

# Thomas Brazelton

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- EMPLOYMENT     **Harvard University**     Cambridge, MA  
NSF Postdoctoral Research Fellow     2023—2026
- EDUCATION     **The University of Pennsylvania**     Philadelphia, PA  
Ph.D, Mathematics     2018—2023  
NSF Graduate Research Fellow
- The Johns Hopkins University**     Baltimore, MD  
B.A. + M.A., Mathematics     2014—2018
- PREPRINTS     19. The evolution of enumerative geometry: a narrative from classical problems to enriched invariants, with C. Bethea. 23 pages, 2025.  
18.  $C_p$ -Mackey functors in Macaulay2, with D. Chan, B. Mudrak, B. Spitz, C. Vogeli, C. Wang, M. Zeng, S. Zotine. 13 pages, 2025.  
17. On rank 2 bundles over smooth affine fourfolds, with M. Opie, T. Syed. 37 pages, 2025.  
16. The Chow–Witt rings of the classifying spaces of quadratically oriented bundles, with M. Wendt. 43 pages, 2025.  
15. Monodromy in the space of symmetric cubic surfaces with a line, with S. Raman. 28 pages, 2024.  
14. Bitangents to symmetric quartics, with C. Bethea. 21 pages, 2024.
- PUBLICATIONS 13. Concerning monoid structures on naive homotopy classes of endomorphisms of punctured affine space, with W. Hornslien. *J. Homotopy Relat. Struc.* (2025).  
12. An enriched degree of the Wronski map, *New York Journal of Mathematics* **31** (2025), 195—222.  
11. Equivariant enumerative geometry. *Advances in Mathematics* **461**, 2025.  
10.  $\mathbb{A}^1$ -Brouwer degrees in Macaulay2, with N. Borisov, F. Espino, T. Hagedorn, Z. Han, J. Lopez Garcia, J. Louwsma, G. Ong, and A. Tawfeek. *J. Software Alg. Geom.* **14** (2024) pp. 175–187.  
9. Residue sums of Dickson polynomials over finite fields, with J. Harrington, M. Litman, T. H. W. Wong. *J. Number Theory* **264** (2024) pp. 1—26.  
8. Lifts, transfers, and degrees of univariate maps, with S. McKean. *Mathematica Scandinavica* **129** (2023) pp. 5—38.  
7. Bézoutians and the  $\mathbb{A}^1$ -degree, with S. McKean and S. Pauli *Algebra & Number Theory* **17(11)**, 2023.  
6. Homotopy Mackey functors of equivariant algebraic  $K$ -theory. *Journal of Pure and Applied Algebra*, **226(8)**, August 2022.  
5. An introduction to  $\mathbb{A}^1$ -enumerative geometry. In Neumann F., Pál A. (eds) *Homotopy Theory and Arithmetic Geometry — Motivic and Diophantine Aspects*. Lecture notes in Mathematics, vol **2292**. Springer, Cham. 2021.  
4. A note on semilinearization and twisted group rings. *Communications in Algebra*, **49:8**, 3380—3386, 2021.  
3. The trace of the local  $\mathbb{A}^1$ -degree, with R. Burklund, M. McKean, M. Montoro, M. Opie. *Homology, Homotopy and Applications* **23(1)** (2021) pp. 1—14.  
2. Zeros of newform Eisenstein series on  $\Gamma_0(N)$ , with V. Jakicic, *J. Number Theory* **190** (2018) pp. 109—130.  
1. On consecutive primitive  $n$ th roots of unity modulo  $q$ , with J. Harrington, S. Kannan, and M. Litman, *J. Number Theory* **174** (2017) pp. 494—504.
- SOFTWARE     **CpMackeyFunctors**, a Macaulay2 package for doing homological algebra with  $C_p$ -Mackey functors. With D. Chan, B. Mudrak, B. Spitz, C. Vogeli, C. Wang, M. Zeng, and S. Zotine.
- A1BrouwerDegrees**, a Macaulay2 package for  $\mathbb{A}^1$ -Brouwer degree computation and working with symmetric bilinear forms. With N. Borisov, F. Espino, T. Hagedorn, Z. Han, J. Lopez Garcia, J. Louwsma, G. Ong, and A. Tawfeek.

