Tianyi Lin

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Academic Appointments

Columbia University New York, NY

Department of Industrial Engineering and Operations Research (IEOR)

- Assistant Professor, July 2024 - Present

Massachusetts Institute of Technology Cambridge, MA

Laboratory for Information and Decision Systems (LIDS)

- Postdoctoral Associate, July 2023 - July 2024
- Advisor: Asuman Ozdaglar

Education

University of California, Berkeley Berkeley, CA

Ph.D. in Electrical Engineering and Computer Science August 2016 - May 2023

- Advisor: Michael I. Jordan
- Track: Optimization and Machine Learning
- Thesis: Structure-driven Algorithm Design in Optimization and Machine Learning

University of California, Berkeley Berkeley, CA

M.S. in Industrial Engineering and Operations Research August 2016 - May 2017

University of Cambridge Cambridgeshire, United Kingdom

M.S. in Pure Mathematics and Statistics September 2011 - June 2012

Nanjing University Nanjing, China

B.S. in Mathematics and Applied Mathematics September 2007 - June 2011

Research Interests

- Optimization.
- Game Theory.
- Machine Learning.
- Optimal Transport.
- Economic and Social Networks.
- Large-Scale Text Analytic.

Publications

Preprints (* refers to equal contribution)

(P3) **Curvature-independent last-iterate convergence for games on Riemannian manifolds**
Y. Cai*, M. I. Jordan*, T. Lin*, A. Oikonomou* and E. Vlatakis*
Neural Information Processing Systems (NeurIPS), 2024, submitted.

(P2) **A nonasymptotic analysis of gradient descent ascent for nonconvex-concave minimax problems**
T. Lin, C. Jin and M. I. Jordan
Journal of Machine Learning Research, major revision.

(P1) **Explicit second-order min-max optimization methods with optimal convergence guarantee**
T. Lin, P. Mertikopoulos and M. I. Jordan
SIAM Journal on Optimization, major revision.

Refereed Journal Publications (* refers to equal contribution)

(J22) **Doubly optimal no-regret online learning in strongly monotone games with bandit feedback**
W. Ba*, T. Lin*, J. Zhang* and Z. Zhou*
Operations Research, 2024.

(J21) **Perseus: A simple and optimal high-order method for variational inequalities**
T. Lin and M. I. Jordan
Mathematical Programming, 2024.

(J20) **Adaptive, doubly optimal no-regret learning in strongly monotone and exp-concave games with gradient feedback**
M. I. Jordan*, T. Lin* and Z. Zhou*
Operations Research, 2024.

(J19) **A continuous-time perspective on global acceleration for monotone equation problems**
T. Lin and M. I. Jordan
Communications in Optimization Theory, 2024.
Invited paper on Special issue dedicated to the memory of Professor Hedy Attouch.

(J18) **Monotone inclusions, acceleration and closed-loop control**
T. Lin and M. I. Jordan
Mathematics of Operations Research, 48(4): 2353-2382, 2023.

(J17) **First-order algorithms for nonlinear generalized Nash equilibrium problems**
M. I. Jordan*, T. Lin* and M. Zampetakis*
Journal of Machine Learning Research, 24(38): 1-46, 2023.

(J16) **A control-theoretic perspective on optimal high-order optimization**
T. Lin and M. I. Jordan
Mathematical Programming, 195 (1): 929-975, 2022.

(J15) **On the efficiency of entropic regularized algorithms for optimal transport**
T. Lin, N. Ho and M. I. Jordan
Journal of Machine Learning Research, 23(137): 1-42, 2022.

(J14) **Accelerating adaptive cubic regularization of Newton's method via random sampling**
X. Chen*, B. Jiang*, T. Lin* and S. Zhang*
Journal of Machine Learning Research, 23(90): 1-38, 2022.

(J13) **On the complexity of approximating multimarginal optimal transport**
T. Lin*, N. Ho*, M. Cuturi and M. I. Jordan
Journal of Machine Learning Research, 23(65): 1-43, 2022.

