

Tengyuan Liang

Appointment

2017–present **University of Chicago**, *Booth School of Business*.
Assistant Professor of Econometrics and Statistics
George C. Tiao Faculty Fellow in Data Science
Affiliated Researcher, Becker Friedman Institute Big Data Initiative

Education

2012–2017 **University of Pennsylvania**, *The Wharton School*.
Ph.D. in Statistics
2008–2012 **Peking University**.
B.S. in Mathematics and Applied Mathematics

Research

Research Interests in Data Science

Fields: statistical inference, statistical learning, stochastic optimization.

Topics: mathematics of neural networks (interpolation, adaptivity), statistical learning, stochastic algorithms in optimization, computational and algorithmic aspects of statistical inference, with applications in economics and business.

Under Review & Manuscripts

- T. Liang. On the Minimax Optimality of Estimating the Wasserstein Metric.
available on arXiv:1908.10324 (v1)
- T. Liang, A. Rakhlin and X. Zhai. On the Risk of Minimum-Norm Interpolants and Restricted Lower Isometry of Kernels.
available on arXiv:1908.10292 (v1)
- X. Dou and T. Liang. Training Neural Networks as Learning Data-adaptive Kernels: Provable Representation and Approximation Benefits.
available on arXiv:1901.07114 (v2), **major revision for JASA**
- T. Liang. On How Well Generative Adversarial Networks Learn Densities: Nonparametric and Parametric Results.
available on arXiv:1811.03179 (v3), under review for IEEE-IT
- M. H. Farrell, T. Liang and S. Misra. Deep Neural Networks for Estimation and Inference: Application to Causal Effects and Other Semiparametric Estimands.
available on arXiv:1809.09953 (v3), **R&R for Econometrica**

Peer-Reviewed Publications

- 13 T. T. Cai, T. Liang and A. Rakhlin. Weighted Message Passing and Minimum Energy Flow for Heterogeneous Stochastic Block Models with Side Information. available on arXiv:1709.03907 (v2), **accept after minor revision for JMLR**
- 12 T. Liang and A. Rakhlin. Just Interpolate: Kernel “Ridgeless” Regression Can Generalize. *The Annals of Statistics*, to appear, 2019.
AoS 2019
- 11 T. Liang and W. J. Su. Statistical Inference for the Population Landscape via Moment Adjusted Stochastic Gradients. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, 81(2):431-456, 2019.
JRSS-B 2019
- 10 T. Liang and J. Stokes. Interaction Matters: A Note on Non-asymptotic Local Convergence of Generative Adversarial Networks. *Proceedings of the International Conference on Artificial Intelligence and Statistics*, PMLR 89:907-915, 2019.
AISTATS 2019
- 9 T. Liang, T. Poggio, A. Rakhlin and J. Stokes. Fisher-Rao Metric, Geometry, and Complexity of Neural Networks. *Proceedings of the International Conference on Artificial Intelligence and Statistics*, PMLR 89:888-896, 2019.
AISTATS 2019
- 8 B. Tzen, T. Liang and M. Raginsky. Local Optimality and Generalization Guarantees for the Langevin Algorithm via Empirical Metastability. *Proceedings of the Conference On Learning Theory*, PMLR 75:857-875, 2018.
COLT 2018
- 7 S. Kale, Z. Karnin, T. Liang and D. Pál. Adaptive Feature Selection: Computationally Efficient Online Sparse Linear Regression under RIP. *Proceedings of the International Conference on Machine Learning*, PMLR 70:1780-1788, 2017.
ICML 2017
- 6 T. T. Cai, T. Liang and A. Rakhlin. Computational and Statistical Boundaries for Submatrix Localization in a Large Noisy Matrix. *The Annals of Statistics*, 45(4):1403-1430, 2017.
AoS 2017
- 5 T. T. Cai, T. Liang and A. Rakhlin. On Detection and Structural Reconstruction of Small-World Random Networks. *IEEE Transactions on Network Science and Engineering*, 4(3):165-176, 2017.
IEEE-TNSE 2017
- 4 T. T. Cai, T. Liang and A. Rakhlin. Geometric Inference for General High-Dimensional Linear Inverse Problems. *The Annals of Statistics*, 44(4):1536-1563, 2016.
AoS 2016

- 3 T. Liang, A. Rakhlin and K. Sridharan. Learning with Square Loss: Localization through Offset Rademacher Complexity. *Proceedings of the Conference on Learning Theory*, PMLR 40:1260-1285, 2015.
COLT 2015, nominated for the best paper award
- 2 A. Belloni, T. Liang, H. Narayanan and A. Rakhlin. Escaping the Local Minima via Simulated Annealing: Optimization of Approximately Convex Functions. *Proceedings of the Conference on Learning Theory*, PMLR 40:240-265, 2015.
COLT 2015
- 1 T. T. Cai, T. Liang and H. H. Zhou. Law of Log Determinant of Sample Covariance Matrix and Optimal Estimation of Differential Entropy for High-Dimensional Gaussian Distributions. *Journal of Multivariate Analysis*, 137:161-172, 2015.
JMVA 2015

Experience

Visiting Experience

- 2019 **Yale University**, *Visitor in Econometrics*.
Cowles Foundation for Research in Economics
- 2016 **Yahoo Research New York**, *Summer Research Scientist*.
Research on Online Learning and Optimization

