

Daniel R. Jiang

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Professional Experience

Facebook, Menlo Park, California.

Research Scientist, Facebook Core Data Science, Jan. 2019 – Present.

University of Pittsburgh, Pittsburgh, Pennsylvania.

Assistant Professor (currently on leave), Department of Industrial Engineering, Sept. 2016 – Present.

Joint appointment, Graduate School of Public and International Affairs, Sept. 2017 – Present.

My research interests in are (1) *approximate dynamic programming & reinforcement learning*; (2) *Bayesian optimization*; (3) *sequential decision making under uncertainty*; (4) *applications in operations research (e.g., energy, public health, sharing economy) and machine learning*.

Education

Ph.D. Operations Research & Financial Engineering, *Princeton University*, 2016.

Thesis: “Risk-Neutral and Risk-Averse Approximate Dynamic Programming Methods.”

Advisor: Warren B. Powell

M.A. Operations Research & Financial Engineering, *Princeton University*, 2013.

B.S. Computer Engineering, *With Highest Distinction*, *Purdue University*, 2011.

B.S. Mathematics, *With Highest Distinction*, *Purdue University*, 2011.

Research

Working Papers

1. Ibrahim El-Shar, Daniel R. Jiang. “Spatial Dynamic Pricing and Prioritization for Shared-Transport Systems.” Working paper, 2021.
2. Yijia Wang, Jeff Kharoufeh, Daniel R. Jiang. “Approximate Value Iteration for Fast-Slow Markov Decision Processes.” Working paper, 2021. *Draft available upon request*.
3. Raul Astudillo, Daniel R. Jiang, Max Balandat, Peter I. Frazier, Eytan Bakshy. “Multi-Step Budgeted Bayesian Optimization with Unknown Costs.” Submitted, 2021. *Draft available upon request*.
4. Yijia Wang, Matthias Poloczek, Daniel R. Jiang. “Subgoal-based Exploration via Bayesian Optimization.” Submitted, 2021. *Draft available upon request*.

Preliminary version presented at ICLR 2019 Task Agnostic Reinforcement Learning Workshop.
5. Yijia Wang and Daniel R. Jiang. “Structured Actor-Critic for Managing Public Health Points-of-Dispensing.” Submitted, 2021. *Preprint: arXiv:1806.02490*.
6. Daniel R. Jiang and Warren B. Powell. “Practicality of Nested Risk Measures for Dynamic Electric Vehicle Charging.” Major revision at **M&SOM**. *Preprint: arXiv:1605.02848*.

Peer-Reviewed Publications (†alphabetical, *joint)

7. Saif Benjafaar†, Daniel R. Jiang†, Xiang Li†, Xiaobo Li†. “Dynamic Inventory Repositioning in On-Demand Rental Networks.” **Management Science** (forthcoming), 2021.

8. Shali Jiang*, Daniel R. Jiang*, Max Balandat*, Brian Karrer, Jake Gardner, Roman Garnett. "Efficient Non-myopic Bayesian Optimization via One-Shot Multi-Step Trees." *Advances in Neural Information Processing Systems*, **NeurIPS 2020**.
9. Max Balandat, Brian Karrer, Daniel R. Jiang, Sam Daulton, Ben Letham, Andrew G. Wilson, Eytan Bakshy. "BoTorch: A Framework for Efficient Monte-Carlo Bayesian Optimization." *Advances in Neural Information Processing Systems*, **NeurIPS 2020**.
10. Ibrahim El-Shar and Daniel R. Jiang. "Lookahead-Bounded Q-Learning." *International Conference on Machine Learning*, **ICML 2020**.
11. Daniel R. Jiang, Lina Al-Kanj, Warren B. Powell. "Optimistic Monte Carlo Tree Search with Sampled Information Relaxation Dual Bounds." **Operations Research**, 68(6), pp. 1678-1697, 2020.
12. Daniel R. Jiang, Emmanuel Ekwedike, Han Liu. "Feedback-Based Tree Search for Reinforcement Learning," *International Conference on Machine Learning*, **ICML 2018** (selected for *long talk*; 8.6% acceptance).
13. Daniel R. Jiang and Warren B. Powell. "Risk-Averse Approximate Dynamic Programming with Quantile-Based Risk Measures," **Mathematics of Operations Research**, 43(2), pp. 554-579, 2018.
Math. of OR Editor's Pick for INFORMS ICYMI in December 2017.
14. Andrew L. Johnson and Daniel R. Jiang. "Shape Constraints in Economics and Operations Research," **Statistical Science**, 33(4), pp. 527-546, 2018.
15. Daniel R. Jiang and Warren B. Powell. "An Approximate Dynamic Programming Algorithm for Monotone Value Functions," **Operations Research**, 63(6), pp. 1489-1511, 2015.
16. Daniel R. Jiang and Warren B. Powell. "Optimal Hour-Ahead Bidding in the Real-Time Electricity Market with Battery Storage using Approximate Dynamic Programming," **INFORMS Journal on Computing**, 27(3), pp. 525-543, 2015.

