Sean R. Sinclair

CONTACT

Northwestern University
Industrial Engineering & Management Sciences
Technological Institute 2145 Sheridan Road, Room D237, Evanston, IL 60208

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RESEARCH INTERESTS

Machine learning algorithms for data-driven sequential decision-making in the framework of reinforcement learning, with applications to societal systems and operations management

ACADEMIC POSITIONS

Northwestern University — *Evanston, IL*
Assistant Professor — *August 2024 -*
Industrial Engineering and Management Science

Massachusetts Institute of Technology — *Cambridge, MA*
Postdoctoral Associate — *July 2023 - July 2024*
Laboratory for Information and Decision Sciences
- Faculty Mentors: Devavrat Shah and Ali Jadbabaie

EDUCATION

Cornell University — *Ithaca, NY*
Ph.D. in Operations Research and Information Engineering — *May 2023*
M.S. in Operations Research and Information Engineering — *May 2021*
- PhD Advisors: Christina Lee Yu and Siddhartha Banerjee
- Thesis: Adaptivity, Structure, and Objectives in Sequential Decision-Making

McGill University — *Montreal, QC*
B.S. in Honours Mathematics and Computer Science — *April 2015*

PUBLICATIONS

*(If entry prefaced by * then authors are ordered alphabetically.)*

The Data-Driven Censored Newsvendor Problem
* Chamsi Hssaine, Sean R. Sinclair
Under Review

Multi-Objective LQR with Linear Scalarization
* Ali Jadbabaie, Devavrat Shah, Sean R. Sinclair
Under Review

Exploiting Exogenous Structure for Sample-Efficient Reinforcement Learning
Jia Wan, Sean R. Sinclair, Devavrat Shah, Martin Wainwright
Under Review
- Presented at ICML Workshop on Aligning Reinforcement Learning Experimentalists and Theorists (2024)

Artificial Replay: A Meta-Algorithm for Harnessing Historical Data in Bandits
* Siddhartha Banerjee, Sean R. Sinclair, Milind Tambe, Lily Xu, Christina Lee Yu
Under Review

Online Fair Allocation of Perishable Resources
* Siddhartha Banerjee, Chamsi Hssaine, Sean R. Sinclair
Under Review
- **Runner-up for the 2024 INFORMS Service Science Best DEIJ Paper Competition**
- Presented at ACM SIGMETRICS (2023)
- Presented at EAAMO (2022)
- Presented at Simons Institute Data-Driven Decision Processes Program Workshop: Quantifying Uncertainty: Stochastic, Adversarial, and Beyond (2022)

Hindsight Learning for MDPs with Exogenous Inputs
Sean R. Sinclair, Felipe Frujeri, Ching-An Cheng, Luke Marshall, Hugo Barbalho, Jingling Li, Jennifer Neville, Ishai Menache, Adith Swaminathan
International Conference on Machine Learning (2023)

Adaptive Discretization in Online Reinforcement Learning
Sean R. Sinclair, Siddhartha Banerjee, Christina Lee Yu
Operations Research (2022)

Sequential Fair Allocation: Achieving the Optimal Envy-Efficiency Tradeoff Curve
Sean R. Sinclair, Gauri Jain, Siddhartha Banerjee, Christina Lee Yu
Operations Research (2022)
- **Finalist for the 2022 INFORMS Diversity, Equity, and Inclusion Best Student Paper Award**
- Presented at ACM FORC (2022)

ORSuite: Benchmarking Suite for Sequential Operations Models
* Christopher Archer, Siddhartha Banerjee, Mayleen Cortez, Carrie Rucker, Sean R. Sinclair, Max Solberg, Qiaomin Xie and Christina Lee Yu
ACM Sigmetrics Performance Evaluation Review (2021)
- Presented at ACM SIGMETRICS Reinforcement Learning for Networks and Queues (2021)

Sequential Fair Allocation of Limited Resources under Stochastic Demands
Sean R. Sinclair, Gauri Jain, Siddhartha Banerjee, Christina Lee Yu
Workshop Paper (2020)
- Presented at Harvard CRCS Workshop on AI for Social Good (2020)
- Presented at Mechanism Design for Social Good Workshop (2020)

Adaptive Discretization for Model-Based Reinforcement Learning
Sean R. Sinclair, Tianyu Wang, Gauri Jain, Siddhartha Banerjee, Christina Lee Yu
Advances in Neural Information Processing Systems (2020)
- Presented at ICML Workshop on Theoretical Foundations of Reinforcement Learning (2020)

Adaptive Discretization for Episodic Reinforcement Learning in Metric Spaces
Sean R. Sinclair, Siddhartha Banerjee, Christina Lee Yu
Proceedings of the ACM on Measurement and Analysis of Computing Systems (2019)
- Presented at ACM SIGMETRICS (2020)
- Presented at NeurIPS Workshop on Optimization in Reinforcement Learning (2019)