PROFESSIONAL SERVICE	<i>Co-Organizer</i> , Macaulay2 Workshop 2025, UW-Madison (DMS-2508868) <i>Co-Organizer</i> , Mid-Atlantic Topology Conference 2024, Northeastern University (DMS-2349755) <i>Co-Organizer</i> , AMS Special Session on Homotopy Theory, JMM 2024 <i>Project leader</i> , Macaulay2 Workshop 2023, University of Minnesota	
COMMITTEE WORK	Graduate Admissions Committee, Harvard Mathematics, 2024–present Community Committee, Harvard Mathematics, 2024–Present	
REFEREE WORK	<i>Referee</i> : Advances in Mathematics, Annali della Scuola Normale Superiore di Pisa, Geometry & Topology, IMRN <i>Reviewer</i> , MathSciNet	
RESEARCH TALKS	No boundaries seminar, University of Chicago Colloquium, Université de Montréal Boston College Algebraic Geometry Seminar SIAM AG Minisymposium: Numerical and certified methods in algebraic geometry Arithmetic, algebraic $K$ -theory and algebraic cycles, OSU UPenn Geometry & Topology Seminar AMTRaK Seminar, UVA UVA Topology Seminar Brown Algebra Seminar Notre Dame Topology Seminar UW-Madison Algebra and Algebraic Geometry Seminar CU-Boulder Topology Seminar Harvard/MIT Algebraic Geometry Seminar Enumerative Geometry Beyond Spaces, Banff Workshop on Applied and Computational Enumerative Geometry, Fields Institute Université du Québec à Montréal, LACIM Seminar Algebra Seminar, University of Pennsylvania Geometry/Topology Seminar, University of Pennsylvania CIMAT Topology Seminar University of Minnesota Topology Seminar University of Chicago Algebraic Topology Seminar University of Chicago No Boundaries Seminar Northeastern Topology Seminar UC-Irvine Topology Seminar UCLA Topology Seminar AMS Special Session on Equivariant Algebra, JMM eCHT Research Seminar Texas A&M Geometry Seminar MIT Topology Seminar Notre Dame Algebraic Geometry & Commutative Algebra Seminar University of Maryland Algebra & Number Theory Seminar Tulane University Algebraic Geometry & Geometric Topology Seminar Emory University Algebra Number Theory Seminar University of Waterloo Geometry/Topology Seminar University of Virginia Topology Seminar Brown University Algebraic Geometry Seminar JMM Special Session on Applied Enumerative Geometry UCLA Topology Seminar Rochester University Topology Seminar Binghamton University Graduate Conference (BUGCAT) Binghamton University Topology Seminar AMS Special Session on $K$ -theory and Chromatic Homotopy Theory, U-Utah Johns Hopkins University Topology Seminar Loyola University Chicago Topology, Algebra, Combinatorics & Operators Seminar UChicago Topology Seminar Young Topologists Meeting 2022, Copenhagen Homotopy Theory with Applications to Arithmetic and Geometry, Fields Institute GROOT (Graduates Reminisce Online On Topology)	Nov 2025 Oct 2025 Sep 2025 Jul 2025 May 2025 Mar 2025 Feb 2025 Feb 2025 Jan 2025 Jan 2025 Dec 2024 Nov 2024 Oct 2024 Aug 2024 Jun 2024 Apr 2024 Apr 2024 Apr 2024 Feb 2024 Feb 2024 Feb 2024 Feb 2024 Jan 2024 Jan 2024 Jan 2024 Jan 2024 Jan 2024 Nov 2023 Nov 2023 Oct 2023 May 2023 Mar 2023 Feb 2023 Feb 2023 Feb 2023 Feb 2023 Feb 2023 Jan 2023 Nov 2022 Nov 2022 Nov 2022 Nov 2022 Oct 2022 Oct 2022 Oct 2022 Oct 2022 Jul 2022 Jun 2022 Jun 2022

