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Employment

Columbia University, New York, NY
2023 – *Associate Professor of Business*
2019 – 2023 *Assistant Professor of Business*

2018 – 2019 **Google Research**, Cambridge, MA
Postdoctoral Researcher, Operations Research Team

2015 **Jane Street Capital**, New York, NY
Trader Intern

2013 – 2015 **Lunarch Studios Inc.**, Waterloo, ON Canada
Co-founder
I took leave from MIT in 2013 to form the start-up Lunarch Studios, which launched the strategy game *Prismata* on the *Steam* platform.

Education

2015 – 2018 **Massachusetts Institute of Technology**, Cambridge, MA
2010 – 2012 *Ph.D. in Operations Research*
Advisor: David Simchi-Levi

2006 – 2010 **University of Waterloo**, Waterloo, ON Canada
B.Math with honors in Pure Mathematics and Combinatorics/Optimization

Journal Papers

1. **Online Matching Frameworks under Stochastic Rewards, Product Ranking, and Unknown Patience** with Brian Brubach, Nathaniel Grammel, Aravind Srinivasan

   Operations Research, articles in advance

2. **Assortment Planning for Recommendations at Checkout under Inventory Constraints** with Xi Chen, David Simchi-Levi, Linwei Xin

   Mathematics of Operations Research, articles in advance

   *covered in Chicago Booth Review, 2018

3. **Tight Guarantees for Static Threshold Policies in the Prophet Secretary Problem** with Nick Arnosti

   Operations Research, 2023

4. **Order-optimal Correlated Rounding for Fulfilling Multi-item E-commerce Orders**

   Manufacturing & Service Operations Management, 2023

   *accepted for presentation at Applied and Computational Discrete Algorithms (ACDA), 2023

   *invited for presentation in Online Algorithms & Online Rounding workshop at FOCS 2023

   *selected for presentation in the MSOM Supply Chain Management SIG, 2022

5. **When is Assortment Optimization Optimal?**

   Management Science, 2023

   *2nd Place, Rothkopf Junior Researcher Paper Prize for Auctions and Market Design, 2021

   *selected for spotlight presentation in the INFORMS Revenue Management and Pricing Conference, 2022

   *selected for presentation in the MSOM Service SIG, 2021

6. **Fairness Maximization among Offline Agents in Online-Matching Markets** with Pan Xu, Yifan Xu

   ACM Transactions on Economics and Computation (TEAC), 2023

7. **Revenue-Optimal Deterministic Auctions for Multiple Buyers with Ordinal Preferences over Fixed-Price Items**

   ACM Transactions on Economics and Computation (TEAC) (invited submission), 2022

8. **Bifurcating Constraints to Improve Approximation Ratios for Network Revenue Management with Reusable Resources** with Jackie Baek

   Operations Research (Technical Note), 2022

9. **Distributionally Robust Linear and Discrete Optimization with Marginals** with Louis Chen, Karthik Natarajan, David Simchi-Levi, Zhenzhen Yan

   Operations Research, 2022

10. **Inventory Balancing with Online Learning** with Wang Chi Cheung, David Simchi-Levi, Xinshang Wang

    Management Science, 2022

11. **Dynamic Pricing (and Assortment) under a Static Calendar** with David Simchi-Levi, Jinglong Zhao

    Management Science, 2021

12. **On Policies for Single-leg Revenue Management with Limited Demand Information** with David Simchi-Levi, Chung-Piaw Teo

    Operations Research, 2021

13. **Algorithms for Online Matching, Assortment, and Pricing with Tight Weight-dependent Competitive Ratios** with David Simchi-Levi

    Operations Research, 2020

    *Finalist, George E. Nicholson Student Paper Competition, 2017

14. **Separation between Second Price Auctions with Personalized Reserves and the Revenue Optimal Auction** with Balasubramanian Sivan

    Operations Research Letters, 2020

15. **Strong Mixed-Integer Programming Formulations for Trained Neural Networks** with Ross Anderson, Joey Huchette, Christian Tjandraatmadja, Juan Pablo Vielma

    Math Programming, 2020

16. **Improvements and Generalizations of Stochastic Knapsack and Markovian Bandits Approximation Algorithms**

    Mathematics of Operations Research, 2018

    *2nd place, INFORMS Optimization Society Student Paper Competition, 2017

17. **Packing and Covering Triangles in Planar Graphs** with Qing Cui, Penny Haxell

