Sullivan, and Minjie Chen, "MagNet: An Open-Source Database for Data-Driven Magnetic Core Loss Modeling," *IEEE Applied Power Electronics Conference (APEC)*, March 2022.

C3. Gen Li, Laixi Shi, <u>Yuxin Chen</u>, Yuantao Gu, Yuejie Chi, "Breaking the Sample Complexity Barrier to Regret-Optimal Model-Free Reinforcement Learning," *Neural Information Processing Systems (NeurIPS)*, December 2021.

C4. Gen Li, <u>Yuxin Chen</u>, Yuejie Chi, Yuantao Gu, and Yuting Wei, "Sample-Efficient Reinforcement Learning Is Feasible for Linearly Realizable MDPs with Limited Revisiting," *Neural Information Processing Systems (NeurIPS)*, December 2021.

C5. Gen Li, Yuting Wei, Yuejie Chi, Yuantao Gu, and <u>Yuxin Chen</u>, "Softmax Policy Gradient Methods Can Take Exponential Time to Converge," *Conference on Learning Theory (COLT)*, August 2021.

C6. Gen Li, Changxiao Cai, <u>Yuxin Chen</u>, Yuantao Gu, Yuting Wei, and Yuejie Chi, "Tightening the Dependence on Horizon in the Sample Complexity of Q-Learning," *International Conference on Machine Learning (ICML)*, July 2021.

C7. Gen Li, Yuting Wei, Yuejie Chi, Yuantao Gu, and <u>Yuxin Chen</u>, "Breaking the Sample Size Barrier in Model-Based Reinforcement Learning with a Generative Model," *Neural Information Processing Systems (NeurIPS)*, December 2020.

C8. Gen Li, Yuting Wei, Yuejie Chi, Yuantao Gu, and <u>Yuxin Chen</u>, "Sample Complexity of Asynchronous Q-Learning: Sharper Analysis and Variance Reduction," *Neural Information Processing Systems (NeurIPS)*, December 2020.

C9. Haoran Li, Seungjae Ryan Lee, Min Luo, Charles R. Sullivan, <u>Yuxin Chen</u>, and Minjie Chen, "MagNet: A Machine Learning Framework for Magnetic Core Loss Modeling," *IEEE Workshop on Control and Modeling for Power Electronics (COMPEL)*, November 2020.

C10. Changxiao Cai, H. Vincent Poor, and <u>Yuxin Chen</u>, "Uncertainty Quantification for Nonconvex Tensor Completion: Confidence Intervals, Heteroscedasticity and Optimality," *International Conference on Machine Learning (ICML)*, July 2020.

C11. Boyue Li, Shicong Cen, <u>Yuxin Chen</u>, Yuejie Chi, "Communication-Efficient Distributed Optimization in Networks with Gradient Tracking and Variance Reduction," *International Conference on Artificial Intelligence and Statistics (AISTATS)*, Sicily, Italy, June 2020.

C12. Changxiao Cai, Gen Li, H. Vincent Poor, and <u>Yuxin Chen</u>, "Nonconvex Low-Rank Symmetric Tensor Completion from Noisy Data," *Neural Information Processing Systems (NeurIPS)*, Vancouver, Canada, December 2019.

C13. Yuanxin Li, Cong Ma, <u>Yuxin Chen</u>, and Yuejie Chi, "Nonconvex Matrix Factorization from Rank-One Measurements," *International Conference on Artificial Intelligence and Statistics (AISTATS)*, Naha, Okinawa, Japan, April 2019.

C14. Cong Ma, Kaizheng Wang, Yuejie Chi, and <u>Yuxin Chen</u>, "Implicit Regularization in Nonconvex Statistical Estimation: Gradient Descent Converges Linearly in Phase Retrieval and Matrix Completion," *International Conference on Machine Learning (ICML)*, Stockholm, July 2018.

C15. Tao Zhang, <u>Yuxin Chen</u>, Shreyas Vasanawala, Ersin Bayram, "Dual Echo Water-Fat Separation Using Deep Learning," *International Society of Magnetic Resonance in Medicine (ISMRM) Meetings*, Paris, June 2018.