Algebraic Structures in Topology, San Juan	Jun 2022
Algebra Seminar, Texas A&M University	Mar 2022
FRG Grant on Trace Methods	Jan 2022
SECANT 2021, Cedar Crest College	Jan 2022
Topology/Geometry Seminar, University of Oregon	Nov 2021
Geometry/Topology Seminar, University of Pennsylvania	Nov 2021
Algebra Seminar, University of Pennsylvania	Nov 2021
Young Topologists Meeting 2020/2021	Jul 2021
Algebra Seminar, University of Pennsylvania	Apr 2020
Binghamton University Graduate Conference (BUGCAT)	Nov 2020
Geometry/Topology Seminar, University of Pennsylvania	Oct 2020
AMS Fall Sectional, UW-Madison	Sep 2019
PIMS Workshop on Arithmetic Topology	Jun 2019
Rényi Institute Number Theory Seminar, Budapest	Sep 2016

AWARDS AND  
FELLOWSHIPS

<b>AIM SQuaRE Grant</b>	2023—2026,
<i>Around the Wronski map</i> , with S. Karp, J. Levinson, S. McKean, K. Purbhoo, F. Sottile	
<b>AIM SQuaRE Grant</b>	2023—2026,
<i>An algebraic approach to Thom spectra</i> , with M. Calle, D. Chan, L. Keenan, M. Péroux	
<b>NSF Postdoctoral Research Fellowship</b>	2023—2026
<b>AMS Travel Grant</b>	2022
<b>Graduate Fellow for Teaching Excellence</b> ,	
Penn Center for Teaching and Learning	2022—2023
<b>Moez Alimohamed Graduate Student Award for Distinguished Teaching in Mathematics</b> , University of Pennsylvania	2021
<b>Graduate Fellow for Equitable and Inclusive Teaching</b> , Penn Center for Teaching and Learning	2021—2022
<b>Master TA</b> , University of Pennsylvania Mathematics Department	2021—2023
<b>Dean’s Scholar</b> , University of Pennsylvania	
Honored as one of nine doctoral students across the School of Arts & Sciences.	2020—2021
<b>Good Teaching Award</b> , University of Pennsylvania Mathematics Department	Fall 2020
<b>NSF Graduate Research Fellow</b>	2019 — 2024
<b>Calabi Fellow</b> , University of Pennsylvania Mathematics Department	2017 — 2020
<b>J.J. Sylvester Award for Excellence in Mathematics</b> (Johns Hopkins)	May 2018
<b>NSF GRFP</b> , Honorable Mention	2018
<b>William Lowell Putnam Award</b> (Johns Hopkins)	May 2016

TEACHING

<b>Harvard University</b>	
MATH1B, Calculus	Fall 2025
MATH101, Sets, groups, and geometry	Spring 2025
MATH266, Unstable motivic homotopy theory	Fall 2024
<b>MIT Educational Justice Initiative</b>	
<i>TA</i> , Code your dreams (Python, HTML, Flask)	Spring 2025
<i>TA</i> , Intro to Python	Fall 2024
<b>University of Pennsylvania</b>	
<i>Instructor</i> , MATH8100 Enumerative Geometry	Spring 2023
Designed and taught an inquiry-based learning course on enumerative geometry for graduate students and advanced undergrads.	

**Penn Directed Reading Program**

Fall 2019 — Spring 2023

Co-founded and co-organized the DRP at Penn with Mona Merling (Fall 2019), co-organized with George Wang (Spring 2020 — Spring 2021), and with Marielle Ong (Fall 2021 — Spring 2023).

Mentor for the following projects:

$\mathbb{A}^1$ -Milnor numbers, Zhong Zhang	Spring 2023
Algebraic geometry from an $\mathbb{A}^1$ -viewpoint, Zhong Zhang	Fall 2022
Enumerative geometry and string theory II, Zhong Zhang	Spring 2022
Enumerative geometry and string theory, Zhong Zhang	Fall 2021
Category theory and homotopy theory, Abigail Timmel	Spring 2020
Group theory and applications, Stephanie Wu	Fall 2019
Persistent homology, Mira Wattal (JHU)	Spring 2018

**Princeton Prison Teaching Initiative**

Spring 2021 — Spring 2022

Volunteer math instructor for South Woods State Prison in New Jersey.