    Graphs and Combinatorics, 2009

Working Papers

1. **Random-order Contention Resolution via Continuous Induction: Tightness for Bipartite Matching under Vertex Arrivals** with Calum MacRury

2. **Real-Time Personalized Order Holding** with Mohammad Reza Aminian, Linwei Xin

3. **Assortment and Inventory Planning under Stockout-Based Substitution: The Many-Products Regime** with Jingwei Zhang, Huseyin Topaloglu

   Major Revision in *Operations Research*

4. **Order Selection Problems in Hiring Pipelines** with Boris Epstein

   Minor Revision in *Operations Research*

5. **Tight Guarantees for Multi-unit Prophet Inequalities and Online Stochastic Knapsack** with Jiashuo Jiang, Jiawei Zhang

   Major Revision in *Operations Research*

   *Jiashuo Jiang was a Finalist in the George E. Nicholson Student Paper Competition, 2022

   *Jiashuo Jiang was a Finalist for the Jeff McGill Student Paper Award for Revenue Management and Pricing, 2021

6. **Beyond IID: Data-Driven Decision-Making in Heterogeneous Environments** with Omar Besbes, Omar Mouchtaki

   Major Revision in *Management Science*

7. **Dynamic Pricing for Reusable Resources: The Power of Two Prices** with Santiago Balseiro, Wenxin Zhang

8. **From Contextual Data to Newsvendor Decisions: On the Actual Performance of Data-Driven Algorithms** with Omar Besbes, Omar Mouchtaki

   Major Revision in *Management Science*

9. **The Benefits of Delay to Online Decision-Making** with Yaqi Xie, Linwei Xin

   Major Revision in *Management Science*

   *covered in Chicago Booth Review, 2023

   *selected for presentation in the MSOM Supply Chain Management SIG, 2023

10. **On (Random-order) Online Contention Resolution Schemes for the Matching Polytope of (Bipartite) Graphs** with Calum MacRury, Nathaniel Grammel

    Major Revision in *Operations Research*

11. **Degeneracy is OK: Logarithmic Regret for Network Revenue Management with Indiscrete Distributions** with Jiashuo Jiang, Jiawei Zhang

    Major Revision in *Operations Research*

12. **A Nonparametric Framework for Online Stochastic Matching with Correlated Arrivals** with Ali Aouad

    R & R in *Management Science*

13. **Online Bipartite Matching with Advice: Tight Robustness-Consistency Tradeoffs for the Two-Stage Model** with Billy Jin

    R & R in *Management Science*

    *Billy Jin was Winner of Student Paper Prize of INFORMS Decision Analysis Society, 2023

14. **Improved Guarantees for Offline Stochastic Matching via new Ordered Contention Resolution Schemes** with Brian Brubach, Nathaniel Grammel, Aravind Srinivasan

    Minor Revision in *Mathematics of Operations Research*

15. **Multi-Stage and Multi-Customer Assortment Optimization With Inventory Constraints** with Elaheh Fata, David Simchi-Levi

    Major Revision in *Operations Research*

16. **A Competitive Analysis of Online Knapsack Problems with Unit Density** with David Simchi-Levi, Jinglong Zhao

    Major Revision in *Management Science*

Conference Papers

1. **Tightness without Counterexamples: A New Approach and New Results for Prophet Inequalities** with Jiashuo Jiang, Jiawei Zhang

   Economics and Computation (EC), 2023

2. **A Nonparametric Framework for Online Stochastic Matching with Correlated Arrivals** with Ali Aouad

   Economics and Computation (EC), 2023

3. **Order-optimal Correlated Rounding for Fulfilling Multi-item E-commerce Orders**

   Economics and Computation (EC), 2023

4. **Optimizing for Strategy Diversity in the Design of Video Games** with Oussama Hanguir, Christopher Thomas Ryan

   Integer Programming and Combinatorial Optimization (IPCO), 2023

5. **On (Random-order) Online Contention Resolution Schemes for the Matching Polytope of (Bipartite) Graphs** with Calum MacRury, Nathaniel Grammel

   Symposium on Discrete Algorithms (SODA), 2023

6. **Order Selection Problems in Hiring Pipelines** with Boris Epstein

   Web and Internet Economics (WINE), 2022

   Constructing Demand Curves from a Single Observation of Bundle Sales with David Simchi-Levi

   Web and Internet Economics (WINE), 2022

7. **Beyond IID: Data-Driven Decision-Making in Heterogeneous Environments** with Omar Besbes, Omar Mouchtaki