Workshops, Posters, & Abstracts

17. Daniel R. Jiang[†], Haipeng Luo[†], Chu Wang[†], Yingfei Wang[†]. "Multi-Armed Bandits and Reinforcement Learning: Advancing Decision Making in E-Commerce and Beyond." Workshop proposal at **KDD 2021**.
18. Yijia Wang, Brian Bell, Matthias Poloczek, Daniel R. Jiang. "Exploration via Sample-Efficient Subgoal Design." *Task Agnostic Reinforcement Learning Workshop* at **ICLR 2019**.
19. Yijia Wang, Daniel R. Jiang. "Hierarchical Reinforcement Learning for Naloxone Procurement and Distribution," *Women in Machine Learning Workshop*, **WiML 2017**.
20. Daniel R. Jiang, Thuy V. Pham, Warren B. Powell, Daniel F. Salas, Warren R. Scott. "A Comparison of Approximate Dynamic Programming Techniques on Benchmark Energy Storage Problems: Does Anything Work?" *IEEE Symposium on Adaptive Dynamic Programming and Reinforcement Learning*, **ADPRL 2014**.

Recent Awards & Honors

1. National Science Foundation ECCS Award 1807536, \$350,892. 2018-2022.
"Dynamic Risk-Averse Optimization of Distributed Energy Resource Aggregators" (co-PI Jeff Kharoufeh).
2. Tencent AI Lab Faculty Award, \$50,000. 2017-2018.
"Advanced Reinforcement Learning Methods for Gameplay AI."
3. Central Research Development Fund, University of Pittsburgh, \$16,000. 2017-2019.
"Naloxone Procurement and Distribution in the Presence of High Drug Prices."

4. Pittsburgh Supercomputing Center Grant, 2017-2018.
5. Wu Prize for Excellence (Sir Gordon Y.S. Wu '58), Princeton University, 2015.

The Wu Prize for Excellence is awarded to upper year graduate students who have performed at the highest level as scholars and researchers.

Service

Co-organizer of KDD Workshop “MAB and RL: Advancing Decision Making in E-Commerce and Beyond”, August 15, 2021; see (17):

Excerpt from workshop proposal: *The areas of reinforcement learning and multi-armed bandits have recently seen significant innovation, while many application domains, such as e-commerce, are full of problems and challenges to which vanilla RL or MAB methods cannot directly apply. This workshop aims at filling this communication gap by creating a platform for researchers and practitioners from both the method/theory side and application side of the community.*

More information: <https://sites.google.com/view/marble-kdd>.

Co-organizer of Facebook Adaptive Experimentation Workshop, February 13, 2020:

The goal for this workshop is to think about how to integrate the insights around these fields, and to think about how they can be used productively in industry. We are hosting this workshop to bring together distinguished academics and industry researchers to discuss the present and future for a research agenda around better decision-making through adaptive experimentation.

More information: <https://aeworkshop.splashthat.com/>.

Reviewer for

Journals: *Operations Research, Management Science, IEEE Transactions on Automatic Control, Manufacturing & Service Operations Management, SIAM Journal on Optimization, Annals of Operations Research, INFORMS Journal on Computing, Transportation Science, European Journal of Operational Research, IEEE Transactions on Smart Grid, IEEE Transactions on Power Systems, IJSE Transactions, Production and Operations Management*, and others.

Conferences/Workshops: *ICLR (International Conference on Learning Representations) 2022, NeurIPS (Neural Information Processing Systems) 2021, ML and the Physical Sciences Workshop (NeurIPS 2019)*.

Associate Editor, *Operations Research Letters*, February 2018–April 2021.

Mentor, Women in Machine Learning (WiML) Workshop at NeurIPS 2017.

