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, Material 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

RESEARCH PROJECTS

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

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

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

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

▶ Competitive Equilibrium for Chores: from Dual Eisenberg-Gale to a Fast, Greedy, LP-based Algorithm.
With Bhaskar Ray Chaudhury, Christian Kroer, and Ruta Mehta. **[EC 2024]** **[ArXiv]**

- New approach to find competitive equilibrium for chores (e.g., dividing workloads) which opens up new possibility in solving this problem; state-of-the-art algorithm to compute competitive equilibrium for chores with high efficiency in large-scale problems.

▶ On the Convergence of Tâtonnement for Linear Fisher Markets.
With Yuan Gao and Christian Kroer. **[ArXiv]**

- Convergence guarantee for a classic economic dynamics: tâtonnement for linear Fisher markets, matching experimental observations.

▶ Performance Estimation Problem for Bilinear Saddle Point Problems.
With Shuvomoy Das Gupta, Christian Kroer, and Garud Iyengar.

- Optimal first-order methods for solving bilinear saddle-point problems by the approach of the performance estimation problem.

▶ 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++