

# Calder Morton-Ferguson

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Department of Mathematics  
Yale University

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## Education

### Massachusetts Institute of Technology

Ph.D., Mathematics. August 2019–May 2024. GPA: 5.0/5.0  
Advisor: Roman Bezrukavnikov

### University of Toronto

Honours Bachelor of Science, June 2019. GPA: 4.0/4.0  
Mathematics Specialist, Computer Science Minor

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## Employment

### Yale University

Gibbs Assistant Professor, since July 2025

### Stanford University

Szegő Assistant Professor, 2024–2025

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## Papers

9. (with P. Diaconis) *Markov chains on Weyl groups from the geometry of the flag variety*, under review. arXiv:2510.02285
8. (with P. Boixeda Alvarez) *Weight modules and gluing of sheaves on the flag variety*, under review. arXiv:2509.25156
7. (with R. Bezrukavnikov, M. Finkelberg, and D. Kazhdan) *Modular reduction of complex representations of finite reductive groups*. arXiv:2502.09605
6. (with R. Bezrukavnikov) *Perverse sheaves and  $t$ -structures on the thin and thick affine flag varieties*, under review; positive reviews received at J. Eur. Math. Soc. arXiv:2409.16259
5. *Polishchuk's conjecture and Kazhdan-Laumon representations*, Compositio Mathematica **161** (2025) no. 5, 993-1020. arXiv:2309.13462
4. *Symplectic Fourier-Deligne transforms on  $G/U$  and the algebra of braids and ties*, Int. Math. Res. Not. IMRN **2024** (2024), no. 13, 10219-10235. arXiv:2304.01998
3. *Kazhdan-Laumon category  $O$ , Braverman-Kazhdan Schwartz space, and the semiinfinite flag variety*, Represent. Theory **29** (2025), 1-34. arXiv:2210.03101
2. (with A. Dranowski, B. Elek, J. Kamnitzer) *Heaps, crystals, and preprojective algebra modules*, Selecta Math (N.S.) **30** (2024), no. 5, 94. arXiv:2202.02490

1. (with A. Dranowski and J. Kamnitzer) Appendix to *The Mirković-Vilonen basis and Duistermaat-Heckman measures* by P. Baumann, J. Kamnitzer, and A. Knutson; Acta Math. **227** (2021) no. 1, 1-101. arXiv:1905.08460

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## Research Awards

### **MIT Charles W. and Jennifer C. Johnson Prize, 2024**

Best graduate student paper, awarded for *Symplectic Fourier-Deligne transforms on  $G/U$  and the algebra of braids and ties*

### **NSERC PGS-D Postgraduate Scholarship, 2021–2024**

Kazhdan-Laumon categories and representations

### **NSERC Undergraduate Student Research Awards**

Topology of quiver flag varieties, supervised by Joel Kamnitzer, 2018  
3-manifold topology, supervised by Dror Bar-Natan, 2017

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## Teaching

### **Instructor**, Yale University

Math 3500 (Abstract Algebra) Spring 2026

Math 2250 (Linear Algebra with Proofs) Fall 2025

### **Instructor**, Stanford University

Math 245C (Topics in Algebraic Geometry) Spring 2025

Math 51 (Linear Algebra & Multivariable Calculus) Fall 2024

### **Course Administrator**, Massachusetts Institute of Technology

18.02B (Calculus III) Winter 2022

### **Teaching Assistant**, Massachusetts Institute of Technology

18.726 (Graduate Algebraic Geometry II) Spring 2024

18.745 & 18.755 (Graduate Lie Groups & Lie Algebras) 2023–2024

18.702 (Abstract Algebra II) Spring 2023

18.02A & 18.02B (Calculus II & III) Fall 2021, Winter 2022

18.725 & 18.726 (Graduate Algebraic Geometry I & II) 2020–2021

### **Teaching Assistant**, University of Toronto

MAT257 (Analysis II) 2018-2019, MAT137 (Calculus) 2017–2018

MAT135 & MAT 136 (Calculus 1A/1B) Fall 2016, Spring 2017

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## Other Awards

### **MIT Charles and Holly Housman Award, 2022**

Presented for “skill and dedication in undergraduate teaching”

### **MIT School of Science Spot Appreciation Award, 2022**

Presented for work as the course administrator for 18.02B in 2022

### **MIT Presidential Fellowship, 2019**

Awarded to 110-125 new students per year “to recruit the most outstanding students worldwide” to pursue graduate studies at MIT

### **Janet Paterson Scholarship, 2019**

Awarded annually to the top graduating student of Innis College at the University of Toronto

**Governor General's Silver Medal, Innis College  
Nominee, 2019**

Awarded annually to the graduating student from Innis College with the highest grade-point average

**Top 500, William Lowell Putnam Mathematical  
Competition, 2018**

**Samuel Beatty In-Course Scholarship, 2018**

Awarded for academic performance in the 2017-2018 academic year

**Margaret and Thomas Taylor Scholarships in  
Mathematics, 2017**

Awarded to undergraduate or graduate students who demonstrate exceptional achievement in mathematics

**University of Toronto Scholar, 2016-2018**

Awarded to the top 100 undergraduates at the university each year

**University of Toronto President's Scholarship, 2015**

**Euclid Mathematics Contest Regional Winner, 2015**

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Research  
Mentorship

**MIT UROP Supervisor, 2021-2024**

*Formal degrees of representations of  $p$ -adic groups*  
with undergraduate student Kenta Suzuki. Fall 2022-Spring 2024.