C16. <u>Yuxin Chen</u>, Govinda Kamath, Changho Suh, and David Tse, "Community Recovery in Graphs with

Locality," *International Conference on Machine Learning (ICML)*, pp. 689-698, New York, June 2016.

C17. <u>Yuxin Chen</u>, and Emmanuel J. Candès, "Solving Random Quadratic Systems of Equations Is Nearly as Easy as Solving Linear Systems," *Advances in Neural Information Processing Systems (NIPS)*, Montreal, Dec. 2015 **(oral, acceptance rate 0.8%)**.

C18. <u>Yuxin Chen</u>, and Changho Suh, "Spectral MLE: Top-K Rank Aggregation from Pairwise Comparisons," *International Conference on Machine Learning (ICML)*, pp. 371-380, Lille, July 2015.

C19. <u>Yuxin Chen</u>, Changho Suh, and Andrea J. Goldsmith, "Information Recovery from Pairwise Measurements: A Shannon-Theoretic Approach," *International Symposium on Information Theory (ISIT)*, pp. 2336-2340, Hongkong, June 2015.

C20. <u>Yuxin Chen</u>, Leonidas Guibas, and Qixing Huang, "Near-Optimal Joint Object Matching via Convex Relaxation," *International Conference on Machine Learning (ICML)*, pp. 100-108, Beijing, June 2014.

C21. Qixing Huang, <u>Yuxin Chen</u>, and Leonidas Guibas, "Scalable Semidefinite Relaxation for Maximum *A Posterior* Estimation," *International Conference on Machine Learning (ICML)*, pp. 64-72, Beijing, June 2014.

C22. <u>Yuxin Chen</u>, and Andrea J. Goldsmith, "Information Recovery from Pairwise Measurements," *International Symposium on Information Theory (ISIT)*, pp. 2012-2016, Honolulu, Hawaii, July 2014.

C23. <u>Yuxin Chen</u>, Yuejie Chi, and Andrea J. Goldsmith, "Robust and Universal Covariance Estimation from Quadratic Measurements via Convex Programming," *International Symposium on Information Theory (ISIT)*, pp. 2017-2021, Honolulu, Hawaii, July 2014.

C24. <u>Yuxin Chen</u>, Yuejie Chi, and Andrea J. Goldsmith, "Estimation of Simultaneously Structured Covariance Matrices from Quadratic Measurements," *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 7719-7723, Florence, Italy, May 2014.

C25. <u>Yuxin Chen</u>, Yonina C. Eldar, and Andrea J. Goldsmith, "An Algorithm for Exact Super-resolution and Phase Retrieval," *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 754-758, Florence, Italy, May 2014.

C26. <u>Yuxin Chen</u>, Andrea J. Goldsmith, and Yonina C. Eldar, "Minimax Universal Sampling for Compound Multiband Channels," *IEEE International Symposium on Information Theory (ISIT)*, pp. 1032-1036, Istanbul, Turkey, July 2013.

C27. <u>Yuxin Chen</u>, and Yuejie Chi, "Spectral Compressed Sensing via Structured Matrix Completion," *International Conference on Machine Learning (ICML)*, pp. 414 - 422, Atlanta, Georgia, June 2013.

C28. <u>Yuxin Chen</u>, Yonina C. Eldar, and A. J. Goldsmith, "Channel Capacity under General Nonuniform Sampling," *IEEE International Symposium on Information Theory (ISIT)*, pp. 860-864, Cambridge, MA, July 2012.

C29. <u>Yuxin Chen</u>, Yonina C. Eldar and Andrea J. Goldsmith, "Shannon Meets Nyquist: Capacity Limits of Sampled Analog Channels," *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 3104-3107, Prague, Czech Republic, May 2011.

C30. <u>Yuxin Chen</u>, Sanjay Shakkottai, and Jeffrey G. Andrews, "Sharing Multiple Messages over Mobile Networks," *IEEE Infocom*, pp. 658-666, Shanghai, China, April 2011.