(J12) **An ADMM-based interior-point method for large-scale linear programming**
T. Lin, S. Ma, Y. Ye and S. Zhang
Optimization Methods and Software, 36(2-3): 389-424, 2021.
Invited paper on Special issue dedicated to the memory of Professor Masao Iri.

(J11) **A unified adaptive tensor approximation scheme to accelerate composite convex optimization**
B. Jiang*, T. Lin* and S. Zhang*
SIAM Journal on Optimization, 30(4): 2897-2926, 2020.

(J10) **Structured nonconvex optimization models: Algorithms and iteration complexity analysis**
B. Jiang*, T. Lin*, S. Ma* and S. Zhang*
Computational Optimization and Applications, 72(1): 115-157, 2019.

(J9) **On the iteration complexity analysis of stochastic primal-dual hybrid gradient approach with high probability**
L. Qiao, T. Lin, Q. Qin and X. Lu
Neurocomputing, 307: 78-90, 2018.

(J8) **Global convergence of unmodified 3-block ADMM for a class of convex minimization problems**
T. Lin, S. Ma and S. Zhang
Journal of Scientific Computing, 76(1): 69-88, 2018.

(J7) **Stochastic primal-dual proximal extragradient descent for compositely regularized optimization**
T. Lin, L. Qiao, T. Zhang, J. Feng and B. Zhang
Neurocomputing, 273: 516-525, 2018.

(J6) **Distributed linearized alternating direction method of multipliers for composite convex consensus optimization**
N. S. Aybat, Z. Wang, T. Lin and S. Ma
IEEE Transactions on Automatic Control, 63(1): 5-20, 2018.

(J5) **An extragradient-based alternating direction method for convex minimization**
T. Lin, S. Ma and S. Zhang
Foundations of Computational Mathematics, 17(1): 35-59, 2017.

(J4) **Exploiting interactions of review text, hidden user communities and item groups, and time for collaborative filtering**
Y. Xu, Q. Yu, W. Lam and T. Lin
Knowledge and Information Systems, 52(1): 221-254, 2017.

(J3) **Iteration complexity analysis of multi-block ADMM for a family of convex minimization without strong convexity**
T. Lin, S. Ma and S. Zhang
Journal of Scientific Computing, 69: 52-81, 2016.

(J2) **On the sublinear convergence rate of multi-block ADMM**
T. Lin, S. Ma and S. Zhang
Journal of the Operations Research Society of China, 3(3): 251-274, 2015.

(J1) **On the global linear convergence of the ADMM with multi-block variables**
T. Lin, S. Ma and S. Zhang
SIAM Journal on Optimization, 25(3): 1478-1497, 2015.

Refereed Conference Proceedings (* refers to equal contribution)

(C24) **A specialized semismooth Newton method for kernel-based optimal transport**
T. Lin, M. Cuturi and M. I. Jordan
Artificial Intelligence and Statistics (AISTATS), 2024.

(C23) **Deterministic nonsmooth nonconvex optimization**
M. I. Jordan*, G. Kornowski*, T. Lin*, O. Shamir* and M. Zampetakis*
Conference on Learning Theory (COLT), 2023.

(C22) **Gradient-free methods for deterministic and stochastic nonsmooth nonconvex optimization**
T. Lin, Z. Zheng and M. I. Jordan
Neural Information Processing Systems (NeurIPS), 2022.

(C21) **First-order algorithms for min-max optimization in geodesic metric spaces**
M. I. Jordan*, T. Lin* and E. Vlatakis*
(Oral) *Neural Information Processing Systems (NeurIPS), 2022.*

(C20) **Online nonsubmodular minimization with delayed costs: From full information to bandit feedback**
T. Lin*, A. Pacchiano*, Y. Yu* and M. I. Jordan
International Conference on Machine Learning (ICML), 2022.

(C19) **Fast distributionally robust learning via variance reduced min-max optimization**
Y. Yu*, T. Lin*, E. Mazumdar* and M. I. Jordan
Artificial Intelligence and Statistics (AISTATS), 2022.

(C18) **On structured filtering-clustering: Global error bound and optimal first-order algorithms**
N. Ho*, T. Lin* and M. I. Jordan
Artificial Intelligence and Statistics (AISTATS), 2022.