Instructor/Team Leader for MATH015	Spring 2022
Instructor for MATH020	Fall 2021
Grader for MATH015	Spring 2021

**Penn Summer Prep**

Philadelphia, PA

Instructor, Introduction to Voting Theory Summer 2021

Designed and taught a two-week course on voting theory for advanced high school students.

**University of Pennsylvania**

Philadelphia, PA

Teaching Assistant, MATH 370 Algebra I	Spring 2021
Teaching Assistant, MATH 114 Calculus II	Fall 2020

**The Johns Hopkins University**

Baltimore, MD

Teaching Assistant, AS.110.421 Dynamical Systems	Spring 2018
Teaching Assistant, AS.110.202 Calculus III	Fall 2017

## ADVISING

Senior thesis: Vinberg's algorithm (Charles Wollgemuth)	2025-2026
Senior thesis: automorphism groups of curves (David Ettel)	2025-2026
Independent study: Schubert calculus and obstruction theory (Yuyuan Luo)	Spring 2024

SEMINARS  
ORGANIZED

Harvard/MIT Juvitop, The norm residue isomorphism theorem, (w/ Logan Hyslop)	Fall 2025
$e\text{CHT}^1$ , Quadratically enriched curve counting (w/ Sabrina Pauli)	Fall 2024
$e\text{CHT}$ , Algebraic, motivic, and topological vector bundles (w/ Morgan Opie)	Fall 2023
UPenn Homotopy Theory Seminar (w/ Andres Mejia)	Spring 2021—Spring 2023
Penn Graduate Student Seminar (w/ Marielle Ong)	Fall 2019—Spring 2020

## FACILITATION

**Center for Teaching and Learning, University of Pennsylvania**

Designing Problems for STEM Classes	Fall 2022
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Designed a university-wide workshop on scaffolding and backwards design in problem sets in STEM.

Inclusive and Equitable Teaching in STEM	Spring 2022
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Designed and facilitated a five-session mini-course on inclusive and equitable teaching in STEM disciplines for graduate students.

Inclusive and Equitable Teaching	Fall 2021
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Co-facilitated a five-session mini-course on inclusive and equitable teaching for graduate students.

