TIANLONG NAN

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EDUCATION

Columbia University, New York — Sept 2022 - **Expected Late 2026**
PhD, Operations Research | **Advisor:** Christian Kroer

Columbia University, New York — Sept 2020 - May 2022
MS, Operations Research (Advanced Master Research Specialization)

Peking University, Beijing — Sept 2017 - July 2020
BE, Economics

Peking University, Beijing — Sept 2016 - July 2020
BS, Materials Chemistry

RESEARCH INTERESTS

Fields: Artificial Intelligence, Algorithmic Game Theory, Optimization

Specific: Market Equilibrium, Equilibrium Computation, First-order Methods, Large-scale Optimization, Online Learning, Machine Learning

PUBLICATIONS

▶ On the Convergence of Tâtonnement for Linear Fisher Markets. *AAAI*, 2025. (Upcoming)
With Yuan Gao and Christian Kroer.

- Convergence guarantees for tâtonnement in linear and quasi-linear Fisher markets, which arise in prominent applications such as ad allocation.

▶ Competitive Equilibrium for Chores: from Dual Eisenberg-Gale to a Fast, Greedy, LP-based Algorithm. *EC*, 2024. Journal version submitted to Operations Research.
With Bhaskar Ray Chaudhury, Christian Kroer, and Ruta Mehta. (in alphabetical order)

- A novel approach and state-of-the-art algorithm for computing competitive equilibrium for chores with high efficiency in large-scale problems, providing a powerful tool for the fair division of 'chores' such as workloads;

▶ Fast and Interpretable Dynamics for Fisher Markets via Block Coordinate Updates. *AAAI*, 2023.
With Yuan Gao and Christian Kroer.

- Stochastic block coordinate descent algorithms for computing market equilibrium, achieving practically and theoretically fast convergence with novel economic interpretations.

RESEARCH PROJECTS

▶ Convergence of Extragradient SVRG for Variational Inequalities: Error Bounds and Increasing Iterate Averaging. [arXiv]
With Yuan Gao and Christian Kroer.

- First linear convergence rate for the variance-reduced stochastic extragradient method in a broad class of problems including solving two-player zero-sum games.

▶ A Computer-Assisted Method for Optimizing Primal-Dual Methods for Large Scale Game Solving.
With Shuvomoy Das Gupta, Christian Kroer, and Garud Iyengar.

- Optimal primal-dual first-order methods for solving two-player zero-sum games using the performance estimation problem approach.

▶ Optimism in Nash Learning with Human Feedback.
With Ruofei Ma and Jay Sheng.

- Optimistic online mirror descent-based algorithms within the framework of Nash learning with human feedback for fine-tuning LLMs.

WORK EXPERIENCE

Accenture, Beijing — Aug 2020 - Nov 2020
Data Analyst Intern

- Designed and tested BMW GPM (Granular Performance Management) v2.0 as part of a 20+ member team, creating a data-driven web platform for in-depth luxury car market analysis.
- Maintained and optimized ETL (Extract, Transform, Load) processes and data integration solutions to ensure efficient data flow and accuracy.

China International Captial Crop. (CICC), Beijing — Oct 2019 - Jan 2020
Quant Development Intern

- Implemented and optimized an index-based stock price prediction model, designing and backtesting trading strategies that increased anticipated profit by 30%.

China Everbright Bank (CEB), Beijng — Jan 2018 - Feb 2018
Data Operation Intern

- Leveraged SQL and Excel for data manipulation and maintenance, enhancing operational efficiency and supporting decision-making in financial operations.

LEADERSHIP & ACTIVITIES

IEOR PhD Council — Oct 2023 - Present
Member, Columbia University

Student Council of College of Chemistry (CCME) — May 2018 - May 2019
President of the 25th Executive Committee, Peking University

AWARDS

Graduate Fellowship in Industrial Engineering and Operations Research — May 2022
Columbia University

Excellent Graduate — July 2020
Peking University

National Scholarship — Oct 2017
Peking University

Gold Medal in the 29th National Chemical Olympiad — Dec 2015
Chinese Chemical Society

SKILLS & LANGUAGE

Mathematics
Optimization, Algorithms, Machine Learning, Reinforcement Learning, Statistics, Stochastic Processes

Computer Skills
Python (Numpy, Pandas, Matplotlib, Scikit-Learn, Statsmodels, PyTorch, Tensorflow, Cvxpy, etc.), Julia, LaTeX, Git, Gurobi, SQL, C++