

Jiajin Li

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Research Interests

My research interests lie in **mathematical optimization** and its applications in data-driven decision making, machine learning, and data science. My goal is to develop novel theoretical frameworks to study and analyze the convergence and statistical behaviors of optimization algorithms. By leveraging these insights from theoretical development, I design efficient algorithms tailored to data-driven optimization problems in these areas, such as graph learning, finance, experimental design, etc.

Academic Experience

Stanford University Postdoctoral Researcher Advisor: Jose Blanchet	2021 - Now
The Chinese University of Hong Kong Ph.D. in Operation Research Advisor: Anthony Man-Cho So	2017 - 2021
Massachusetts Institute of Technology Visiting Ph.D. Student Advisor: Justin Solomon	Aug 2020 - Mar 2021
Chongqing University B.S. in Statistics	2013 - 2017

Selected Publications

1. Nonsmooth Nonconvex-Nonconcave Minimax Optimization: Primal-Dual Balancing and Iteration Complexity Analysis [PDF](#)
[Jiajin Li](#), Linglingzhi Zhu, Anthony Man-Cho So
NeurIPS 2022 Workshop on Optimization for Machine Learning (**OPT 2022**), **Oral**.
Under review at **Mathematical Programming**.
2. Unifying Distributionally Robust Optimization via Optimal Transport Theory [PDF](#)
Jose Blanchet*, Daniel Kuhn*, [Jiajin Li](#)*, Bahar Taskesen* (alphabetical order).
To be submitted to **SIAM Journal on Optimization**.
3. Towards a First-Order Algorithmic Framework for Wasserstein Distributionally Robust Optimization [PDF](#)
[Jiajin Li](#), Caihua Chen, Anthony Man-Cho So.
Preliminary version appeared in Neural Information Processing Systems (**NeurIPS**), 2019.
To be submitted to **Mathematical Programming**.
4. Modified Frank Wolfe in Probability Space [PDF](#)
Jose Blanchet*, Peter Glynn*, Carson Kent*, [Jiajin Li](#)* (alphabetical order)
Preliminary version appeared in Neural Information Processing Systems (**NeurIPS**), 2021.
To be submitted to **Mathematical Programming**.
5. Trade-off among Infeasibility, Efficiency and Accuracy for Gromov-Wasserstein Computation [PDF](#)
[Jiajin Li](#), Jianheng Tang, Lemin Kong, Huikang Liu, Jia Li, Anthony Man-Cho So and Jose Blanchet.
Preliminary version appeared in International Conference on Learning Representation (**ICLR**), 2023.
Under review at **Journal of Machine Learning Research**.

Publication List

Note: + supervised student author.

1. Universal Gradient Descent Ascent Method for Nonconvex-Nonconcave Minimax Optimization
Taoli Zheng⁺, Linglingzhi Zhu, Anthony Man-Cho So, Jose Blanchet, **Jiajin Li**.
Neural Information Processing Systems (**NeurIPS**), 2023.
2. Outlier-Robust Gromov-Wasserstein
Lemin Kong⁺, **Jiajin Li**, Jianheng Tang, Anthony Man-Cho So.
Neural Information Processing Systems (**NeurIPS**), 2023.
Spotlight presentation; top 4% of submissions
3. A Convergent Single-Loop Algorithm for for Gromov-Wasserstein in Graph Data
Jiajin Li, Jianheng Tang, Lemin Kong, Huikang Liu, Jia Li, Anthony Man-Cho So and Jose Blanchet.
International Conference on Learning Representation, (**ICLR**), 2023.
4. Wasserstein Distributionally Robust Linear-Quadratic Estimation under Martingale Constraints
Kyriakos Lotidi⁺, Nicholas Bambos, Jose Blanchet, **Jiajin Li**
International Conference on Artificial Intelligence and Statistics (**AISTATS**), 2023.
5. Learning Proximal Operators to Discover Multiple Optima
Lingxiao Li, Noam Aigerman, Vladimir G. Kim, **Jiajin Li**., Kristjan Greenewald,
Mikhail Yurochkin, Justin Solomon
International Conference on Learning Representation, (**ICLR**), 2023.
6. Robust Attributed Graph Alignment via Joint Structure Learning and Optimal Transport
Jianheng Tang Weiqi Zhang, **Jiajin Li**, Kangfei Zhao, Fugee Tsung, Jia Li.
International Conference on Data Engineering (**ICDE**), 2023.
7. Tikhonov Regularization is Optimal Transport Robust under Martingale Constraints
Jiajin Li, Sirui Lin, Jose Blanchet, Viet Anh Nguyen.
Neural Information Processing Systems (**NeurIPS**), 2022.
8. Rethinking Graph Neural Networks for Anomaly Detection
Jianheng Tang⁺, **Jiajin Li**, Ziqi Gao, Jia Li.
International Conference on Machine Learning (**ICML**), 2022.
9. A Splitting Scheme for Flip-Free Distortion Energies
Oded Stein, **Jiajin Li**, Justin Solomon
SIAM Journal on Imaging Sciences (**SIIMS**), 2022.
10. Modified Frank Wolfe in Probability Space
Carson Kent, **Jiajin Li**, Jose Blanchet, Peter Glynn
Neural Information Processing Systems (**NeurIPS**), 2021.
11. Deconvolutional Networks on Graph Data
Jia Li, **Jiajin Li**, Yang Liu, Jianwei Yu, Yueting Li, Hong Cheng
Neural Information Processing Systems (**NeurIPS**), 2021.
12. Understanding Notions of Stationarity in Nonsmooth Optimization: A Guided Tour of Various
Constructions of Subdifferential for Nonsmooth Functions
Jiajin Li, Anthony Man-Cho So, Wing-Kin Ma.
IEEE Signal Processing Magazine (**SPM**), 2020, 37(5):18-31.
13. Fast Epigraphical Projection-based Incremental Algorithms for Wasserstein Distributionally Robust
Support Vector Machine
Jiajin Li, Caihua Chen, Anthony Man-Cho So.
Neural Information Processing Systems (**NeurIPS**), 2020.