   Neural Information Processing Systems (NeurIPS), 2022

8. **Online Bipartite Matching with Advice: Tight Robustness-Consistency Tradeoffs for the Two-Stage Model** with Billy Jin

   Neural Information Processing Systems (NeurIPS), 2022

9. **Tight Guarantees for Static Threshold Policies in the Prophet Secretary Problem** with Nick Arnosti

   Economics and Computation (EC), 2022

10. **When is Assortment Optimization Optimal?**

    Economics and Computation (EC), 2022

11. **Group-level Fairness Maximization in Online Bipartite Matching** with Pan Xu, Yifan Xu

    Autonomous Agents and Multi-Agent Systems (AAMAS), 2022

12. **Tight Guarantees for Multi-unit Prophet Inequalities and Online Stochastic Knapsack** with Jiashuo Jiang, Jiawei Zhang

    Symposium on Discrete Algorithms (SODA), 2022

13. **Fairness Maximization among Offline Agents in Online-Matching Markets** with Pan Xu, Yifan Xu

    Web and Internet Economics (WINE), 2021

14. **Improved Guarantees for Offline Stochastic Matching via new Ordered Contention Resolution Schemes** with Brian Brubach, Nathaniel Grammel, Aravind Srinivasan

    Neural Information Processing Systems (NeurIPS), 2021

15. **Follow Your Star: New Frameworks for Online Stochastic Matching with Known and Unknown Patience** with Brian Brubach, Nathaniel Grammel, Aravind Srinivasan

    Artificial Intelligence and Statistics (AISTATS), 2021

16. **Reaping the Benefits of Bundling under High Production Costs** with David Simchi-Levi

    Artificial Intelligence and Statistics (AISTATS), 2021

17. **Revenue-Optimal Deterministic Auctions for Multiple Buyers with Ordinal Preferences over Fixed-Price Items**

    Web and Internet Economics (WINE), 2020

18. **The Convex Relaxation Barrier, Revisited: Tightened Single-Neuron Relaxations for Neural Network Verification** with Christian Tjandraatmadja, Ross Anderson, Joey Huchette, Krunal Patel, Juan Pablo Vielma

    Neural Information Processing Systems (NeurIPS), 2020

19. **Distributionally Robust Max Flows** with Louis Chen, Jim Orlin, David Simchi-Levi

    Symposium on Simplicity in Algorithms (SOSA), 2020

20. **Tight Weight-dependent Competitive Ratios for Online Edge-weighted Bipartite Matching and Beyond** with David Simchi-Levi

    Economics and Computation (EC), 2019

21. **Improvements and Generalizations of Stochastic Knapsack and Markovian Bandits Approximation Algorithms**

    Symposium on Discrete Algorithms (SODA), 2014

22. **A Geometric Approach to Combinatorial Fixed-point Theorems** with Elyot Grant

    European Conference on Combinatorics, Graph Theory and Applications (EUROCOMB), 2013

23. **The Approximability and Integrality Gap of Interval Stabbing and Independence Problems** with Shalev Ben-David, Elyot Grant, Malcolm Sharpe

    Canadian Conference on Computational Geometry (CCCG), 2012

Cases

1. **Ventilator Rationing during the Covid-19 Pandemic**

   Columbia CaseWorks

   *Finalist, Informs Case Competition, 2020

Grants

Columbia Center of AI Technology (CAIT) in collaboration with *Amazon*, "**Joint Selection and Inventory Optimization under Limited Capacity**", joint with Huseyin Topaloglu
Amount: $150,000; Duration: January 2022–June 2023

Teaching

Spring 2021, 2023 — **Columbia B9136 (PhD, Topics in Revenue and Supply Chain Management)**
Instructor

Spring 2020, 2021, 2022, 2023 — **Columbia B8108/B8109 (MBA, Supply Chain Management)**
Instructor

Spring 2017 — **MIT 15.762/15.763 (Supply Chain Management)**
Co-instructor

January 2012, 2013, 2016 — **MIT 15.S50 (Special Seminar in Management)**
Instructor and Course Designer

This is a course I designed based on my experience as a former professional poker player. It consists of eight 90-minute lectures and two problem sets, which grant a 1/4-credit at MIT. I use the game of poker to illustrate concepts in probability and statistics, and more generally, as a framework within which to think about difficult decisions, uncertainty, risk, and a good outcome vs. a good decision. This has now become a yearly course at MIT, and has been placed onto MIT OpenCourseWare. Furthermore, I have been invited to give the introductory lecture from this course, "The Joy of Making Good Decisions", at various venues, including *Google New York*, *Riot Games*, the *MIT Entrepreneurship Center*, and for the *MIT Master of Finance* program.