C31. <u>Yuxin Chen</u>, and Sujay Sanghavi, "A General Framework for High-dimensional Estimation in the Presence of Incoherence," *Allerton Conference on Communication, Control, and Computing*, pp. 1570-1576, Monticello, IL, Sep. 2010.

C32. <u>Yuxin Chen</u>, and Jeffrey G. Andrews, "An Upper Bound on Multi-hop Transmission Capacity with Dynamic Route Selection," *IEEE Symposium on Information Theory (ISIT)*, pp. 1718-1722, Austin, TX, June 2010.

Tutorials

Tu1. "Reinforcement Learning: Fundamentals, Algorithms, and Theory," *International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2022*, cotaught with Yuting Wei and Yuejie Chi.

Tu2. "Statistical and Algorithmic Foundations of Reinforcement Learning," *ICSA Applied Statistics Sympo-*

sium 2021, cotaught with Yuting Wei, Yuejie Chi, and Zhengyuan Zhou.

Tu3. "Nonconvex Optimization for High-Dimensional Signal Estimation: Spectral and Iterative Methods," *European Signal Processing Conference (EUSIPCO) 2020*, cotaught with Yuejie Chi and Cong Ma.

Tu4. "Taming Nonconvexity in Information Science," *Information Theory Workshop (ITW) 2018*, cotaught with Yuejie Chi.

Tu5. "Recent Advances in Nonconvex Methods for High-Dimensional Estimation," *International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2018*, cotaught with Yuejie Chi and Yue Lu.

Invited talks

T1. "Settling the Sample Complexity of Model-Based Offline Reinforcement Learning," *Joint Statistical Meetings*, Washington, D.C., Aug. 2022.

T2. "Inference for Heteroskedastic PCA with Missing Data," *IMS Annual Meeting*, London, June 2022.

T3. "Breaking the Sample Size Barrier in Reinforcement Learning: From Generative Models to Online RL," *PACM Colloquium*, Princeton University, Nov. 2021.

T4. "On the Effectiveness of Nonconvex Policy Optimization," *Semiautonomous Seminar*, University of California at Berkeley, Oct. 2021.

T5. "Softmax Policy Gradient Methods Can Take Exponential Time to Converge," *INFORMS Annual Meeting*, Oct. 2021.

T6. "Inference and Uncertainty Quantification for Low-Rank Models," *Data Science Seminar*, Johns Hopkins University, Oct. 2021.

T7. "Inference and Uncertainty Quantification for Low-Rank Models," *Statistics Seminar*, UIUC, Oct. 2021.

T8. "Demystifying the Efficiency of Reinforcement Learning: A Few Recent Stories," *IEOR/DRO Seminar*, Columbia University, Sep. 2021.

T9. "On the Effectiveness of Nonconvex Policy Optimization," *ICERM Workshop on Advances in Theory and Algorithms for Deep Reinforcement Learning*, August 2021.

T10. "On the Effectiveness of Nonconvex Optimization in Reinforcement Learning," *SIAM Conference on Optimization*, July 2021.

T11. "The Effectiveness of Nonconvex Tensor Completion: Fast Convergence and Uncertainty Quantification," *IPAM Workshop on Efficient Tensor Representations for Learning and Computational Complexity*, May 2021.

T12. "Demystifying the Efficiency of Reinforcement Learning: A Few Recent Stories," *ESE Seminar Series, Department of Electrical and Systems Engineering*, University of Pennsylvania, May. 2021.

T13. "Demystifying the Efficiency of Reinforcement Learning: A Few Recent Stories," *ISL Colloquium, Department of Electrical Engineering*, Stanford University, Apr. 2021.

T14. "Taming Nonconvexity in Statistical and Reinforcement Learning," *Department Seminar, Department of Statistics and Data Science*, Yale University, March. 2021.

T15. "Demystifying the Efficiency of Reinforcement Learning: A Few Recent Stories," *Frontiers in Computing and Mathematical Sciences, Computing + Mathematical Sciences Department*, Caltech, Feb. 2021.

