Sean R. Sinclair

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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 EMPLOYMENT

Assistant Professor, Industrial Engineering and Management Sciences 2024 - Present
Northwestern University

Postdoctoral Associate 2023 - 2024
Massachusetts Institute of Technology
Laboratory for Information and Decision Sciences, and Institute for Data, Systems, and Society
Mentors: Ali Jadbabaie and Devavrat Shah

EDUCATION

Cornell University 2018 - 2023
MS/PhD, Operations Research and Information Engineering
Thesis: *Adaptivity, Structure, and Objectives in Sequential Decision-Making*
Advisors: Christina Lee Yu and Sid Banerjee

McGill University 2012 - 2014
Honours BSc, Mathematics and Computer Science
Advisor: Tony Humphries

SELECTED AWARDS

- Northwestern Searle Fellow (2025)
- 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)
- Finalist for the INFORMS Diversity, Equity, and Inclusion Best Student Paper Award (2022)
- *Doctoral Consortium Selected Attendance*: Cornell ORIE Young Researchers Workshop (2022), EAAMO (2022), FAccT (2022), Michigan Institute for Data Science Future Leaders Summit (2022), Jane Street Symposium (2020)
- *Top Reviewer*: ICML (2022), AISTATS (2022), NeurIPS (2021)
- 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)

PUBLICATIONS

(If authors prefaced by ($\alpha - \beta$) then remaining authors are ordered alphabetically.)

Working Papers

8. "Network and Risk Analysis of Surety Bounds". ($\alpha - \beta$) Tamara Broderick, Ali Jadbabaie, Vanessa Lin, Manuel Quintero, Arnab Sarker, Sean R. Sinclair.

7. "Sequential Fair Allocation With Replenishments: A Little Envy Goes An Exponentially Long Way". Chido Onyeze, Sean R. Sinclair, Chamsi Hssaine, Sid Banerjee.
   - Presented at EC Workshop on New Directions in Social Choice (2025)
   - Presented at ACM SIGMETRICS (2025)

6. "Reinforcement Learning in MDPs with Information-Ordered Policies". Zhongjun Zhang, ($\alpha - \beta$) Shipra Agrawal, Ilan Lobel, Sean R. Sinclair, Christina Lee Yu.
   - **Finalist for the 2025 INFORMS George Nicholson Student Paper Competition**

5. "The Data-Driven Censored Newsvendor Problem". ($\alpha - \beta$) Chamsi Hssaine, Sean R. Sinclair.
   - Accepted to Durham Early Career Scholars Workshop (2025)

4. "Multi-Objective LQR with Linear Scalarization". ($\alpha - \beta$) Ali Jadbabaie, Devavrat Shah, Sean R. Sinclair

3. "Exploiting Exogenous Structure for Sample-Efficient Reinforcement Learning". Jia Wan, Sean R. Sinclair, Devavrat Shah, Martin Wainwright.
   - Presented at SIGMETRICS Workshop on Causal Inference (2025)
   - Presented at ICML Workshop on Aligning Reinforcement Learning Experimentalists and Theorists (2024)

2. "Artificial Replay: A Meta-Algorithm for Harnessing Historical Data in Bandits". ($\alpha - \beta$) Siddhartha Banerjee, Sean R. Sinclair, Milind Tambe, Lily Xu, Christina Lee Yu.

1. "Online Fair Allocation of Perishable Resources". ($\alpha - \beta$) Siddhartha Banerjee, Chamsi Hssaine, Sean R. Sinclair.
   - **Runner-up for the 2024 INFORMS Service Science Best DEIJ Paper Competition**
   - *Media*: Examining Algorithmic Fairness and Accountability
   - 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)

Journal Papers

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

3. "Sequential Fair Allocation: Achieving the Optimal Envy-Efficiency Tradeoff Curve" (2022). Sean R. Sinclair, Gauri Jain, Siddhartha Banerjee, Christina Lee Yu. *Operations Research*.
    - **Finalist for the 2022 INFORMS Diversity, Equity, and Inclusion Best Student Paper Award**
    - Presented at ACM FORC (2022)
2. "Adaptive Discretization for Episodic Reinforcement Learning in Metric Spaces" (2019). Sean R. Sinclair, Siddhartha Banerjee, Christina Lee Yu. *Proceedings of the ACM on Measurement and Analysis of Computing Systems*.
    - Presented at ACM SIGMETRICS (2020)
    - Presented at NeurIPS Workshop on Optimization in Reinforcement Learning (2019)
1. "Normal and pathological dynamics of platelets in humans" (2017). 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*.

