# Tianjiao Li

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## RESEARCH INTERESTS

My research focuses on the design and analysis of novel first-order methods for *Nonlinear Optimization, Stochastic Optimization*, and *Dynamic Decision-Making*. I also actively pursue the practical value of these methods in relevant applications. I am particularly interested in

(i) Parameter-free methods for convex and nonconvex optimization
(ii) Stochastic optimization for statistical and machine learning
(iii) Policy optimization and policy evaluation in reinforcement learning
(iv) Applications, e.g., healthcare, E-commerce, finance

## EDUCATION

**Aug 2020 - Jun 2025** (expected)
**Georgia Institute of Technology**, Atlanta, GA, USA
Ph.D. in Operations Research
- Advisor: Guanghui (George) Lan
- Co-advisor: Ashwin Pananjady
- Minor: Machine Learning
- Department: H. Milton Stewart School of Industrial and Systems Engineering

**Aug 2019 - May 2021**
**Georgia Institute of Technology**, Atlanta, GA, USA
M.S. in Quantitative and Computational Finance

**Sep 2015 - Jun 2019**
**Fudan University**, Shanghai, China
B.S. in Information and Computational Science
- Department: School of Mathematical Sciences

## PUBLICATIONS

($\alpha$-$\beta$ =alphabetical order)

- **A Simple Uniformly Optimal Method without Line Search for Convex Optimization**

  **Tianjiao Li**, Guanghui Lan
  Under second-round review, *Mathematical Programming Series A*. Initial version submitted in Oct 2023.
  *(Winner of Alice and John Jarvis Best Student Paper Award, 2024)*

- **Accelerated Stochastic Approximation with State-Dependent Noise**

  Sasila Ilandarideva, Anatoli Juditsky, Guanghui Lan, **Tianjiao Li** ($\alpha$-$\beta$)
  *Mathematical Programming Series A, 2024*

- **Stochastic First-Order Methods for Average-Reward Markov Decision Processes**

  **Tianjiao Li**, Feiyang Wu, Guanghui Lan
  Accepted for publication, *Mathematics of Operations Research, 2024*

- **Faster Algorithm and Sharper Analysis for Constrained Markov Decision Process**

  **Tianjiao Li**, Ziwei Guan, Shaofeng Zou, Tengyu Xu, Yingbin Liang, Guanghui Lan
  *Operations Research Letters, vol. 54, 107107, 2024*

- **Accelerated and Instance-Optimal Policy Evaluation with Linear Function Approximation**

  **Tianjiao Li**, Guanghui Lan, Ashwin Pananjady
  *SIAM Journal on Mathematics of Data Science, vol. 5, no. 1, pp. 174-200, 2023*

- **Simple and Optimal Methods for Stochastic Variational Inequalities, I: Operator Extrapolation**

  Georgios Kotsalis, Guanghui Lan, **Tianjiao Li ($\alpha$-$\beta$)**
  *SIAM Journal on Optimization, vol. 32, no. 3, pp. 2041-2073, 2022*

- **Simple and Optimal Methods for Stochastic Variational Inequalities, II: Markovian Noise and Policy Evaluation in Reinforcement Learning**

  Georgios Kotsalis, Guanghui Lan, **Tianjiao Li ($\alpha$-$\beta$)**
  *SIAM Journal on Optimization, vol. 32, no. 2, pp. 1120-1155, 2022*

## PREPRINTS AND WORKING PAPERS

- **Auto-Conditioned Primal-Dual Hybrid Gradient Method and Alternating Direction Method of Multipliers**

  Guanghui Lan, **Tianjiao Li ($\alpha$-$\beta$)**
  Preprint at arXiv:2410.01979. To be submitted to *SIAM Journal on Optimization*.

- **Novel Accuracy Certificates for Smooth Convex Optimization**

  Sasila Ilandarideva, Anatoli Juditsky, Guanghui Lan, **Tianjiao Li ($\alpha$-$\beta$)**
  In preparation. To be submitted to *SIAM Journal on Optimization*.

