

# Tianjiao Li

ISyE Main Building, 755 Ferst Drive Northwest, Atlanta, GA, 30318  
Email: tli432@gatech.edu | Phone: (470) 452-9327  
Webpage: tli432.github.io | Google Scholar: scholar.google.com

## RESEARCH INTERESTS

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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

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- Aug 2020 - Georgia Institute of Technology**, Atlanta, GA, USA
- Jun 2025** (expected) 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 - Georgia Institute of Technology**, Atlanta, GA, USA
- May 2021** M.S. in Quantitative and Computational Finance
- Sep 2015 - Fudan University**, Shanghai, China
- Jun 2019** B.S. in Information and Computational Science  
- Department: School of Mathematical Sciences

## PUBLICATIONS

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( $\alpha$ - $\beta$  =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

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- **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

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- **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

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- **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

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- Apr 2024 - Laboratoire Jean Kuntzmann, University Grenoble Alpes, Grenoble, France**
- May 2024** Visiting Graduate Student
  - Host: Anatoli Juditsky
  - Project: Stochastic Optimization Algorithms for Machine Learning Applications
- Oct 2021 - Simons Institute for the Theory of Computing, UC Berkeley, Berkeley, CA**
- Nov 2021** Visiting Graduate Student
  - Host: Ashwin Pananjady
  - Program: Computational Complexity of Statistical Inference

## RESEARCH COLLABORATION

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- Nov 2023 - University of Louisville Health and Hospital**
- Present** 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 - AI Institute for Advances in Optimization (AI4OPT)**
- May 2023** 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

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- May 2023 - Amazon, Seattle, WA, USA**
- Aug 2023** 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

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- **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

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- **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
  - Session: Optimization I
  - 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

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- **Guanghai (George) Lan (Professor)**
  - H. Milton Stewart School of Industrial and Systems Engineering, Georgia Tech
  - Email: george.lan@isye.gatech.edu
  - Phone: (404) 385-5402
- **Ashwin Pananjady (Assistant Professor)**
  - H. Milton Stewart School of Industrial and Systems Engineering  
& School of Electrical and Computer Engineering, Georgia Tech
  - Email: ashwinpm@gatech.edu
  - Phone: (510) 384-7711
- **Arkadi Nemirovski (Professor)**
  - H. Milton Stewart School of Industrial and Systems Engineering, Georgia Tech
  - Email: arkadi.nemirovski@isye.gatech.edu
  - Phone: (404) 385-0769
- **Anatoli Juditsky (Professor)**
  - Laboratoire Jean Kuntzmann, University Grenoble Alpes
  - Email: anatoli.juditsky@univ-grenoble-alpes.fr
  - Phone: 0033(0)457421744