T16. "Taming Nonconvexity in Tensor Completion: Fast Convergence and Uncertainty Quantification," *Statistics Seminar, Department of Statistics*, Harvard University, Feb. 2021.

T17. "Taming Nonconvexity in Tensor Completion: Fast Convergence and Uncertainty Quantification," *Statistics Seminar, Department of Data Sciences and Operations*, University of Southern California, Feb. 2021.

T18. "Taming Nonconvexity in Statistical and Reinforcement Learning," *Department Seminar, Department of Electrical Engineering*, Yale University, Feb. 2021.

T19. "Demystifying the Efficiency of Reinforcement Learning: Two Recent Stories," *ECSE Seminar Series*, RPI, Feb. 2021.

T20. "Taming Nonconvexity in Statistical and Reinforcement Learning," *Wharton Statistics Seminar*, University of Pennsylvania, Jan. 2021.

T21. "Nonconvex Optimization Meets Statistics: A Few Recent Stories," *Department Seminar, Electrical and Computer Engineering*, Carnegie Mellon University, Jan. 2021.

T22. "Solving Random Quadratic Systems of Equations Is Nearly as Easy as Solving Linear Systems," *International Congress of Chinese Mathematicians*, Dec. 2020.

T23. "Breaking the Sample Size Barrier in Reinforcement Learning: A Model-Based Approach (a.k.a. the Plug-in approach)," *Neyman Seminar, Statistics Department*, University of California at Berkeley, Nov. 2020.

T24. "Fast Global Convergence of Natural Policy Gradient Methods with Entropy Regularization," *INFORMS Annual Meeting*, Nov. 2020.

T25. "Breaking the Sample Size Barrier in Model-Based Reinforcement Learning," *Algorithmic Foundations of Data Science Seminar*, Oct. 2020.

T26. "Sample Complexity of Asynchronous Q-learning: Sharper Analysis and Variance Reduction," keynote speaker, *ACM MobiHoc Workshop on the Frontiers of Networks: Theory and Algorithms*, Oct. 2020.

T27. "Demystifying the Efficiency of Reinforcement Learning: A Few Recent Stories," *Operations Research Forum*, Sep. 2020.

T28. "Inference and Uncertainty Quantification for Noisy Matrix Completion," *Joint Statistical Meetings*, Philadelphia, Aug. 2020.

T29. "Sample Complexity of Asynchronous Q-Learning: Sharper Analysis and Variance Reduction," *TBSI Workshop on Learning Theory*, Shenzhen, July 2020.

T30. "Nonconvex Optimization Meets Statistics: A Few Recent Stories," *Wirelesss Systems Lab Seminar*, Stanford, May 2020.

T31. "Nonconvex Optimization Meets Statistics: A Few Recent Stories," *Communications and Signal Processing, University of Michigan*, March 2020.

T32. "Nonconvex Optimization Meets Statistics: A Few Recent Stories," *TBSI Workshop on Data Science*, Shenzhen, December 2019.

T33. "Inference and Uncertainty Quantification for Noisy Matrix Completion," *ICSA International Conference*, Hangzhou, December 2019.

T34. "Noisy Matrix Completion: Understanding Statistical Guarantees for Convex Relaxation via Nonconvex Optimization," *Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, November 2019.

T35. "Nonconvex Optimization Meets Statistics: A Few Recent Stories," *Penn Research in Machine Learning Seminar, University of Pennsylvania*, October 2019.

T36. "Inference and Uncertainty Quantification for Noisy Matrix Completion," *INFORMS Annual Meeting*, Seattle, October 2019.

T37. "Implicit Regularization for Solving Random Quadratic Systems of Equations," *INFORMS Annual Meeting*, Seattle, October 2019.

T38. "Nonconvex Optimization Meets Statistics: From Random Initialization to Uncertainty Quantification," *ORIE Colloquium Seminar Series, Cornell*, October 2019.

T39. "Inference and Uncertainty Quantification for Noisy Matrix Completion," *TRIAD Lecture Series, Georgia Tech*, September 2019.