- **Multiscale Replay: A Robust Algorithm for Stochastic Variational Inequalities with a Markovian Buffer**

  Milind Nakul, **Tianjiao Li**, Ashwin Pananjady
  In preparation. To be submitted to *Mathematics of Operations Research*.

## AWARDS AND HONORS

- **Alice and John Jarvis Best Student Paper Award, 2024**

  - Awarded annually to one Ph.D. student in ISyE across all disciplines
- **Second Place, Poster Competition, YinzOR Student Conference 2024**
- **Shabbir Ahmed PhD Fellowship for Excellence in Research, 2023**

  - Awarded annually to one Ph.D. student in ISyE for research in optimization
- **First Place, Best Poster Award, Georgia Statistics Day 2023**
- **Fudan University School of Mathematical Sciences Academic Scholarship**

## TEACHING AND STUDENT MENTORING

- **Course Instructor, Summer 2024, Georgia Tech**
  **Statistics and Applications (ISyE 3770)**

  - Description: one-semester probability and statistics course for engineering students
  - Class size: **64** (26 on campus + 38 online)
  - Overall teaching evaluation: **4.8/5.0** (response rate: 56%)
    * Respect for students: **4.8/5.0**
    * Inclusiveness: **4.9/5.0**
    * Communicated how to succeed: **4.7/5.0**
    * Availability: **4.9/5.0**
    * Stimulates interest: **4.6/5.0**
    * Clarity: **4.5/5.0**
    * Feedback helpfulness: **4.8/5.0**

- **Guest Lecturer, Fall 2024, Georgia Tech**
  **Computational Data Analysis / Machine Learning (ISyE 6740)**

  - Description: general machine learning course for master and Ph.D. students
  - Instructor: Guanghui (George) Lan
  - Responsibility: 2 Lectures in machine learning and data science

- **Guest Lecturer, Spring 2024, Georgia Tech**
  **Optimization Methods for Reinforcement Learning (ISyE 8803)**
  - Description: advanced topic in optimization for RL for ISyE Ph.D. students
  - Instructor: Guanghui (George) Lan
  - Responsibility: 8 Lectures in policy evaluation and average-reward MDPs

- **Student Mentoring:**
  - Milind Nakul, ISyE PhD Student, Georgia Tech
    Research project: Experience replay for policy evaluation in reinforcement learning
  - Feiyang Wu, CS Master Student, Georgia Tech
    Research project: Stochastic first-order methods for average-reward MDPs
  - ISyE PhD mentoring program, Georgia Tech

## VISITING EXPERIENCE

**Apr 2024 - May 2024** **Laboratoire Jean Kuntzmann, University Grenoble Alpes**, Grenoble, France
Visiting Graduate Student
- Host: Anatoli Juditsky
- Project: Stochastic Optimization Algorithms for Machine Learning Applications

**Oct 2021 - Nov 2021** **Simons Institute for the Theory of Computing, UC Berkeley**, Berkeley, CA
Visiting Graduate Student
- Host: Ashwin Pananjady
- Program: Computational Complexity of Statistical Inference

## RESEARCH COLLABORATION

**Nov 2023 - Present** **University of Louisville Health and Hospital**
Project: reinforcement learning method for clinical decision making within surgical operations
- Realtime intra- and post-operative clinical recommendation for prevention and mitigation of cardiac surgery-associated acute kidney injury (CSA-AKI)
- Realtime intra-operative treatment recommendation for management of hypotension during surgeries

**Oct 2022 - May 2023** **AI Institute for Advances in Optimization (AI4OPT)**
Project: AI4OPT collaboration with Intel Corporation
- Implemented the factorial model and random forest to detect significant factors in a process control problem (targeting at reducing the variability of a time series) with limited and highly skewed data

## INDUSTRIAL EXPERIENCE

**May 2023 - Aug 2023** **Amazon**, Seattle, WA, USA
Position: Applied Scientist Intern
- Developed an automated seasonality detection and seasonal-trend decomposition module for Amazon Payment anomaly detection platform
- The internal paper was accepted by 2023 Amazon Machine Learning Conference (AMLC)

