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Will Ma

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Employment

Columbia University, New York, NY
2024 – *Roderick H. Cushman Associate Professor of Business*
2023 – 2024 *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. **Optimizing for Strategy Diversity in the Design of Video Games** with Oussama Hanguir, Jiangze Han, Christopher Thomas Ryan
   Math Programming, 2024
2. **On (Random-order) Online Contention Resolution Schemes for the Matching Polytope of (Bipartite) Graphs** with Calum MacRury, Nathaniel Grammel
   Operations Research, forthcoming
3. **Order Selection Problems in Hiring Pipelines** with Boris Epstein
   Operations Research, articles in advance

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

   Operations Research, articles in advance

   *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

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

   Operations Research, articles in advance

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

   Mathematics of Operations Research, 2024

   *covered in Chicago Booth Review, 2018

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

   Operations Research, 2023

8. **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

9. **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

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

    ACM Transactions on Economics and Computation (TEAC), 2023

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

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

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

    Operations Research (Technical Note), 2022

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

    Operations Research, 2022

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

    Management Science, 2022

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

    Management Science, 2021

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

    Operations Research, 2021

17. **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

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

    Operations Research Letters, 2020

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

    Math Programming, 2020

20. **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

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

    Graphs and Combinatorics, 2009

Working Papers

1. **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

2. **VC Theory for Inventory Policies** with Yaqi Xie, Linwei Xin

   *selected for presentation in the MSOM Supply Chain Management SIG, 2024

3. **Online Matching and Contention Resolution for Edge Arrivals with Vanishing Probabilities** with Calum MacRury, Pranav Nuti

4. **Sample Complexity of Posted Pricing for a Single Item** with Billy Jin, Thomas Kesselheim, Sahil Singla

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

   Major Revision in *Management Science*

6. **Leveraging the degree of Dynamic Substitution in Assortment and Inventory Planning** with Jingwei Zhang, Huseyin Topaloglu

   Minor Revision in *Operations Research*

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

   R & R in *Management Science*

8. **Online Contention Resolution Schemes for Network Revenue Management and Combinatorial Auctions** with Calum MacRury, Jingwei Zhang

9. **Optimizing Inventory Placement for a Downstream Online Matching Problem** with Boris Epstein

   Major Revision in *Manufacturing & Service Operations Management*

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

    Minor Revision in *Operations Research*

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

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

    R & R in *Management Science*

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

    Major Revision in *Operations Research*

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

    Major Revision in *Management Science*

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

    Minor Revision in *Mathematics of Operations Research*

16. **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

17. **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*

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

    Major Revision in *Management Science*

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

Conference Papers

1. **Online Matching and Contention Resolution for Edge Arrivals with Vanishing Probabilities** with Calum MacRury, Pranav Nuti

   Economics and Computation (EC), 2024

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

   Symposium on Theory of Computing (STOC), 2024

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

   Economics and Computation (EC), 2023

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

   Economics and Computation (EC), 2023

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

   Economics and Computation (EC), 2023

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

   Integer Programming and Combinatorial Optimization (IPCO), 2023

7. **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

8. **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

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

   Neural Information Processing Systems (NeurIPS), 2022

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

    Neural Information Processing Systems (NeurIPS), 2022

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

    Economics and Computation (EC), 2022

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

    Economics and Computation (EC), 2022

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

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

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

    Symposium on Discrete Algorithms (SODA), 2022

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

    Web and Internet Economics (WINE), 2021

16. **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

17. **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

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

    Artificial Intelligence and Statistics (AISTATS), 2021

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

    Web and Internet Economics (WINE), 2020

20. **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

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

    Symposium on Simplicity in Algorithms (SOSA), 2020

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

    Economics and Computation (EC), 2019

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

    Symposium on Discrete Algorithms (SODA), 2014

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

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

25. **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

Columbia:

2025 Summer-half-block	B8120 Revenue Management (MBA)
2025 Summer-half-block	B8109 Supply Chain Management (MBA)
2025 Spring	B9136 Analysis of Algorithms in Operations Research (PhD)
2025 Spring-A	B8120 Revenue Management (MBA)
2024 Fall-A	B8109 Supply Chain Management (MBA)
2024 Summer-block	B8109 Revenue and Supply Chain Management (MBA)
2024 Spring	B8109 Supply Chain Management (MBA)
2023 Spring	B9136 Topics in Revenue and Supply Chain Management (PhD)
2023 Spring	B8109 Supply Chain Management (MBA)
2022 Spring	B8108 Supply Chain Management (MBA)
2021 Spring	B9136 Topics in Revenue and Supply Chain Management (PhD)
2021 Spring	B8108 Supply Chain Management (MBA)
2020 Spring	B8108 Supply Chain Management (MBA)

MIT:

2017 Spring	15.762/15.763 Supply Chain Management, co-instructor
2016 Winter	15.S50 Special Seminar in Management
2013 Winter	15.S50 Special Seminar in Management
2012 Winter	15.S50 Special Seminar in Management

Special Seminar in Management: 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 the *MIT Master of Finance* program.

Academic Mentorship

Current students: Boris Epstein (Columbia DRO), Wenxin Zhang (Columbia DRO; co-advised with Santiago Balseiro), Yaqi Xie (Chicago Booth; co-advised with Linwei Xin) Matias Romero (Chicago Booth; co-advised with Hongyao Ma)

Former students: Omar Mouchtaki (Columbia DRO; co-advised with Omar Besbes), Jiashuo Jiang (NYU Stern Ph.D. 2022; co-advised with Jiawei Zhang)

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

Current postdocs: Calum MacRury, Andreas Maggiori (co-mentored with Eric Balkanski)

Former postdocs: Jingwei Zhang (co-mentored with Huseyin Topaloglu)

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), Shawn Xia (Columbia DRO, Ph.D. 2024), Hao-Ting Wei (Columbia IEOR, Ph.D. 2024)

Other Professional Activities

Associate Editor for journals: Management Science

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

Program Committee for conferences: EC 2024 (Senior PC), WINE 2023 (Senior PC), EC 2023, WINE 2022, EC 2022, WINE 2021, EC 2021

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

2024 Tsinghua SEM, Management Science and Engineering seminar
CUHK, DOT-SEEM seminar
HKUST, joint IE/OM seminar
HKU, seminar jointly hosted by Business School's IIM and Department of Computer Science
Shanghai University of Finance and Economics, ITCS seminar
CUHK-Shenzhen, School of Data Science colloquium series
University of Tokyo, seminar for research group of Yasushi Kawase
Stanford University, RAIN (Research on Algorithms and Incentives in Networks) seminar
Banff workshop on Combinatorial Optimization for Online Platforms
Simons Institute reunion workshop for Data-driven Decision Processes program

2023 Online Algorithms & Online Rounding workshop at FOCS
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, Operations Management 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.