Changxiao Cai — Curriculum Vitae

CONTACT

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EDUCATION

Ph.D. in Electrical Engineering, Princeton University — May 2021
Advisors: Prof. Yuxin Chen and Prof. H. Vincent Poor

M.A. in Electrical Engineering, Princeton University — May 2018
Advisor: Prof. Sergio Verdú

B.E. in Electronic Engineering (with distinction), Tsinghua University — June 2016

B.S. in Economics (second degree), Tsinghua University — June 2016

EMPLOYMENT

Postdoctoral researcher, University of Pennsylvania — July 2021 - present
Advisors: Prof. T. Tony Cai and Prof. Hongzhe Li

RESEARCH INTERESTS

Mathematical data science, high-dimensional statistics, machine learning, convex and nonconvex optimization, information theory

PREPRINTS

1. **Changxiao Cai**, T. Tony Cai, Hongzhe Li, "Transfer Learning for Contextual Multi-armed Bandits", major revision for *The Annals of Statistics*, 2022, arXiv:2211.12612
2. Gen Li, **Changxiao Cai**, H. Vincent Poor, Yuxin Chen, "Minimax Estimation of Linear Functions of Eigenvectors in the Face of Small Eigen-Gaps", submitted to *The Annals of Applied Probability*, 2022, arXiv:2104.03298
3. Gen Li, **Changxiao Cai**, Yuxin Chen, Yuting Wei, Yuejie Chi, "Is Q-Learning Minimax Optimal? A Tight Sample Complexity Analysis", major revision for *Operations Research*, 2022, arXiv:2102.06548

JOURNALS

1. **Changxiao Cai**, H. Vincent Poor, Yuxin Chen, "Uncertainty Quantification for Nonconvex Tensor Completion: Confidence Intervals, Heteroscedasticity and Optimality", accepted to *IEEE Transactions on Information Theory*, 2022+, arXiv:2006.08580
2. **Changxiao Cai**, Gen Li, Yuejie Chi, H. Vincent Poor, Yuxin Chen, "Subspace Estimation from Unbalanced and Incomplete Data Matrices: $\ell_{2,\infty}$ Statistical Guarantees", *The Annals of Statistics*, 49(2): 944–967, 2021.
3. **Changxiao Cai**, Gen Li, H. Vincent Poor, Yuxin Chen, "Nonconvex Low-Rank Tensor Completion from Noisy Data", *Operations Research*, 70(2): 1219-1237, 2022.
4. **Changxiao Cai**, Sergio Verdú, "Conditional Rényi Divergence Saddlepoint and the Maximization of α-Mutual Information", *Entropy, Special Issue on Probabilistic Methods in Information Theory, Hypothesis Testing, and Coding*, vol. 21, issue 10, Oct. 2019.
5. **Changxiao Cai**, Sujay Sanghavi, Haris Vikalo, "Structured Low-Rank Matrix Factorization for Haplotype Assembly", *IEEE Journal of Selected Topics in Signal Processing, Special Issue on Structured Matrices in Signal and Data Processing*, vol. 10, no. 4, pp. 647–657, June 2016.

Conferences

1. Gen Li, **Changxiao Cai**, Yuxin Chen, Yuantao Gu, Yuting Wei, Yuejie Chi, "Tightening the Dependence on Horizon in the Sample Complexity of Q-Learning", *International Conference on Machine Learning (ICML)*, July, 2021.
2. **Changxiao Cai**, H. Vincent Poor, Yuxin Chen, "Uncertainty Quantification for Nonconvex Tensor Completion: Confidence Intervals, Heteroscedasticity and Optimality", *International Conference on Machine Learning (ICML)*, July, 2020.
3. **Changxiao Cai**, Gen Li, H. Vincent Poor, Yuxin Chen, "Nonconvex Low-Rank Tensor Completion from Noisy Data", *Conference on Neural Information Processing Systems (NeurIPS)*, pp. 1863–1874, Vancouver, Canada, Dec. 2019.
4. **Changxiao Cai**, Sujay Sanghavi, Haris Vikalo, "Structurally-constrained Gradient Descent for Matrix Factorization in Haplotype Assembly Problems", *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp.2638–2641, Shanghai, China, Mar. 2016.

Working papers

1. **Changxiao Cai**, T. Tony Cai, Hongzhe Li, "Transfer Learning for Clustering in Gaussian Mixture Models", in preparation.
2. Hongzhe Zhang, **Changxiao Cai**, T. Tony Cai, Hongzhe Li, "Transfer Learning for Ridge Regression with Random Coefficients", in preparation.

Honors and Awards

SEAS Award for Excellence, Princeton University	2020
Gordon Y.S. Wu Fellowship in Engineering, Princeton University	2016 - 2021
Outstanding Undergraduate in Beijing, Tsinghua University	2016
China National Scholarship (2%), Tsinghua University	2013 & 2014
ST Engineering China Scholarship (1%), Tsinghua University	2013 - 2015
Outstanding Academic Performance Scholarship, Tsinghua University	2013 - 2016

Teaching

ELE538: Mathematics of High-Dimensional Data, Fall 2018, Teaching Assistant

ELE520: Mathematics of Data Science, Fall 2020, Teaching Assistant

Talks

"Uncertainty Quantification for Nonconvex Tensor Completion: Confidence Intervals, Heteroscedasticity and Optimality", *The Machine Learning/Artificial Intelligence Seminar*, EE, Princeton University, 2020

"Nonconvex Low-rank Tensor Completion from Noisy Data", *Virtual Workshop on Missing Data Challenges in Computation, Statistics and Applications*, IAS, 2020

"Uncertainty Quantification for Nonconvex Tensor Completion: Confidence Intervals, Heteroscedasticity and Optimality", *International Conference on Machine Learning (ICML)*, 2020

Professional Service

Reviewer for journals: The Annals of Statistics, IEEE Transactions on Information Theory, Operations Research, SIAM Journal on Matrix Analysis and Applications, IEEE Transactions on Signal Processing, Information and Inference: A Journal of the IMA, IEEE Communications Letters, Entropy

Reviewer for conferences: Conference on Neural Information Processing Systems (NeurIPS), International Conference on Machine Learning (ICML), IEEE International Symposium on Information Theory (ISIT), International Conference on Learning Representations (ICLR), Conference on Information Sciences and Systems (CISS)

Member of Technical Program Committee: 52nd Annual Conference on Information Sciences and Systems (CISS 2018), 54th Annual Conference on Information Sciences and Systems (CISS 2020)