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# Will Ma

Decision, Risk, and Operations division  
Graduate School of Business, Columbia University  
3022 Broadway, Uris Hall 407  
New York, NY 10027

Phone: +1 617-938-9151  
Email: [wm2428@gsb.columbia.edu](mailto:wm2428@gsb.columbia.edu)

## Education

- 2015 – 2018 **Massachusetts Institute of Technology**, Cambridge, MA  
2010 – 2012 *Ph.D. in Operations Research*  
Dissertation: Dynamic, Data-driven Decision-making in Revenue Management  
Advisor: David Simchi-Levi
- 2006 – 2010 **University of Waterloo**, Waterloo, ON Canada  
*B.Math with honors in Pure Mathematics and Combinatorics/Optimization*

## Employment

- 2019 – **Columbia University**, New York, NY  
*Assistant Professor, Decision, Risk, and Operations division, Graduate School 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.

## Journal Articles

1. **Distributionally Robust Linear and Discrete Optimization with Marginals** with Louis Chen, Karthik Natarajan, David Simchi-Levi, Zhenzhen Yan  
*Operations Research*, Forthcoming
2. **Revenue-Optimal Deterministic Auctions for Multiple Buyers with Ordinal Preferences over Fixed-Price Items**  
*ACM Transactions on Economics and Computation (TEAC)*, Forthcoming
3. **Inventory Balancing with Online Learning** with Wang Chi Cheung, David Simchi-Levi, Xinshang Wang  
*Management Science*, Forthcoming

4. **Dynamic Pricing (and Assortment) under a Static Calendar** with David Simchi-Levi, Jinglong Zhao  
*Management Science*, 2021
5. **On Policies for Single-leg Revenue Management with Limited Demand Information** with David Simchi-Levi, Chung-Piaw Teo  
*Operations Research*, 2021
6. **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
7. **Separation between Second Price Auctions with Personalized Reserves and the Revenue Optimal Auction** with Balasubramanian Sivan  
*Operations Research Letters*, 2020
8. **Strong Mixed-Integer Programming Formulations for Trained Neural Networks** with Ross Anderson, Joey Huchette, Christian Tjandraatmadja, Juan Pablo Vielma  
*Math Programming*, 2020
9. **Improvements and Generalizations of Stochastic Knapsack and Markovian Bandits Approximation Algorithms**  
*Mathematics of Operations Research*, 2018  
\*Honorable Mention, INFORMS Optimization Society Student Paper Competition, 2017
10. **Packing and Covering Triangles in Planar Graphs** with Qing Cui, Penny Haxell  
*Graphs and Combinatorics*, 2009

## Under Revision/Review

1. **Bifurcating Constraints to Improve Approximation Ratios for Network Revenue Management with Reusable Resources** with Jackie Baek  
*Operations Research (Technical Note)*, Minor Revision
2. **When is Assortment Optimization Optimal?**  
*Management Science*, Major Revision  
\*2nd Place, Rothkopf Junior Researcher Paper Prize for Auctions and Market Design  
\*Selected for oral presentation in the MSOM Service SIG, 2021  
\*Selected for oral presentation in the Market Innovation Workshop, 2021  
\*Selected for oral presentation in the INFORMS Market Design Workshop at EC, 2021
3. **Tight Guarantees for Static Threshold Policies in the Prophet Secretary Problem** with Nick Arnosti  
*Operations Research*, Major Revision
4. **Follow Your Star: New Frameworks for Online Stochastic Matching with Known and Unknown Patience** with Brian Brubach, Nathaniel Grammel, Aravind Srinivasan  
*Operations Research*, Major Revision

5. **Assortment Planning for Recommendations at Checkout under Inventory Constraints** with Xi Chen, David Simchi-Levi, Linwei Xin  
*Mathematics of Operations Research*, Major Revision  
 \*Covered in Chicago Booth Review, 2018  
 \*1st Place, Chinese Scholars Association for Management Science and Engineering (CSAMSE) Best Paper Award sponsored by Columbia Business School, 2017  
 \*2nd Place, POMS Hong Kong Student Paper Competition, 2017
6. **Constructing Demand Curves from a Single Observation of Bundle Sales** with David Simchi-Levi  
*Operations Research (Technical Note)*, Major Revision  
 \*1st Place, INFORMS Data Mining Section Best Paper Competition—Applied Track, 2018
7. **Optimizing for Strategy Diversity in the Design of Video Games** with Oussama Hanguir, Christopher Thomas Ryan
8. **A Competitive Analysis of Online Knapsack Problems with Unit Density** with David Simchi-Levi, Jinglong Zhao  
 \*Honorable Mention, POMS Hong Kong Student Paper Competition, 2020 (student entrant: Jinglong Zhao)
9. **Multi-Stage and Multi-Customer Assortment Optimization With Inventory Constraints** with Elaheh Fata, David Simchi-Levi