## SERVICES

- **Journal Reviewing:**

  - SIAM Journal on Optimization
  - Mathematical Programming
  - Annuals of Statistics
  - Computational Optimization and Applications
  - Optimization Letters

- **Conference Reviewing:**

  - Conference on Learning Theory (COLT) 2022-2024

- **Session Organization:**

  - **INFORMS Annual Meeting 2024**, Seattle, WA, Oct 2024
    Session: Advances in Continuous Optimization Algorithms
    Session: Advances in Non-Smooth Optimization
  - **International Symposium on Mathematical Programming (ISMP 2024)**, Montreal, Canada, Jul 2024
    Session: Advances in First-Order Methods for Stochastic and Continuous Optimization

## TALKS AND PRESENTATIONS

- **INFORMS Annual Meeting**, Seattle, WA, Oct 2024

  - Session: ME34 - First-Order Methods in Continuous and Stochastic Optimization
  - Location: Summit - 425
  - Date and Time: Monday, October 21, 4:00 PM - 4:20 PM
  - Title: A Simple Uniformly Optimal Method without Line Search for Convex Optimization

- **Cornell ORIE Young Researchers Workshop**, Ithaca, NY, Oct 2024

  - Title: A Simple Uniformly Optimal Method without Line Search for Convex Optimization

- **YinzOR Student Conference, CMU Tepper School of Business**, Pittsburg, PA, Aug 2024

  - Poster presentation: Accelerated Stochastic Approximation with State-Dependent Noise
  - Won the Second Place in the poster competition

- **International Symposium on Mathematical Programming (ISMP 2024)**, Montreal, Canada, Jul 2024

  - Session: Advances in Stochastic First-Order Methods
  - Title: A Simple Uniformly Optimal Method without Line Search for Convex Optimization

- **DAO Team Seminar at Laboratoire Jean Kuntzmann**, Grenoble, France, May 2024

  - Title: A Simple Uniformly Optimal Method without Line Search for Convex Optimization

- **INFORMS Optimization Society Conference**, Houston, TX, Mar 2024

  - Session: Advances in Continuous Optimization Algorithms
  - Title: A Simple Uniformly Optimal Method without Line Search for Convex Optimization

- **INFORMS Annual Meeting**, Phoenix, AZ, Oct 2023

  - Session: Recent Advances in Policy Optimization and Reinforcement Learning
  - Title: Accelerated and Instance-Optimal Policy Evaluation with Linear Function Approximation

- **Georgia Statistics Day**, Atlanta, GA, Oct 2023

  - Poster presentation: Accelerated and Instance-Optimal Policy Evaluation with Linear Function Approximation
  - Won the First Place in the poster competition

- **SIAM Conference on Optimization**, Seattle, WA, May 2023

  - Session: New Sparse Optimization
  - Title: Accelerated Stochastic Approximation with State-Dependent Noise

- **INFORMS Annual Meeting**, Indianapolis, IN, Oct 2022

  - Session: Reinforcement Learning Theory
  - Title: Stochastic First-Order Methods for Average-Reward Markov Decision Processes

- **ISyE Ph.D. Student Seminar**, Atlanta, GA, Sep 2022

  - Title: Stochastic First-Order Methods for Average-Reward Markov Decision Processes

- **Asilomar Conference on Signals, Systems, and Computers**, Online, Nov 2021

  - Session: Theory of Reinforcement Learning
  - Title: Faster Algorithm and Sharper Analysis for Constrained Markov Decision Process

- **INFORMS Annual Meeting**, Online, Oct 2021

  - Session: Stochastic Optimization in Machine Learning
  - Title: Simple and Optimal Methods for Stochastic Variational Inequalities

## REFERENCES

- **Guanghui (George) Lan (Professor)**

  H. Milton Stewart School of Industrial and Systems Engineering, Georgia Tech
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  Phone: (404) 385-5402

- **Ashwin Pananjady (Assistant Professor)**

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- **Arkadi Nemirovski (Professor)**

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- **Anatoli Juditsky (Professor)**

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