Academic Mentorship

Current students: Omar Mouchtaki (Columbia DRO; co-advised with Omar Besbes), Boris Epstein (Columbia DRO), Wenxin Zhang (Columbia DRO; co-advised with Santiago Balseiro), Yaqi Xie (Chicago Booth; co-advised with Linwei Xin)

Other student collaborators: Billy Jin (Cornell ORIE), Nathaniel Grammel (Maryland CS), Mohammad Aminian (Chicago Booth)

Former students: Jiashuo Jiang (NYU Stern Ph.D. 2022; co-advised with Jiawei Zhang)

Thesis committee member: Xingyu Zhang (Columbia IEOR Ph.D. 2021), Oussama Hanguir (Columbia IEOR Ph.D. 2022), Judy Gan (Columbia DRO Ph.D. 2023), Noemie Perivier (Columbia IEOR Ph.D. 2023), Harsh Sheth (Columbia IEOR Ph.D. 2023)

Other Professional Activities

Associate Editor for journals: Management Science

Program Committee for conferences: WINE 2023 (Senior PC), EC 2023, WINE 2022, EC 2022, WINE 2021, EC 2021

Reviewer for journals: Mathematics of Operations Research, Naval Research Logistics, Operations Research, Production and Operations Management, Management Science, Algorithmica, SIAM Journal on Discrete Mathematics, Manufacturing & Service Operations Management, INFORMS Journal on Computing, ACM Transactions on Economics and Computation, Transportation Science, SIAM Journal on Computing

Reviewer for conferences: STOC 2024, SODA 2024, NeurIPS 2023, ESA 2023, STOC 2023, IPCO 2023, ITCS 2022, NeurIPS 2022, ESA 2022, SODA 2021, SODA 2020, SODA 2018

Co-chair for Revenue Management & Pricing (RMP) Cluster at INFORMS Annual Meeting, 2022

Co-organizer of IEOR-DRO seminar series at Columbia, 2021 –

Organizer of DSL seminar series at MIT, 2016 – 2018

Visiting Scholar, hosted by Prof. Chung-Piaw Teo of the Department of Analytics & Operations in NUS Business School, January 2017

Co-supervisor (with David Simchi-Levi) of Arjun Khandelwal through the MIT Undergraduate Research Opportunities Program (UROP), working on "Predicting User Choice in Video Games"

Invited Talks

2023 Cornell ORIE seminar series; Cornell Johnson, OTIM seminar

2022 Columbia DRO Brown Bag seminar; Tiger Analytics academic seminar; Simons Institute weekly seminar for Data-driven Decision Processes program; Berkeley IEOR weekly seminar; 3rd Workshop on Information and Learning, IESE Barcelona; MIT Operations Research seminar series; UIUC ISE weekly seminar

2021 University of Maryland, Theory CS group CATS seminar; HKUST Business School, ISOM seminar; 2nd Workshop on Information and Learning, virtual; NYU Stern, OM seminar; Stanford Business School, OIT seminar

2020 CBS PFS No Free Lunch seminar; UMD Smith; USC Marshall

2019 NJIT Tuchman; Cornell Tech; DSL seminar, MIT; 1st Workshop on Information and Learning, IESE Barcelona; Core Data Science, Facebook Research; Algorithms Seminar, Google Research NYC

2018 Duke Fuqua, Operations Management; Columbia IEOR-DRO seminar; Harvard Kennedy School, Quantitative Analysis; WUSTL Olin, Operations and Manufacturing Management; Georgia Tech ISyE; CMU Tepper, Operations Research; UW Foster, Operations Management; UCLA Anderson, Decisions, Operations, and Technology Management; Chicago Booth, Operations Management

2017 UVA Darden, Quantitative Analysis; INSEAD, Technology and Operations Management; Northwestern Kellogg, Operations Management; Dartmouth Tuck, Operations and Management Science; MIT Sloan, Operations Management seminar; Stanford Market Innovation Workshop; Princeton ORFE; NYU Stern, Operations Management seminar; NUS Business School, Analytics & Operations seminar; SUTD Engineering Systems and Design seminar

2016 Cornell ORIE Ph.D. Student Workshop

Outside Activities

Columbia Business School requires faculty members to disclose any activities that might present a real or apparent conflict of interest. I currently have no outside activities fitting this description.