Normal and pathological dynamics of platelets in humans
Gabriel P. Langlois, Morgan Craig, Antony R. Humphries, Michael C. Mackey, Joseph M. Mahaffy, Jacques Bélair, Thibault Moulin, Sean R. Sinclair, Liangliang Wang
Journal of Mathematical Biology (2017)

Academic Presentations

Online Fair Allocation of Perishable Resources
- IDEAL Workshop: Foundations of Fairness and Accountability — *November 2024*
- TTIC Workshop — *August 2024*
- MIT Sloan School of Management — *February 2024*
- LIDS Student Conference — *January 2024*
- INFORMS Annual Meeting — *October 2023*

Hindsight Learning for MDPs with Exogenous Inputs
- International Symposium on Mathematical Programming — *July 2024*
- INFORMS Optimization Society — *March 2024*
- Université de Montréal — *February 2024*
- ICML *(Poster)* — *July 2023*

Online Reinforcement Learning and Regret
- Simons Institute, Data-Driven Decision Processes Bootcamp *August 2022*

Summer School: Reinforcement Learning for Operations
- Kellogg School of Management, Northwestern University *(Talks, Code Demos)* *August 2022*

Sequential Fair Allocation: Achieving the Optimal Envy-Efficiency Tradeoff Curve
- Northwestern University: Industrial Engineering and Management Science *February 2023*
- Dartmouth College: Tuck School of Business *January 2023*
- Johns Hopkins University: Cary Business School *January 2023*
- University of Chicago: Booth School of Business *January 2023*
- University of Toronto: Rotman School of Management *January 2023*
- University of Illinois, Chicago: Liautaud Business School *January 2023*
- Northwestern University: Kellogg School of Management *December 2022*
- École Polytechnique Fédérale de Lausanne: Management of Technology *December 2022*
- Frankfurt School of Finance & Management *December 2022*
- University of Michigan: Industrial and Operations Engineering *December 2022*
- University of Texas, Austin: McCombs School of Business *November 2022*
- University of Pennsylvania: Wharton School *November 2022*
- Cornell ORIE Young Researchers Workshop *October 2022*
- INFORMS Annual Meeting, DEI Best Student Paper Award Session *October 2022*
- Workshop on Algorithms for Learning and Economics *(Talk, Panel)* *June 2022*
- ACM SIGMETRICS *June 2022*
- University of Michigan Future Leaders Summit *April 2022*
- Devavrat Shah's Group Meeting at MIT *February 2022*
- Rigorous Systems Research Group at Caltech *January 2022*
- INFORMS Annual Meeting *October 2021*
- ICJAI Workshop on AI for Social Good *August 2021*
- EC Workshop on Operations of People-Centric Systems *(Talk, Poster)* *July 2021*
- Microsoft Research Reinforcement Learning Reading Group *June 2021*

ORSuite: Benchmarking Suite for Sequential Operations Models
- ACM SIGMETRICS Reinforcement Learning for Networks and Queues Workshop *June 2021*

Sequential Fair Allocation of Limited Resources under Stochastic Demands
- Mechanism Design for Social Good Workshop *(Poster)* *August 2020*
- Harvard CRCS AI for Social Good Workshop *July 2020*

Adaptive Discretization for Model-Based Reinforcement Learning
- Neural Information Processing System (NeurIPS) *(Poster)* *December 2020*
- ICML Theoretical Foundations of Reinforcement Learning Workshop *July 2020*

Adaptive Discretization for Episodic Reinforcement Learning in Metric Spaces
- ACM SIGMETRICS *July 2020*
- Jane Street Symposium *January 2020*
- NeurIPS Workshop on Optimization in Reinforcement Learning *December 2019*
- Cornell ORIE Young Researchers Workshop *October 2019*
- Cornell Operations Research Advances through Collaboration *October 2019*
- Cornell Celebration of Statistics and Data Science *(Poster)* *September 2019*

Teaching Experience

Teaching Assistant ORIE 6590: Approximate Dynamic Programming and Reinforcement Learning, *Spring 2021 - Cornell University*

Teaching Assistant ORIE 3300: Optimization, *Fall 2019 - Cornell University*

Teaching Assistant ORIE 1380: Data Science for All, *Spring 2019 - Cornell University*

Classroom Teacher Secondary School Mathematics Teacher with Peace Corps Ghana, *2015-2017 - Amankwakrom Junior High School*