(C17) **A variational inequality approach to Bayesian regression games**
W. Guo*, M. I. Jordan* and T. Lin*
Conference on Decision and Control (CDC), 2021.

(C16) **On projection robust optimal transport: Sample complexity and model misspecification**
T. Lin, Z. Zheng, E. Chen, M. Cuturi and M. I. Jordan
Artificial Intelligence and Statistics (AISTATS), 2021.

(C15) **Relaxed Wasserstein and applications to GANs**
X. Guo*, J. Hong*, T. Lin* and N. Yang*
International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2021.

(C14) **Projection robust Wasserstein distance and Riemannian optimization**
T. Lin*, C. Fan*, N. Ho, M. Cuturi and M. I. Jordan
(Spotlight) *Neural Information Processing Systems (NeurIPS), 2020.*

(C13) **Fixed-support Wasserstein barycenters: Computational hardness and fast algorithm**
T. Lin, N. Ho, X. Chen, M. Cuturi and M. I. Jordan
Neural Information Processing Systems (NeurIPS), 2020.

(C12) **New proximal Newton-type methods for convex optimization**
I. Adler*, Z. Hu* and T. Lin*
Conference on Decision and Control (CDC), 2020.

(C11) **Finite-time last-iterate convergence for multi-agent learning in games**
T. Lin*, Z. Zhou*, P. Mertikopoulos and M. I. Jordan
International Conference on Machine Learning (ICML), 2020.

(C10) **On gradient descent ascent for nonconvex-concave minimax problems**
T. Lin, C. Jin and M. I. Jordan
International Conference on Machine Learning (ICML), 2020.

(C9) **Near-optimal algorithms for minimax optimization**
T. Lin, C. Jin and M. I. Jordan
Conference on Learning Theory (COLT), 2020.

(C8) **Improved sample complexity for stochastic compositional variance reduced gradient**
T. Lin, C. Fan, M. Wang and M. I. Jordan
American Control Conference (ACC), 2020.

(C7) **On efficient optimal transport: An analysis of greedy and accelerated mirror descent algorithms**
T. Lin*, N. Ho* and M. I. Jordan
International Conference on Machine Learning (ICML), 2019.

(C6) **Sparsemax and relaxed Wasserstein for topic sparsity**
T. Lin, Z. Hu and X. Guo
International Conference on Web Search and Data Mining (WSDM), 2019.

(C5) **Understanding sparse topical structure of short text via stochastic variational-Gibbs inference**
T. Lin, S. Zhang and H. Cheng
International Conference on Information and Knowledge Management (CIKM), 2016.

(C4) **On stochastic primal-dual hybrid gradient approach for compositely regularized minimization**
L. Qiao, T. Lin, Y. Jiang, F. Yang, W. Liu and X. Lu
European Conference on Artificial Intelligence (ECAI), 2016.

(C3) **Collaborative filtering incorporating review text and co-clusters of hidden user communities and item groups**
Y. Xu, W. Lam and T. Lin
International Conference on Information and Knowledge Management (CIKM), 2014.

(C2) **Latent aspect mining via exploring sparsity and intrinsic information**
Y. Xu, T. Lin, W. Lam, Z. Zhou, H. Cheng and A. Man-Cho So
International Conference on Information and Knowledge Management (CIKM), 2014.

(C1) **The dual-sparse topic model: Mining focused topics and focused terms in short text**
T. Lin*, W. Tian*, Q. Mei and H. Cheng
International Conference on World Wide Web (WWW), 2014.