14. Dirichlet Graph Variational Autoencoder
Jia Li, Jianwei Yu, **Jiajin Li**, Honglei Zhang, Kangfei Zhao, Yu Rong, Hong Cheng, Junzhou Huang.
Neural Information Processing Systems (**NeurIPS**), 2020.
15. The Gambler’s Problem and Beyond
Baoliang Wang, Shuai Li, **Jiajin Li**, Siu On Chan.
International Conference on Learning Representations (**ICLR**), 2020.
16. A First-Order Algorithmic Framework for Distributionally Robust Logistic Regression
Jiajin Li, Sen Huang, Anthony Man-Cho So.
Neural Information Processing Systems (**NeurIPS**), 2019.
17. Policy Optimization with Second-Order Advantage Information
Jiajin Li^{*}, Baoliang Wang^{*}. (alphabetical order)
International Joint Conference on Artificial Intelligence (**IJCAI**), 2018.

Working Papers

1. Accelerated First-Order Methods with Second-Order Information for Nonconvex Optimization
Jiajin Li, Yinyu Ye.
2. Generalized Frank-Wolfe method for optimization in probability space via Bregman proximal mapping
Jose Blanchet, **Jiajin Li**^{*}, Lezhi Tan (alphabetical order).
In preparation for **Mathematics of Operation Research**.
3. Unveiling Spurious Stationary Points under Bregman-Moreau Envelopes
He Chen⁺, **Jiajin Li**, Anthony Man-Cho So.
In preparation for **ICML 2024**.
4. First-order Methods with Random Constraint Projections for Weakly Convex Function
He Chen⁺, **Jiajin Li**^{*}, Anthony Man-Cho So (alphabetical order).
In preparation for **SIAM Journal on Optimization**.
5. Synthetic Principal Component Design: Fast Covariate Balancing with Synthetic Controls
Yiping Lu, **Jiajin Li**, Lexing Ying, Jose Blanchet.
NeurIPS 2022 Workshop on Causality for Real-world Impact.
Submitted to **AISTATS 2024**.
6. Automatic Outlier Rectification via Optimal Transport
Jose Blanchet^{*}, **Jiajin Li**^{*}, Markus Pelger^{*} and Greg Zanotti^{*} (alphabetical order)
To be submitted to **Transaction Research on Machine Learning**.
7. Epi-Convergent Data-Driven Approximation: A Unified View of Pessimistic and Optimistic
Yiping Lu, **Jiajin Li** and Jose Blanchet.

Professional Services

- **Session Chair**, INFORMS Annual Meeting, 2023, Phoenix, AZ.
Theoretical Foundation in Minimax Optimization / Nonsmooth Optimization.
- **Session Chair**, SIAM Conference on Optimization (OP23), 2023, Seattle, Washington.
Modeling Frontier and Algorithmic Foundation of Robust Optimization
- **Session Chair**, International Conference on Continuous Optimization (ICCOPT) 2022, Bethlehem, PA.
Recent Advances in Distributionally Robust Optimization
- **Reviewer**, Neural Information Processing Systems (NeurIPS) 2023, 2022, 2021, 2020
- **Reviewer**, International Conference on Machine Learning (ICML) 2023, 2022, 2021, 2020
- **Reviewer**, International Conference on Learning Representation (ICLR) 2022, 2023