Teaching Experience

- 2017–present **University of Chicago Booth School of Business**, *Instructor*.
 - Spring 18: Business Statistics (41000, MBA), average rating 4.0/5.0 (two sections).
 - Fall 18: Business Statistics (41000, MBA), average rating 3.6/5.0 (three sections).
- 2012–2017 **Wharton School at University of Pennsylvania**, *Teaching Assistant*.
 - Spring 17: Stochastic Processes (431, PhD)
 - Spring 15: Concentration Inequalities (991, PhD), guest lecturer
 - Spring 14, Spring 15: Advanced Quantitative Modeling (622, MBA)
 - Fall 13: Introductory Statistics (111), recitation instructor
 - Spring 13: Statistical Inference (431)
 - Fall 12, Fall 15, Fall 16: Probability (430)

Invited Seminars & Talks

- 2019–2020
 - MIT (Statistics and Stochastics Seminar Series, IDSS)
 - Yale (Econometrics Seminar, Dept. of Economics)
 - Harvard (Statistics Colloquium, Dept. of Statistics)
- 2018–2019
 - Duke (Decision Sciences Seminar, Fuqua School of Business)
 - ENSAE-CREST (Center for Research in Economics and Statistics Seminar)
 - UChicago (Joint U Chicago and TTIC Machine Learning Seminar)

- 2017–2018
- UIUC (Machine Learning Seminar, ECE Dept.)
 - UChicago (Statistics Colloquium, Dept. of Statistics)
 - HKUST (Joint Statistics Seminar, Business school and Dept. of Mathematics)
- 2016–2017
- Stanford (Statistics Seminar, Dept. of Statistics)
 - Princeton (Colloquia, Operation Research and Financial Engineering)
 - MIT (Operations Research and Statistics Seminar, Sloan School of Management)
 - UChicago (Econometrics and Statistics Seminar, Booth School of Business)
 - Cambridge (Statistical Laboratory Seminar, Dept. of Mathematics)
 - Georgia Tech (Statistics Seminar, Dept. of Mathematics)
 - UCSD (Statistics Seminar, Dept. of Mathematics)
 - UVA (Statistics Seminar, Dept. of Statistics)
 - UIUC (Statistics Seminar, Dept. of Statistics)
 - Rutgers (Statistics Seminar, Dept. of Statistics, cancelled)
 - Imperial College London (Operations Management Seminar, Business School)

* indicates coauthor presentation

- Invited Conference Talks
- ICCOPT 2019 (Generalization and Optimization invited session)
 - JSM 2019 (Invited session on “Modern Non-parametrics”)
 - AISTATS 2019 (present two papers)
 - DALI 2019 (Machine Learning Theory invited session, George, South Africa)
 - Econometric Conference on Big Data and AI (invited talk at “Factor Models” session, Tsinghua Univ.)
 - COLT 2018* (Stochastic Optimization session, KTH)
 - Issac Newton Institute (Workshop on Future Challenges in Statistical Scalability, Cambridge)
 - EcoSta 2018 (Frontiers in Financial Statistics invited session, CityU Hong Kong)
 - CISS 2018 (Statistical Learning invited session, Princeton)
 - ICML 2017 (Online Learning session, Sydney)
 - Yahoo Labs (Machine Learning research seminar)
 - COLT 2015 (University Pierre and Marie Curie, two long talks)
 - Yale* (NSF Workshop for Empirical Process and Modern Statistical Decision Theory)
 - CIRM (Meeting in Mathematical Statistics: New Procedures for New Data, Luminy, France)
 - CRM (Workshop on the Mathematical Foundations of Learning Theory, Barcelona, Spain)
 - MFO (Workshop on Adaptive Statistical Inference, Oberwolfach, Germany)

Honors & Awards

- 2017–2018 George C. Tiao Faculty Fellow
Research fellowship for computational and data science
- 2014–2017 Winkelman Fellowship
The highest honorific fellowship awarded by the Wharton School

- 2016 J. Parker Memorial Bursk Award
Awarded by the Statistics Department at the Wharton School for excellence in research
- 2014 US Junior Oberwolfach Fellow
- 2012–2017 Wharton Doctoral Fellowship
- 2009–2010 National Scholarship

Service

Professional Service

- 2014–
present **Journal & Conference Referee.**
- The Annals of Statistics
 - Journal of the Royal Statistical Society: Series B
 - Bernoulli Journal
 - Journal of American Statistical Association: Theory and Methods
 - Biometrika
 - Journal of Machine Learning Research
 - IEEE Transactions on Information Theory
 - Statistica Sinica
 - Latin American Journal of Probability and Mathematical Statistics
 - Conference on Learning Theory (COLT)
 - Symposium on the Theory of Computing (STOC)
 - International Conference for Learning Representations (ICLR)
 - IEEE International Symposium on Information Theory (ISIT)
- 2018 **Session Chair.**
- COLT 2018, Stochastic Optimization/Langevin session

University Service

- 2018 Faculty Participant in Spring Convocation, Chicago Booth
- 2017 Faculty Recruiting Interviewer, Chicago Booth

Mentoring & Advising

- 2018–
present Organizer for Data Science Reading Group, UChicago
- Mentoring statistics PhD students, *list of papers*

Skills

R, Python, MATLAB

Spark, Hadoop

LaTeX, Git, RMarkdown, Jupyter Notebook