## Refereed Conference Proceedings

1. **Group-level Fairness Maximization in Online Bipartite Matching** with Pan Xu, Yifan Xu  
 To appear in the Proceedings of the 21st International Conference on *Autonomous Agents and Multi-Agent Systems (AAMAS)*, 2022
2. **Tight Guarantees for Multi-unit Prophet Inequalities and Online Stochastic Knapsack** with Jiashuo Jiang, Jiawei Zhang  
 To appear in the Proceedings of the 33rd Annual ACM-SIAM *Symposium on Discrete Algorithms (SODA)*, 2022  
 \*Jiashuo Jiang was a Finalist for the Jeff McGill Student Paper Award for Revenue Management and Pricing
3. **Fairness Maximization among Offline Agents in Online-Matching Markets** with Pan Xu, Yifan Xu  
 Proceedings of the 17th Conference on *Web and Internet Economics (WINE)*, 2021
4. **Improved Guarantees for Offline Stochastic Matching via new Ordered Contention Resolution Schemes** with Brian Brubach, Nathaniel Grammel, Aravind Srinivasan  
 Proceedings of the 35th Conference on *Neural Information Processing Systems (NeurIPS)*, 2021
5. **Follow Your Star: New Frameworks for Online Stochastic Matching with Known and Unknown Patience** with Brian Brubach, Nathaniel Grammel, Aravind Srinivasan  
 Proceedings of the 24th International Conference on *Artificial Intelligence and Statistics (AISTATS)*, 2021

6. **Reaping the Benefits of Bundling under High Production Costs** with David Simchi-Levi  
Proceedings of the 24th International Conference on *Artificial Intelligence and Statistics (AISTATS)*, 2021
7. **Revenue-Optimal Deterministic Auctions for Multiple Buyers with Ordinal Preferences over Fixed-Price Items**  
Proceedings of the 16th Conference on *Web and Internet Economics (WINE)*, 2020
8. **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  
Proceedings of the 34th Conference on *Neural Information Processing Systems (NeurIPS)*, 2020
9. **Distributionally Robust Max Flows** with Louis Chen, Jim Orlin, David Simchi-Levi  
Proceedings of the 3rd ACM-SIAM *Symposium on Simplicity in Algorithms (SOSA)*, 2020
10. **Prophet Inequalities on the Intersection of a Matroid and a Graph** with Jackie Baek  
Proceedings of the 12th *Symposium on Algorithmic Game Theory (SAGT)*, 2019
11. **Tight Weight-dependent Competitive Ratios for Online Edge-weighted Bipartite Matching and Beyond** with David Simchi-Levi  
Proceedings of the 20th ACM conference on *Economics and Computation (EC)*, 2019
12. **Improvements and Generalizations of Stochastic Knapsack and Multi-armed Bandit Approximation Algorithms**  
Proceedings of the 25th Annual ACM-SIAM *Symposium on Discrete Algorithms (SODA)*, 2014
13. **A Geometric Approach to Combinatorial Fixed-point Theorems** with Elyot Grant  
Proceedings of the 7th *European Conference on Combinatorics, Graph Theory and Applications (EU-ROCOMB)*, 2013
14. **The Approximability and Integrality Gap of Interval Stabbing and Independence Problems** with Shalev Ben-David, Elyot Grant, Malcolm Sharpe  
Proceedings of the 24th *Canadian Conference on Computational Geometry (CCCG)*, 2012

## Cases

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

published by *Columbia CaseWorks*

\*Finalist, Informs Case Competition, 2020

## Teaching

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

Spring 2020,  
2021              **Columbia B8108 (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.

## Other Professional Activities

Program committee: EC 2021, EC 2021 Workshop on Operations of People-centric Systems, WINE 2021

Reviewer for: Mathematics of Operations Research, Naval Research Logistics, Operations Research, Production and Operations Management, Management Science, Algorithmica, SIAM Journal on Discrete Mathematics, ACM-SIAM Symposium on Discrete Algorithms (SODA) 2018, SODA 2020, Manufacturing & Service Operations Management (MSOM), MSOM Service SIG 2020, SODA 2021, MSOM Supply Chain SIG 2021, INFORMS Journal on Computing, Theory of Computing Systems

Coordinator of DSL seminar series at MIT, September 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”

## Grants Received

*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–December 2022

## Invited Talks

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