- **Reviewer**, International Conference on Artificial Intelligence and Statistics (AISTATS) 2023
- **Reviewer**, Operation Research
- **Reviewer**, Mathematics of Operation Research
- **Reviewer**, Mathematical Programming
- **Reviewer**, SIAM Journal on Optimization
- **Reviewer**, Journal of Global Optimization
- **Reviewer**, IEEE Transactions on Information Theory (TIT)
- **Reviewer**, IEEE Transactions on Knowledge and Data Engineering (T-KDE)
- **Reviewer**, Pattern Recognition

Invited Talk

1. Unifying Distributionally Robust Optimization via Optimal Transport Theory
— International Conference Stochastic Programming, July 2023.
2. Nonsmooth Nonconvex Nonconcave Minimax Optimization
— International Conference on Continuous Optimization (ICCOPT), July, 2022.
— NeurIPS 2022 Workshop on Optimization for Machine Learning, December, 2022.
— Department of Mathematics, Rensselaer Polytechnic Institute, February, 2023.
3. Trade-off among Infeasibility, Efficiency and Accuracy for Gromov-Wasserstein Computation
— SIAM Conference on Optimization (OP23), June 2023.
4. Tikhonov Regularization is Optimal Transport Robust under Martingale Constraints
— UT Austin EECS Rising Stars Workshop, October, 2022.
— INFORMS Annual Meeting, October, 2022.
5. Modified Frank-Wolfe in Probability Space
— Workshop “Robustness and Resilience in Stochastic Optimization and Statistical Learning: Mathematical Foundations”, May, 2022.
— VinAI NeurIPS 2021 Workshop, November, 2021.
6. Efficient and Provable Algorithms for Wasserstein Distributionally Robust Optimization in Machine Learning
— INFORMS Annual Meeting, October, 2021.
— University of Maryland, College Park, January, 2021.
— ETH AI Center Post-Doctoral Fellowship Symposium, March, 2021.
— Shanghai Jiao Tong University, April, 2021.
7. Fast Epigraphical Projection-based Incremental Algorithms for Wasserstein Distributionally Robust Support Vector Machine
— Geometric Data Processing Group, MIT, August, 2020.
— NeurIPS 2020, December, 2020.
8. A First-Order Algorithmic Framework for Distributionally Robust Logistic Regression
— The 17th Chinese Workshop on Machine Learning and applications, 2019.
— NeurIPS 2019 (Poster), December, 2019.

Awards

UT Austin EECS Rising Star	2023
Shortlist for ETH AI Center Post-Doctoral Fellowship	2021
Postgraduate Scholarship in CUHK	2017-2021
NeurIPS Student Travel Award	2019
ICML Student Travel Award	2018
IJCAI-ECAI Student Travel Grant	2018
Outstanding Graduates of Chongqing City	2017
Outstanding Undergraduate Thesis of Chongqing University	2017
Meritorious Winner at the American Interdisciplinary Contest in Modeling (ICM)	2015

Teaching Assistants

ENGG 5501: Foundation of Optimization	Fall 2019, 2020
ESTR 2004: Discrete Mathematics for Engineers (ELITE Stream)	Fall 2019, 2020
SEEM 4670: Service Systems	Spring 2019
ENGG 2440B: Discrete Mathematics for Engineers	Fall 2018
ENGG 1410A: Linear Algebra and Vector Calculus	Spring 2018

Mentorship

- Lezhi Tan, Undergraduate student@Peking University (UGVR Program) 2023 -
- He Chen, Ph.D student@Chinese University of Hong Kong 2023 -
- Kyriakos Lotidis, Ph.D Student@Stanford 2022 -
- Sirui Lin, Ph.D Student@Stanford 2021 -
- Taoli Zheng, Ph.D student@Chinese University of Hong Kong 2021 -
- Lemin Kong, Ph.D student@Chinese University of Hong Kong 2021 -
- Jianheng Tang, Ph.D student@Hong Kong university of Science and Technology 2021 -

Programming Skills

Python, MATLAB(C/C++ Mex), R and Mathematica

List of Referees

1. Jose Blanchet (jose.blanchet@stanford.edu)
Professor, Department of Management Science and Engineering
Stanford University
2. Daniel Kuhn (daniel.kuhn@epfl.ch)
Professor, Risk Analytics and Optimization Chair
Ecole Polytechnique Fdrale de Lausanne (EPFL)
3. Anthony Man-Cho So (manchoso@se.cuhk.edu.hk)
Professor, Department of Systems Engineering and Engineering Management
The Chinese University of Hong Kong
4. Yinyu Ye (yyye@stanford.edu)
K. T. Li Professor of Engineering
Stanford University