Honours

Runner-up for the INFORMS Service Science Best DEIJ Paper Competition	*2024*
Best Presentation, LIDS Student Conference	*2024*
Honorable Mention, ACM Sigmetrics Dissertation Award	*2023*
Honorable Mention, George Dantzig Dissertation Award	*2023*
Cornell ORIE Young Researchers Workshop Selected Attendee	*2022*
Finalist for the INFORMS Diversity, Equity, and Inclusion Best Student Paper Award	*2022*
EAAMO Doctoral Consortium Selected Attendee	*2022*
FAccT Doctoral Consortium Selected Attendee	*2022*
Michigan Institute for Data Science Future Leaders Summit Selected Attendee	*2022*
Top Reviewer ICML	*2022*
Top Reviewer AISTATS	*2022*
Outstanding Reviewer Award NeurIPS	*2021*
Jane Street Symposium Selected Attendee	*2020*
Honourable Mention, National Science Foundation Graduate Research Fellowship	*2020*
Honourable Mention, Ford Predoctoral Fellowship	*2020*
First Year Fellowship, School of Operations Research, Cornell University	*2018*
First Class Honours, McGill University	*2015*
Dean's Honour List, McGill University	*2014 - 2015*
Student Undergraduate Research Award, McGill University	*2014*

Service

In Cornell:

- *Mentoring*: Graduate Student Mentor with Operations Research Graduate Association *(2019-2022)* and Office of Academic Diversity Initiatives *(2019-2022)*
- *Operations Research Graduate Association*: First Year Colloquium Organizer *(2018-2019)*, Secretary *(2019-2021)*, Co-President *(2021-2022)*, URM PhD Application Support Program Officer *(2022 - 2023)*

In Professional Organizations:

- *Application Support*: Queer in AI *(2020-2022)*
- *Conference Organization*: Local Organizer for Stochastic Networks Conference *(2022)*
- *Award Committee*: Public Sector Operations Research Best Paper Award *(2023)*

In Conferences:

- *Session Chair*: INFORMS Annual Meeting *(2021-)*
- *Technical Program Committee*: SIGMETRICS *(2025-)*
- *Referee*: EAAMO *(2022)*, AISTATS *(2019- 2022)*, NeurIPS *(2020-2022)*, ICLR *(2021-2022)*, ICML *(2021-2023)*, Harvard CRCS Workshop on AI for Social Good *(2020)*, Cornell University Mathematical Contest in Modeling *(2020)*, EC *(2023)*

In Journals:

- *Referee*: Transactions of Machine Learning Research *(2022-)*, Operations Research *(2021-)*, Management Science *(2022-)*, Manufacturing and Service Operations *(2023-)*, IEE Transactions on Information Theory *(2024-)*, Computers and Operations Research *(2022-)*

In Outreach

- MD4SG Advice for Applying to PhD Programs Social *(2022)*
- Undergraduate Research Night, Cornell Computing and Information Science *(2021)*

- STEM Preview Day, Cornell Diversity Programs in Engineering *(2020, 2021)*
- Graduate Student Mentoring Undergraduates Dinner, Office of Diversity Initiatives *(2019)*
- Leadership Camp for the Deaf, Peace Corps Ghana *(2017)*
- GLOW + BRO Camp Organizer, YPES Ghana *(2017)*
- Let Girls Learn Laboratory for Secondary School Education, Peace Corps *(2016)*
- STARS and GLOW Camp Organizer, Peace Corps Ghana *(2016)*

Industry Experience

Research Intern Microsoft Research Reinforcement Learning Group, *Summer 2021*

Financial Analyst National Life Group, *2017 - 2018*

Advising

◇ **Current Advisees**

Haiqing Gao
Jointly supervised with Seyed Iravani
Northwestern IEMS, 2022 -

◇ **Undergraduate and High-School Collaborators**

Yijia Dai, 2022, Cornell CS Undergraduate.

Juntao Ren, 2022, Cornell CS Undergraduate.

Logan Kraver, 2022, Cornell CS Undergraduate.

Dave Jung, 2022, Cornell CS Undergraduate.

David Wolfers, 2021, Cornell CS Undergraduate.

Jaoli Bowden, 2021, High School Student.

Christopher Archer, 2021, Cornell ORIE Undergraduate. Graduate Student at EECS, UC Berkeley

Carrie Rucker, 2021, ORIE Undergraduate. Business Analyst at Capital One

Max Solberg, 2021, Cornell CS Undergraduate. Technology Associate at Morgan Stanley

Shashank Pathak, 2021, Cornell ORIE MEng.

Gauri Jain, 2020, Cornell CS Undergraduate. Graduate Student at EECS, Harvard

Open Source Software

`ORSuite`: Collection of OpenAI Gym interfaces for studied models in the operations research community, implementation of domain-specific algorithms, and instrumentation for running experiments and comparing performance on multi-criteria objectives, https://github.com/cornell-orie/ORSuite