T40. "Spectral Methods Meets Asymmetry: Two Recent Stories," *TRIAD Lecture Series, Georgia Tech*, September 2019.

T41. "The Projected Power Method: An Efficient Nonconvex Algorithm for Joint Discrete Assignment from Pairwise Data," *TRIAD Lecture Series, Georgia Tech*, September 2019.

T42. "Random Initialization and Implicit Regularization in Nonconvex Statistical Estimation," *TRIAD Lecture Series, Georgia Tech*, August 2019.

T43. "The Power of Nonconvex Optimization in Solving Random Quadratic Systems of Equations," *TRIAD Lecture Series, Georgia Tech*, August 2019.

T44. "Bridging Convex and Nonconvex Optimization in Noisy Matrix Completion: Stability and Uncer-

tainty Quantification," *MIFODS workshop on Graphical Models, Massachusetts Institute of Technology*, August 2019.

T45. "Solving Random Quadratic Systems of Equations Is Nearly as Easy as Solving Linear Systems," *International Conference on Continuous Optimization (ICCOPT)*, Berlin, August 2019.

T46. "Noisy Matrix Completion: Bridging Convex and Nonconvex Optimization," *International Conference on Continuous Optimization (ICCOPT)*, Berlin, August 2019.

T47. "Bridging Convex and Nonconvex Optimization in Noisy Matrix Completion: Stability and Uncertainty Quantification," *Statistics Seminar, Stanford University*, May 2019.

T48. "Random Initialization and Implicit Regularization in Nonconvex Statistical Estimation," *TRIPODS Southwest Summer Conference*, May 2019.

T49. "Bridging Convex and Nonconvex Optimization in Noisy Matrix Completion: Stability and Uncertainty Quantification," *Statistics Colloquium, University of Chicago*, May 2019.

T50. "Bridging Convex and Nonconvex Optimization in Noisy Matrix Completion: Stability and Uncertainty Quantification," *PACM Colloquium, Princeton University*, May 2019.

T51. "Bridging Convex and Nonconvex Optimization in Noisy Matrix Completion: Stability and Uncertainty Quantification," *ISyE Seminar, Gatech*, Apr. 2019.

T52. "Random Initialization and Implicit Regularization in Nonconvex Statistical Estimation," *Signal and Information Processing (SIP) Seminar*, Rutgers University, Mar. 2019.

T53. "Stability, Nonconvex Optimization, and Asymmetry in Low-Rank Matrix Estimation," *TRIPODS Seminar*, University of Arizona, Feb. 2019.

T54. "Noisy Matrix Completion: Understanding the Stability of Convex Relaxation via Nonconvex Optimization," *Information Theory and Applications (ITA) Workshop*, Feb. 2019.

T55. "Gradient Descent with Random Initialization: Fast Global Convergence for Nonconvex Phase Retrieval," *KITP conference (Rough Landscapes: From Physics to Algorithms)*, Jan. 2019.

T56. "Random Initialization and Implicit Regularization in Nonconvex Statistical Estimation," *International Workshop on Mathematical Issues in Information Sciences (MIIS)*, Shenzhen, Dec. 2018.

T57. "Asymmetry Helps: Eigenvalue and Eigenvector Analyses of Asymmetrically Perturbed Low-Rank Matrices," *International Conference of the ERCIM WG on Computational and Methodological Statistics*, Pisa, Dec. 2018.

T58. "Random Initialization and Implicit Regularization in Nonconvex Statistical Estimation," *MaD (Math and Data) Seminar, NYU Courant Institute and Center for Data Science*, Nov 2018.

T59. "Gradient Descent with Random Initialization: Fast Global Convergence for Nonconvex Phase Retrieval," *INFORMS Annual Meeting*, Phoenix, Nov. 2018.

T60. "Near-Optimal Joint Object Matching via Convex Relaxation," *INFORMS Annual Meeting*, Phoenix, Nov. 2018.