Mentoring Experience

Internship Mentor

Raul Astudillo, Cornell University, 2020-2021.

Ph.D. Student Supervision

Yijia Wang, Ph.D. Student, University of Pittsburgh, 2016-Present.

Ibrahim Elshar, Ph.D. Student (co-advised), University of Pittsburgh, 2017-Present.

Dissertation Committee or Reader

Seyed-Danial Mohseni-Taheri (committee), University of Illinois Chicago, 2021.

Joe Durante (reader), Princeton University, 2020.

Emmanuel Ekwedike (reader), Princeton University, 2020.

Liang Xu (committee), University of Pittsburgh, 2019.
David Abdul-Malak (committee), University of Pittsburgh, 2018.
Felipe Hernandez Cruz (committee), University of Pittsburgh, 2018.
Arnab Bhattacharya (committee), University of Pittsburgh, 2017.
Onur Tavaslioglu (committee), University of Pittsburgh, 2017.
Bolong Cheng (reader), Princeton University, 2017.

Undergraduate Mentoring

Mackenzie Cavanaugh, Trevor Dycio, Carolyn Pontari, Julie Shields, University of Pittsburgh, Fall 2018.
IE Senior Design: "Optimizing the Production of Meds2Home Prescriptions for Grane Rx Pharmacy."
First Place IE Project, Swanson School of Engineering Design EXPO.
Nick Kelly, Undergraduate Intern, University of Pittsburgh, Fall 2018.
Mohamed Kashkoush, Undergraduate Intern, University of Pittsburgh, 2017-2018.

Teaching Experience

@ University of Pittsburgh

Decision Models (newly developed), IE 1086/2086, Fall 2016–
Advanced undergraduate/master's level; data-driven decision making under uncertainty with a broad set of applications in energy, inventory, revenue management, healthcare, and finance.
Approximate Dynamic Programming (newly developed), IE 3186, Spring 2017, Fall 2018.
Ph.D. level; fundamental theory of approximate dynamic programming/reinforcement learning.
Reinforcement Learning (newly developed), IE 2186, Summer 2018.
Master's level; covers policy evaluation, control, and applications of reinforcement learning.
Innovate: Global Issues in Engineering and Business, March 2017, 2018 (one-week abroad portion only).
Undergraduate level; led by Prof. Jayant Rajgopal & covers global engineering issues (e.g., supply chain) in China. The week-long study abroad portion visits Beijing, Suzhou, and Shanghai, China.

@ Princeton University

Probability and Stochastic Systems, ORF 309, Fall 2015.
Assistant in Instruction for Ramon van Handel; junior level course on probability with weekly precepts.
Senior Thesis Writing Group Leader, ORFE Department, 2013–2016.
Mentoring group for undergraduate seniors working on their senior theses.
Operations and Information Engineering, ORF 411, Fall 2013, 2014.
Assistant in Instruction for Warren B. Powell; senior level course on decision-making in OR.
Optimal Learning, ORF 418, Spring 2013.
Assistant in Instruction for Warren B. Powell; senior level course on sequential information collection.

Seminars & Presentations

Decision Sciences Seminar, Duke Fuqua, April 2022.

INFORMS Annual Conference, Anaheim, CA, October 2021.
Industrial Engineering Seminar, University of Pittsburgh, Virtual, April 2021.
Operations Management Seminar, Singapore Management University, Virtual, April 2021.
Institute of OR and Analytics Seminar, National University of Singapore, Virtual, December 2020.
Pitt SWE Code Day (for middle schoolers), Pittsburgh, PA, November 2020.
Industrial and Systems Engineering Seminar, University of Tennessee, Knoxville, TN, March 2020.
INFORMS Annual Conference, Seattle, WA, October 2019.
Information and Decision Sciences Seminar, University of Illinois at Chicago, Chicago, IL, September 2019.
INFORMS Annual Conference, Phoenix, AZ, November 2018.
ICML Conference, Stockholm, Sweden, July 2018.
POMS Annual Conference, Houston, TX, May 2018.
Systems and Industrial Engineering Seminar, University of Arizona, Tucson, AZ, April 2018.
INFORMS Optimization Society Conference, Denver, CO, March 2018.
INFORMS Annual Conference, Houston, TX, October 2017.
IFORS Conference, Quebec City, Canada, June 2017.
Commodity and Energy Markets Annual Meeting, Oxford, UK, June 2017 (Peer-reviewed).
IISE Annual Conference, Pittsburgh, PA, May 2017.
POMS Annual Conference, Seattle, WA, May 2017.
INFORMS Computing Society Conference, Austin, TX, January 2017.
INFORMS Annual Meeting, Nashville, TN, November 2016.
4th International Conference on Computational Sustainability, Cornell University, July 2016
ICSP Conference, Búzios, Brazil, June 2016
Industrial Engineering Seminar, University of Pittsburgh, Pittsburgh, PA, January 2016.
Tepper School of Business Seminar, Carnegie Mellon University, Pittsburgh, PA, January 2016.
INFORMS Annual Meeting, Philadelphia, PA, November 2015.
MOPTA Conference, Lehigh University, July 2015.
ISMP Conference, Pittsburgh, PA, July 2015.
INFORMS Computing Society Conference, Richmond, VA, January 2015.
INFORMS Annual Meeting, San Francisco, CA, November 2014.
MOPTA Conference, Lehigh University, August 2014.
9th French Meeting on Planning, Decision Making, and Learning, University of Liège, May 2014.
INFORMS Annual Meeting, Minneapolis, MN, October 2013.