Honors and Awards

- IBM Goldstine Fellowship (declined) 2023-2025
- Google-BAIR Commons Funding 2021-2022
- Berkeley Artificial Intelligence Research (BAIR) Funding 2020-2021
- Berkeley EECS Fellowship 2019
- Berkeley IEOR Marshall-Oliver-Rosenberger Fellowship 2018
- National Scholarship in China (2% of the department) 2009-2010

Invited Talks

- INFORMS Annual Meeting at Seattle. (October 2024)
- INFORMS Optimization Society Meeting at Houston. (March 2024)
- Information Science and Systems Conference at Princeton. (March 2024)
- INFORMS Annual Meeting at Phoenix. (October 2023)
- Math Department Seminar, University of South Caroline. (August 2023)
- IEOR Seminar, Columbia University. (February 2023)

- OR and STATS Seminar, MIT Sloan School of Management. (February 2023)
- ISE Department Seminar, Virginia Tech. (February 2023)
- Math Department Seminar, Rensselaer Polytechnic Institute. (February 2023)
- ISE Department Seminar, UIUC. (January 2023)
- IE Department Seminar, Clemson University. (January 2023)
- ORIE Colloquium, Cornell University. (January 2023)
- IMSE Department Seminar, Iowa State University. (January 2023)
- IE School Seminar, Purdue University. (January 2023)
- OPLOG Division Seminar, UBC Sauder School of Business. (December 2022)
- ISE Department Seminar, Texas A&M University. (December 2022)
- Tech Research Seminar, NYU Stern School of Business. (December 2022)
- Business Analytics Seminar, Iowa Tippie College of Business. (November 2022)
- INFORMS Annual Meeting at Indiana. (October 2022)
- International Conference on Continuous Optimization (ICCOPT). (July 2022)
- Learning and Games Program, Simons Institute. (April 2022)
- INFORMS Optimization Society Meeting at Greenville. (March 2022)
- INFORMS Annual Meeting at Anaheim. (October 2021)
- SIAM Conference on Optimization, Virtual. (July 2021)
- INFORMS Annual Meeting, Virtual. (November 2020)
- INFORMS Optimization Society, Cancelled. (March 2020)
- INFORMS Annual Meeting at Seattle. (October 2019)
- International Conference on Continuous Optimization (ICCOPT). (August 2019)
- INFORMS Annual Meeting at Phoenix. (November 2018)
- IEOR Department Seminar, UC Berkeley. (September 2018)
- Berkeley-Stanford Workshop on Math and Computational Finance. (July 2018)
- International Congress of Mathematical Optimization (ISMP). (July 2018)
- Berkeley-Columbia Meeting in Engineering and Statistics. (April 2018)
- INFORMS Optimization Society Meeting at Denver. (March 2018)

Professional Services

Session Chair: INFORMS (2021, 2020, 2019), ICCOPT (2022).

Ad-hoc Referee

- Referees for Journals
  - Operations Research
  - Journal of Machine Learning Research
  - Mathematics of Operations Research
  - Mathematical Programming
  - Foundations of Computational Mathematics
  - SIAM Journal on Optimization
  - SIAM Journal on Mathematics of Data Science
  - SIAM Journal on Imaging Science
  - INFORMS Journal on Computing

- INFORMS Journal on Optimization
- Computational Optimization and Applications
- Journal of Scientific Computing
- Annuals of Statistics
- IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- IEEE Transactions on Knowledge and Data Engineering (TKDE)
- ACM Transactions on Knowledge Discovery from Data (TKDD)
- Information and Inference: A Journal of the IMA
- Probability in Engineering and Information Sciences
- Journal of Mathematical Imaging and Vision

- Referees for Conferences: ICML, NeurIPS, AISTATS, WWW, WSDM, CIKM.

Member

- The Institute for Operations Research and the Management Sciences (INFORMS)
- INFORMS Optimization Society
- INFORMS Computing Society
- INFORMS Applied Probability Society
- Society for Industrial and Applied Mathematics (SIAM)
- Mathematical Optimization Society (MOS)

Teaching Experience

- Weekly discussion sessions, office hours, and homework solutions.
  - STAT 2. Introduction to Statistics, Fall 2022.
  - CS 194. Networks: Models, Processes and Algorithms, Spring 2022.
  - IEOR 240. Optimization Analysis, Fall 2019, Fall 2018.
  - IEOR 262A. Mathematical Programming I, Fall 2017.

Computer Skills

Programming:

- Expert level at development in MATLAB.
- Proficient at Python, C and C++.
- Experience with CPLEX and Pytorch.

Last updated in July 6, 2024