T61. "Random Initialization in Nonconvex Phase Retrieval," *52nd Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, Oct. 2018.

T62. "Random Initialization and Implicit Regularization in Nonconvex Statistical Estimation," *Statistics Department Seminar, Yale University*, Oct 2018.

T63. "Random Initialization and Implicit Regularization in Nonconvex Statistical Estimation," *Optimization Seminar, ORFE, Princeton University*, Oct 2018.

T64. "Gradient Descent with Random Initialization: Fast Global Convergence for Nonconvex Phase Retrieval," *56th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, Oct. 2018.

T65. "Gradient Descent with Random Initialization: Fast Global Convergence for Nonconvex Phase Retrieval," *London Workshop for Non-Convex Optimization and Matrix Factorization*, London, Sep. 2018.

T66. "Random Initialization and Implicit Regularization in Nonconvex Statistical Estimation," *Statistics Research Colloquium, Purdue University*, Sep 2018.

T67. "Random Initialization and Implicit Regularization in Nonconvex Statistical Estimation," *Wharton*

Statistics department seminar, University of Pennsylvania, Sep 2018.

T68. "Gradient Descent with Random Initialization: Fast Global Convergence for Nonconvex Phase Retrieval," *ICSA China Conference with the Focus on Data Science*, July 2018.

T69. "The Power of Nonconvex Paradigms for High-Dimensional Estimation," *Tsinghua-Berkeley Shenzhen Institute*, July 2018.

T70. "Random Initialization in Solving Quadratic Systems of Equations," *ShanghaiTech Workshop on Information, Learning, and Decision (SWILD)*, June 2018.

T71. "Random Initialization and Implicit Regularization in Nonconvex Statistical Estimation," *ICSA Applied Statistics Symposium*, June 2018.

T72. "Random Initialization and Implicit Regularization in Nonconvex Statistical Estimation," *Joint Information Systems Lab (ISL) Colloquium and Information Theory Forum, Stanford University*, May 2018.

T73. "Random Initialization and Implicit Regularization in Nonconvex Statistical Estimation," *Statistics Department Colloquium, PSU*, Apr. 2018.

T74. "Gradient Descent with Random Initialization: Fast Global Convergence for Nonconvex Phase Retrieval," *Oberwolfach Workshop on Applied Harmonic Analysis and Data Processing*, Oberwolfach, Mar. 2018.

T75. "Implicit Regularization in Nonconvex Statistical Estimation," *Information Theory and Its Applications (ITA) Workshop*, San Diego, Feb. 2018.

T76. "Implicit Regularization in Nonconvex Statistical Estimation," *Data Science Seminar series*, Institute for Mathematics and its Applications (IMA), Jan. 2018.

T77. "Implicit Regularization in Nonconvex Statistical Estimation," *International Conference on Data Science*, Shanghai, Dec. 2017.

T78. "Implicit Regularization in Nonconvex Statistical Estimation," *Signal Processing and Communications Seminar Series*, University of Delaware, Dec. 2017.

T79. "Implicit Regularization in Nonconvex Statistical Estimation," *Simons Institute Workshop on Optimization, Statistics and Uncertainty*, Berkeley, Nov. 2017.

T80. "Implicit Regularization in Nonconvex Statistical Estimation," *51st Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, Oct. 2017.

T81. "Implicit Regularization in Nonconvex Statistical Optimization," *Statistics Seminar, Columbia University*, Oct. 2017.

T82. "Regularized Mirror Descent: A Nonconvex Approach for Learning Mixed Probability Distributions," *55th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, Oct. 2017.

T83. "Spectral Method and Regularized MLE Are Both Optimal for Top-K Ranking," *Joint Statistical Meetings*, Baltimore, August 2017.

T84. "The Projected Power Method: An Efficient Algorithm for Joint Alignment from Pairwise Differences," *Meeting of the International Linear Algebra Society*, Ames, July 2017.

T85. "Solving Random Quadratic Systems of Equations Is Nearly as Easy as Solving Linear Systems," *ShanghaiTech Symposium on Information Science and Technology (SSIST)*, Shanghai, July 2017.