Professional Activities

Industrial Mathematics Workshop and Clinic, IMA at University of Minnesota, July-Aug 2017.
IISE New Faculty Colloquium, Pittsburgh, PA, May 2017.
INFORMS New Faculty Colloquium, Nashville, TN, November 2016.
Member, INFORMS (Institute for Operations Research and the Management Sciences), 2013–Present.
Member, MOS (Mathematical Optimization Society), 2015–Present.

Member, IEEE (Institute of Electrical and Electronics Engineers), 2014–Present.

Other Awards & Honors

First Year Fellowship, Princeton University, 2011–2012.

Eta Kappa Nu Outstanding Junior in Electrical Engineering Award, Purdue University, Fall 2009.

Awarded to 1 out of approximately 200 undergraduate ECE students.

First Place, Purdue Mathematics Department Problem of the Week Competition, Spring 2008.

MathCounts Scholarship (full tuition, room, and board), Purdue University, 2007–2011.

Indiana Resident Top Scholar (full tuition, room, and board), Purdue University, 2007–2011.

National Merit and Academic Success Scholarships, Purdue University, 2007–2011.

Valedictorian, West Lafayette High School, May 2007.

Qualifier, USA Mathematical Olympiad (USAMO), April 2006.

Top 0.2% (approximately 400/200,000) of participating US high school students.

Patents

1. Warren B. Powell, Daniel R. Jiang. "Method for Bidding Battery Storage into Hour-Ahead Energy Markets," **U.S. Patent No. 9,965,802**, issued May 8, 2018.

Other Experience

Undergraduate Research Intern, Department of Computer Science, Stanford University, June 2010–August 2010. *Advised by Prof. Monica Lam.*

Developed an algorithm to use email & social networking data to generate hierarchical, graph-based representations of social affiliations to improve sharing granularity on social networks.

Engineering Intern, Boston Scientific, St. Paul, MN, May 2009–August 2009.

Research Intern, Envision Center for Data Perceptualization & Haptic Interface Research Laboratory, Purdue University, June 2007–August 2007. *Advised by Prof. Hong Tan.*

Miscellaneous

Articles on my research on using video games to study reinforcement learning algorithms, 2018.

"Pitt Researcher Uses Video Games to Unlock New Levels of A.I." (November 5, 2018)

"Swanson School professor using video games to test artificial intelligence." (December 12, 2018)

3 on 3 Intramural Basketball Champions, Princeton University Dillon Intramural Sports, Fall 2013.

Outstanding Quantitative Analysis Award, Princeton University Case Competition, Fall 2013.

Presented a strategy for the deployment of Google's Project Loon.

Co-creator of social media webapp *What Would I Say?*, Hack Princeton 2013, November 2013.

17 million pageviews, 9 million unique visitors, winner of "Best Facebook Integrated Hack," and the subject of articles in The New Yorker, CNN, The Telegraph, and Time.

Executive Board, Princeton Graduate Engineering Council, 2013–15.

Most Viral Video Award for *Charged*, Princeton University Science Action Competition, May 2013.

Co-written, directed, shot, edited with Omer Malik, Harvey Cheng, Matt Chang, Yasmin Afsar.

Personal

Citizenship: USA

Place of Birth: West Lafayette, IN