

Calder Morton-Ferguson

Department of Mathematics
Yale University

<https://caldermf.github.io/>
calder.morton-ferguson@yale.edu

Education	<p>Massachusetts Institute of Technology Ph.D., Mathematics. August 2019–May 2024. GPA: 5.0/5.0 Advisor: Roman Bezrukavnikov</p> <p>University of Toronto Honours Bachelor of Science, June 2019. GPA: 4.0/4.0 Mathematics Specialist, Computer Science Minor</p>
Employment	<p>Yale University Gibbs Assistant Professor, since July 2025</p> <p>Stanford University Szegő Assistant Professor, 2024–2025</p>
Papers	<p>9. (with P. Diaconis) <i>Markov chains on Weyl groups from the geometry of the flag variety</i>, under review. arXiv:2510.02285</p> <p>8. (with P. Boixeda Alvarez) <i>Weight modules and gluing of sheaves on the flag variety</i>, under review. arXiv:2509.25156</p> <p>7. (with R. Bezrukavnikov, M. Finkelberg, and D. Kazhdan) <i>Modular reduction of complex representations of finite reductive groups</i>. arXiv:2502.09605</p> <p>6. (with R. Bezrukavnikov) <i>Perverse sheaves and t-structures on the thin and thick affine flag varieties</i>, under review; positive reviews received at J. Eur. Math. Soc. arXiv:2409.16259</p> <p>5. <i>Polishchuk's conjecture and Kazhdan-Laumon representations</i>, Compositio Mathematica 161 (2025) no. 5, 993–1020. arXiv:2309.13462</p> <p>4. <i>Symplectic Fourier-Deligne transforms on G/U and the algebra of braids and ties</i>, Int. Math. Res. Not. IMRN 2024 (2024), no. 13, 10219–10235. arXiv:2304.01998</p> <p>3. <i>Kazhdan-Laumon category O, Braverman-Kazhdan Schwartz space, and the semiinfinite flag variety</i>, Represent. Theory 29 (2025), 1–34. arXiv:2210.03101</p> <p>2. (with A. Dranowski, B. Elek, J. Kamnitzer) <i>Heaps, crystals, and preprojective algebra modules</i>, Selecta Math (N.S.) 30 (2024), no. 5, 94. arXiv:2202.02490</p>

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
-

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
-

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
-

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

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.

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

Seminar & Conference Talks	<p>Duke University Number Theory Seminar April 8, 2026</p> <p>Univ. of Toronto Geom. & Physics Seminar February 2, 2026</p> <p>Northeastern University GPRT Seminar November 13, 2025</p> <p>MIT Lie Groups Seminar November 12, 2025</p> <p>UCLA Algebra Seminar March 14, 2025</p> <p>University of Michigan GLNT Seminar October 21, 2024</p> <p>Stanford Representation Theory Seminar September 26, 2024</p> <p>MIT Seminar on Affine Kac-Moody Algebras May 6 & 9, 2024</p> <p>UCLA Algebra Seminar November 3, 2023</p> <p>Canada-USA-Mexico Represent. Theory, Noncomm. Alg. and Categorification, University of Montreal August 25, 2023</p> <p>UMass Amherst Representation Theory Seminar May 8, 2023</p> <p>Yale Geometry, Symmetry and Physics Seminar April 3, 2023</p> <p>MIT Lie Groups Seminar December 7, 2022</p> <p>ICERM Program on Braids in Representation Theory and Algebraic Combinatorics February 26, 2022</p> <p>MIT Pure Math Graduate Student Seminar September 24, 2021</p> <p>IAS Quantum Groups Learning Seminar March 4 & 11, 2021</p> <p>Canadian Undergraduate Math Conferences, 2016-2019</p> <ul style="list-style-type: none"> 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
Conferences, Workshops, & Research Visits	<p>Research Visit to SMRI March 18-25, 2025. University of Sydney.</p> <p>Arizona Winter School, Session Leader March 8-12. University of Arizona.</p> <p>WARTHOG 2024: Coherent-Constructible Equivalences in Local Geometric Langlands and Representation Theory July 22-26, 2024. University of Oregon.</p> <p>Relative Langlands Duality Summer School & Workshop June 3-6, 2024. University of Minnesota.</p> <p>MSRI Summer School in Derived Algebraic Geometry June 26-July 7, 2023. UC Berkeley.</p> <p>Coulomb Branches and Knot Homology Summer School in Geometric Representation Theory June 19-23, 2023. Massachusetts Institute of Technology.</p>

-
- 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.
-

**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.