T86. "The Projected Power Method: An Efficient Algorithm for Joint Alignment from Pairwise Differences," *SIAM Conference on Optimization*, Vancouver, May 2017.

T87. "The Projected Power Method: A Nonconvex Algorithm for Discrete Problems," *Electrical Engineering Seminar Series, Harvard University*, Apr. 2017.

T88. "The Effectiveness of Nonconvex Optimization in Two Problems," *Statistics Seminar, NYU Stern School of Business*, Mar. 2017.

T89. "The Effectiveness of Nonconvex Optimization in Two Problems," *IDeAS Seminar, Princeton University*, Mar. 2017.

T90. "The Projected Power Method: A Nonconvex Algorithm for Joint Alignment from Pairwise Differences," *Information Theory and Applications Workshop*, San Diego, Feb. 2017.

T91. "Solving Random Quadratic Systems of Equations Is Nearly as Easy as Solving Linear Systems," *50th*

Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, Nov. 2016.

T92. "An Efficient Algorithm for Joint Alignment from Pairwise Differences," *CMO-BIRS Workshop: Applied Harmonic Analysis, Massive Data Sets, Machine Learning, and Signal Processing*, Oaxaca, Oct. 2016.

T93. "An Efficient Algorithm for Joint Alignment from Pairwise Differences," *54th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, Sep. 2016.

T94. "Solving Random Quadratic Systems of Equations Is Nearly as Easy as Solving Linear Systems," *World Congress in Probability and Statistics*, Toronto, July 2016.

T95. "Modern Optimization Meets Physics: Recent Progress on Phase Retrieval," *International Matheon Conference on Compressed Sensing and its Applications (CSA)*, Berlin, Dec. 2015.

T96. "Solving Random Quadratic Systems of Equations Is Nearly as Easy as Solving Linear Systems," *Workshop on Sensing and Analysis of High-Dimensional Data (SAHD)*, Duke University, July 2015.

T97. "Near-Optimal Joint Object Matching via Convex Relaxation," *IDeAS Seminar, Princeton University*, Apr. 2014.

T98. "Near-Optimal Joint Object Matching via Convex Relaxation," *Information Initiative at Duke (iiD) Seminar*, Duke University, Apr. 2014.

T99. "Near-Optimal Joint Object Matching via Convex Relaxation," *Center for Signal and Information Processing (CSIP) Seminar*, Georgia Tech, Mar. 2014.

Current Ph. D. students

1. Yuling Yan (Princeton ORFE, co-advised with Jianqing Fan)
2. Yanxi Chen (Princeton ECE, co-advised with H. Vincent Poor)
3. Jack Ji (Princeton ECE, co-advised with Mengdi Wang)
4. Wenhao Zhan (Princeton ECE, co-advised with Jason Lee)
5. Eshaan Nichani (Princeton ECE, co-advised with Jason Lee)

Ph. D. theses supervised

1. Cong Ma, *Statistics Meets Nonconvex Optimization: Computational Efficiency and Uncertainty Quantification*, 2020 (now Assistant Professor of Statistics, University of Chicago)
2. Changxiao Cai, *Efficient Estimation and Inference in Nonconvex Low-Complexity Models*, 2021 (now postdoc at UPenn)

Current postdocs

1. Gen Li (co-advised with Yuting Wei)
2. Qian Yu (co-advised with Jason Lee)
3. Yuchen Zhou

Former postdocs

1. Pengkun Yang, 2018–2020 (now Assistant Professor, Center for Statistical Science, Tsinghua University)

Patents

P1. Tao Zhang, <u>Yuxin Chen</u>, John M Pauly, and Shreyas Vasanawala, "Robust dual echo Dixon imaging with flexible echo times," US 10,338,174, July 2019 (licensed to Siemens Healthcare and GE Healthcare).

P2. Tao Zhang, John M Pauly, <u>Yuxin Chen</u>, Joseph Cheng, and Shreyas Vasanawala, "Robust self-navigating MRI using large coil arrays," US 9,857,446, January 2018 (licensed to GE, Siemens, and Philips).

