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. Estimating Certain Integral Probability Metric (IPM) Is as Hard as Estimating under the IPM.
  available on arXiv:1911.00730 (v1), under review
- 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
- 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

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Peer-Reviewed Publications

13 T. Liang and A. Rakhlin. Just Interpolate: Kernel "Ridgeless" Regression Can Generalize. *The Annals of Statistics*, to appear, 2019.
AoS 2019

12 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

11 T. T. Cai, T. Liang and A. Rakhlin. Weighted Message Passing and Minimum Energy Flow for Heterogeneous Stochastic Block Models with Side Information. *Journal of Machine Learning Research*, conditionally accepted, 2019.
JMLR 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**, *Visiting Assistant Professor 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)
- MIT (MIFODS workshop "Learning with a complex structure," 45 mins talk)

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)

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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
- JSM 2020 (IMS invited session, "Theory of Deep Learning")
- 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

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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

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