*$q$ -quasiinvariants and Cherednik algebras at roots of unity*  
with undergraduate student Frank Wang. Fall 2021-Spring 2022.

**MIT SPUR Mentor, Summer 2021**

*Convolution-exact perverse sheaves on the affine flag variety*  
with undergraduate student Alan Peng

*Toward explicit Hilbert series of quasiinvariants in char.  $p$*   
with undergraduate student Frank Wang.

**MIT PRIMES Mentor, 2020**

*Generational behavior of Gaussian binomial coefficients at roots of unity*  
with high school students Andy Chen, Peter Jiang, and Tom Wang.

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Technical  
Research  
Skills

**Programming and Scientific Computing**

Proficiency in Python, PyTorch, SageMath, Wolfram Language

**High-Performance Computing & Infrastructure**

SLURM, Bash, Git, Linux/Unix Environments, Parallel  
Programming & GPU Acceleration

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Seminar &  
Conference  
Talks

**Duke University Number Theory Seminar** April 8, 2026  
**Univ. of Toronto Geom. & Physics Seminar** February 2, 2026  
**Northeastern University GPRT Seminar** November 13, 2025  
**MIT Lie Groups Seminar** November 12, 2025  
**UCLA Algebra Seminar** March 14, 2025  
**University of Michigan GLNT Seminar** October 21, 2024  
**Stanford Representation Theory Seminar** September 26, 2024  
**MIT Seminar on Affine Kac-Moody Algebras** May 6 & 9, 2024  
**UCLA Algebra Seminar** November 3, 2023  
**Canada-USA-Mexico Represent. Theory, Noncomm. Alg. and Categorification, University of Montreal** August 25, 2023  
**UMass Amherst Representation Theory Seminar** May 8, 2023  
**Yale Geometry, Symmetry and Physics Seminar** April 3, 2023  
**MIT Lie Groups Seminar** December 7, 2022  
**ICERM Program on Braids in Representation Theory and Algebraic Combinatorics** February 26, 2022  
**MIT Pure Math Graduate Student Seminar** September 24, 2021  
**IAS Quantum Groups Learning Seminar** March 4 & 11, 2021  
**Canadian Undergraduate Math Conferences, 2016-2019**  
Queen's University, Kingston ON, 2019  
University of Saskatchewan, Saskatoon SK, 2018  
University of Quebec at Montreal, Montreal QC, 2017  
University of Victoria, Victoria BC, 2016

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Conferences,  
Workshops, &  
Research  
Visits

**Research Visit to SMRI**  
March 18-25, 2025. University of Sydney.  
**Arizona Winter School, Session Leader**  
March 8-12. University of Arizona.  
**WARTHOG 2024: Coherent-Constructible Equivalences in Local Geometric Langlands and Representation Theory**  
July 22-26, 2024. University of Oregon.  
**Relative Langlands Duality Summer School & Workshop**  
June 3-6, 2024. University of Minnesota.  
**MSRI Summer School in Derived Algebraic Geometry**  
June 26-July 7, 2023. UC Berkeley.  
**Coulomb Branches and Knot Homology Summer School in Geometric Representation Theory**  
June 19-23, 2023. Massachusetts Institute of Technology.

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**Lie Groups Days in Honor of David Vogan**

September 23-24, 2022. Massachusetts Institute of Technology.

**Quantized Symplectic Singularities & Applic. to Lie Theory**

June 13-17, 2022. Massachusetts Institute of Technology.

**Los Angeles Workshop on Representations and Geometry:  
Schubert Calculus and Quantum Integrability**

June 6-10, 2022. University of Southern California.

**Conference on Representation Theory & Algebraic Analysis**

May 11-14, 2020. Weizmann Institute of Science (attended virtually).

**Summer School on Geometric & Algebraic Combinatorics**

June 17-28, 2019. Institut de Mathématiques de Jussieu-Paris RG.

**Thematic Program in Comm. Algebra & Algebraic Geometry**

May 28-June 1, 2019. Notre Dame University.

**Thematic Program in Geometric Representation Theory**

June 11-15, 2018. Notre Dame University.

**University of Toronto Perverse Sheaves Learning Seminar**

September 2018-April 2019. University of Toronto.

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**Service  
& Other  
Experience****Seminars Co-organized**

Stanford Representation Theory Seminar, 2024-2025

MIT Pure Math Graduate Student Seminar, 2020-2021

**Refereeing**

Compositio Mathematica, IMRN, Transformation Groups,  
Representation Theory, Annals of Representation Theory,  
Mathematical Research Letters.

**Teaching Assistant, Boston Pre-Release Center**

Spring 2023, Boston, MA. Taught high-school equivalent math to  
incarcerated students at the Boston Pre-Release correctional facility.

**University of Toronto Mathematics Union President**

2017-2018, University of Toronto.