Teaching

Mathematics of High-Dimensional Data (Stat 991-302), UPenn	Spring 2022
Convex Optimization for Statistics and Data Science (STAT/OID 481/581), UPenn	Spring 2022
Mathematics of Data Science (ELE 520), Princeton	Fall 2020
Information Signals (ELE 201), Princeton	Fall 2020
Information Signals (ELE 201), Princeton	Spring 2020
Large-Scale Optimization for Data Science (ELE 522), Princeton	Fall 2019
— *Princeton Engineering Commendation List for Outstanding Teaching*	
Mathematics of High-Dimensional Data (ELE 538B), Princeton	Fall 2018
— *Princeton Engineering Commendation List for Outstanding Teaching*	
Probabilistic Systems and Information Processing (ELE 382), Princeton	Fall 2018
Large-Scale Optimization for Data Science (ELE 538B), Princeton	Spring 2018
— *Princeton Engineering Commendation List for Outstanding Teaching*	
Special Topics in Statistical Optimization and Reinforcement Learning (ORF 570 / ELE 578, co-taught with Mengdi Wang), Princeton University	Spring 2018
Statistical Signal Processing (ELE 382), Princeton	Fall 2017
Sparsity, Structure, and Inference (ELE 538B), Princeton	Spring 2017
— *Princeton Engineering Commendation List for Outstanding Teaching*	

Honors and awards

Alfred P. Sloan Research Fellowship	2022
Google Research Scholar Award	2022
Paper [J5.] wins SLDS Student Paper Award, American Statistical Association (ASA)	2022
Princeton SEAS Junior Faculty Award	2021
Paper [J12.] is selected as Finalist, INFORMS George Nicholson Award	2021
Princeton Graduate Mentoring Award	2020
ICCM Best Paper Award (Gold Medal)	2020
ARO Young Investigator Program (YIP) Award	2020
ELE522 (Large-Scale Optimization for Data Science) is included in the Princeton Engineering Commendation List for Outstanding Teaching	2020
Finalist for the Best Paper Prize for Young Researchers in Continuous Optimization	2019
ELE538B (Mathematics of High-Dimensional Data) is included in the Princeton Engineering Commendation List for Outstanding Teaching	2019
AFOSR Young Investigator Program (YIP) Award	2019
ELE538B (Large-Scale Optimization for Data Science) is included in the Princeton Engineering Commendation List for Outstanding Teaching	2018
Princeton SEAS Innovation Award	2018
ELE538B (Sparsity, Structure, and Inference) is included in the Princeton Engineering Commendation List for Outstanding Teaching	2017
Finalist for the Bell Labs Prize	2015
Finalist for the Best Paper Award, SPARS	2013
Graduated with High Distinction, Tsinghua University	2008

Professional service

Associate Editor, Information and Inference, 2022 - present.

Associate Editor, IEEE Transactions on Signal Processing, 2022 - present.

Area Chair, Neural Information Processing Systems (NeurIPS), 2022.

Area Chair, International Conference on Machine Learning (ICML), 2022.

Area Chair, International Conference on Learning Representations (ICLR), 2021.

Area Chair, International Conference on Machine Learning (ICML), 2021.

Co-organizer of the DataX workshop "Old and New Open Questions in Optimization" at Princeton, 2020.

Area Chair, International Conference on Learning Representations (ICLR), 2020.

Area Chair, International Conference on Machine Learning (ICML), 2020.

Technical Program Committee (TPC) Member, IEEE International Symposium on Information Theory (ISIT), 2020.

Co-director of the 54th Conference on Information Sciences and Systems (CISS), March 2020.

Co-organizer of the Machine Learning for Signal Processing (MLSP) Data Competition (on Map Synchronization), 2018.

Co-organizer of the workshop "Bridging Mathematical Optimization, Information Theory, and Data Science" at Princeton Center for Theoretical Science, May 2018.

Co-director of the 52nd Conference on Information Sciences and Systems (CISS), March 2018.