Peer Reviewed Conference Proceedings

3. "Hindsight Learning for MDPs with Exogenous Inputs" (2023). 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*
2. "ORSuite: Benchmarking Suite for Sequential Operations Models" (2021). ($\alpha - \beta$) Christopher Archer, Siddhartha Banerjee, Mayleen Cortez, Carrie Rucker, Sean R. Sinclair, Max Solberg, Qiaomin Xie and Christina Lee Yu. *ACM Sigmetrics Performance Evaluation Review*.
    - Presented at ACM SIGMETRICS Reinforcement Learning for Networks and Queues (2021)
1. "Adaptive Discretization for Model-Based Reinforcement Learning" (2020). 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)

Workshop Papers

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

Theses

2. "Adaptivity, Structure, and Objectives in Sequential Decision-Making" (2023). Sean R. Sinclair. *PhD Disseration*, Cornell University.
    - Honorable Mention, ACM Sigmetrics Dissertation Award (2023)
    - Honorable Mention, George Dantzig Dissertation Award (2023)
1. "Numerical Methods for State-Dependent Distributed Delay Differential Equations" (2014). Sean R. Sinclair. *Honours Research Project*, McGill University.

INVITED TALKS & SELECTED PRESENTATIONS

The Data-Driven Censored Newsvendor Problem
- INFORMS Annual Meeting *October 2025*
- INFORMS Applied Probability Society Conference *July 2025*
- Durham Early Career Scholars Workshop *June 2025*
- INFORMS MSOM Conference *June 2025*

A Network Analysis of Surety Bonds
- Liberty Mutual *February 2025*

Reinforcement Learning in MDPs with Exogenous Inputs
- INFORMS Annual Meeting *October 2024*

Online Fair Allocation of Perishable Resources
- Allerton Conference *September 2025*
- IDEAL Workshop: Foundations of Fairness and Accountability *November 2024*
- INFORMS Annual Meeting *October 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
- NYU Stern PhD Seminar *October 2024*
- 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*
- IJCAI 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 Systems (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

Northwestern University (All as primary faculty and course designer)
- IEMS 488 (PhD). Economics and Decision Analysis Spring 2026
- IEMS 365 (Undergrad). Analytics for Social Good Winter 2025-2026, Spring 2026
- IEMS 408 (PhD). Decision Making in Dynamic Learning Environments Spring 2025

Cornell University (Teaching Assistant)
- ORIE 6590 (PhD). Approximate Dynamic Programming and Reinforcement Learning Spring 2021
- ORIE 3300 (Undergrad). Optimization Fall 2019
- ORIE 1380 (Undergrad). Data Science for All Spring 2019

Amankwakrom Junior High School (with Peace Corps Ghana)
- Secondary School Mathematics Teacher 2015 - 2017

ACADEMIC ADVISING

Current Advisees

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

Zhongjun Zhang
Northwestern IEMS, 2024 -

Thesis Committees

Nele Amiri, KU Leuven (2026 expected)
Dinglin Xia, Northwestern (2027 expected)
Jeffrey Wang, Northwestern (2026 expected)

Undergraduate and High-School Collaborators

Christopher Martin, 2024-2025, Cornell ORIE Undergraduate
Dawson Ren, 2023-2024, Northwestern IEMS Undergraduate
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
Carrie Rucker, 2021, ORIE Undergraduate
Max Solberg, 2021, Cornell CS Undergraduate
Shashank Pathak, 2021, Cornell ORIE MEng
Gauri Jain, 2020, Cornell CS Undergraduate

ACADEMIC SERVICE & OTHER ACTIVITIES

In Northwestern:
- *Research Project Advisor*: Client Project Challenge *(2025-)*

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-)*, INFORMS Applied Probability Conference *(2025-)*
- *Technical Program Committee*: SIGMETRICS *(2025-)*, SIGMETRICS Student Research Competition (SRC) *(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, Operations Research, Management Science, Manufacturing and Service Operations, Mathematics of Operations Research, IEEE Transactions on Information Theory, Computers and Operations Research *(2022-)*, Manufacturing and Service Operations SIG, Journal of Humanitarian Logistics and Supply Chain Management

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 & OTHER EXPERIENCE

Microsoft Research
Reinforcement Learning Group — Summer 2021

National Life Group
Financial Analyst — 2017 - 2018

Peace Corps Ghana
Secondary School Education Volunteer — 2015 - 2017
Let Girls Learn Literacy Coordinator — 2016 - 2017

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