EXPOSITORY  
TALKS

Texas A&M Undergrad Math Society	Nov 2023
Gimbal lock and covering spaces	

Penn Undergrad Math Society	Nov 2022
A hands-on introduction to homotopy	

**Penn Geometry/Topology Grad Seminar**

<sup>1</sup>electronic Computational Homotopy Theory seminar

	<i>Local homotopy theory and Galois descent</i>	Sep 2022
	<i>The algebraic vector bundle problem</i>	Feb 2022
	<i>Euler characteristics of real algebraic manifolds</i>	Oct 2021
	MIT Talbot Workshop, 2021	Oct 2021
	<i>Ambidexterity</i>	
	Penn General Robotics, Automation, Sensing & Perception Laboratory	Oct 2019
	<i>A brief introduction to topology</i>	
	Moravian College REU Seminar	Jun 2019
	<i>A hands-on introduction to homotopy</i>	
	University of Pennsylvania Graduate Pizza Seminar	
	<i>How to prevent nuclear war and then decide what to watch on Netflix</i>	Feb 2023
	<i>Elliptic curves and the NSA</i>	Jan 2020
	<i>Gimbal lock</i>	Dec 2020
	<i>Social choice and topology</i>	Mar 2019
	<i>The generalized Poincaré conjecture</i>	Oct 2018
	Johns Hopkins Undergraduate Mathematics Seminar	Apr 2018
	<i>A Crash Course in Homotopy Theory</i>	
SELECTED	Enumerative Geometry Beyond Spaces, Banff	Aug 2023
CONFERENCES	PCMI Research Program in Motivic Homotopy Theory	Jul 2023
AND WORKSHOPS	International Workshop on Algebraic Topology, Shanghai	Jun 2024
(* INDICATES ONLINE)	Algebraic Structures in Topology II, San Juan	Jun 2024
	Workshop on Computational and Applied Enumerative Geometry, Fields Institute	Jun 2024
	Motives in Mainz	Mar 2024
	Joint Mathematics Meetings 2024, San Francisco	Jan 2024
	European Autumn School in Topology 2023	Sep 2023
	Stacks Project Workshop 2023, Ann Arbor	Aug 2023
	Recent Advances in Algebraic $K$ -Theory, IHES	Jul 2023
	Motivic and non-commutative aspects of enumerative geometry, Nijmegen	Jul 2023
	Scissors $K$ -theory and Trace Methods, Indiana University	Jun 2023
	Macauley2 Workshop, University of Minnesota	May 2023
	Mid-Atlantic Topology Conference, Philadelphia	Apr 2023
	Joint Mathematics Meeting, Boston	Jan 2023
	Banff Workshop on Toric Degenerations	Dec 2022
	Binghamton University Graduate Conference in Algebra & Topology	Nov 2022
	AMS Sectional, Salt Lake City	Oct 2022
	Young Topologists Meeting, Copenhagen	Jul 2022
	Homotopical Methods in Fixed Point Theory, CU-Boulder	Jul 2022
	Homotopy Theory with Applications to Arithmetic and Geometry, Fields Institute	Jun 2022
	Algebraic $K$ -theory, motivic cohomology and motivic homotopy theory, INI	Jun 2022
	Algebraic Structures in Topology, San Juan	Jun 2022
	Graduate Student Conference in Algebra, Geometry, & Topology, Temple University	May 2022
	MIT Talbot Workshop: Ambidexterity in Chromatic Homotopy Theory, Plymouth MA	Oct 2021
	Mathematics Teacher-Scholar Symposium, Reed College*	May 2021
	Institute for Mathematics and Democracy 2021*	May 2021
	Graduate Student Conference in Geometry and Topology*	Apr 2021
	Midwest Topology Conference*	Apr 2021
	Binghamton University Graduate Conference in Algebra and Topology*	Nov 2020
	ICERM: Monodromy and Galois groups in enumerative geometry*	Aug-Sep 2020
	Regensburg Transatlantic Transchromatic Homotopy Theory Conference II*	Aug 2020
	IHES Motivic, Equivariant and Non-commutative Homotopy Theory*	July 2020
	Motives and What Not, Universität Regensburg*	May 2020
	Midwest Topology Seminar*	May 2020
	MAGUS*	May 2020
	Motives & Stacks, Universität Duisburg-Essen	Sep 2019
	European Autumn School in Topology 2019, Utrecht	Sep 2019
	AMS Fall Sectional, UW-Madison	Sep 2019

PIMS Workshop on Arithmetic Topology, UBC	Jun 2019
Graduate Student Conference in Algebra, Geometry, & Topology, Temple University	Jun 2019
Arizona Winter School 2019: Topology and Arithmetic	Mar 2019
Homotopy Theory Summer Berlin 2018	Jun 2018
Joint Mathematics Meeting, Atlanta	Jan 2017

SERVICE

**Master TA, UPenn**

In charge of running TA trainings and conducting observations.

**The Franklin Institute Science Museum** 2018 — 2022

Volunteer science presenter with Team Boson, responsible for running tables at exhibits and discussing science with the public.

**Johns Hopkins Math Club** 2015 — 2018

President (2017-2018), Vice President (2016-2017), organizer of speakers and events, test writer / grader / organizer for the Johns Hopkins Math Tournament, held yearly for high school students in the greater DC area. Founder of the Johns Hopkins Undergraduate Math Seminar.

EXPERIENCE

**Noblis, Inc** Reston, VA  
 PhD intern in post-quantum cryptography. Summer 2018

**Texas A&M REU** College Station, TX  
 Analytic number theory, supervised by Dr. Matthew Young. Summer 2017

**Muhlenberg College REU** Allentown, PA  
 Number theory, supervised by Dr. Joshua Harrington. Summer 2016