Benjamin K. Breen

Curriculum Vitae

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Research interests

Number theory, representation theory, arithmetic statistics	
Hilbert modular forms, Cohen-Lenstra heuristics, reflection theorems, class field	theory
Explicit methods in algebraic number theory and modular forms	
EDUCATION	
Dartmouth College, Hanover, NH Ph.D. in Mathematics Advisor: John Voight	Expected June 2020
Dissertation: The 2-Selmer group of number fields A.M. in Mathematics	June 2016

Carleton College, Northfield, MN

B.A. in Mathematics

ACADEMIC EXPERIENCES

Institute for Computation and Experimental Research in	1 Mathematics
Visiting Scholar at Brown University, Providence, RI	
Computational Aspects of the Langlands Program	September - December 2015

June 2014

ARTICLES/PUBLICATIONS

- 4. "Heuristics for narrow class groups in even S_n -fields" (In preparation)
- 3. "On unit signatures and narrow class groups of odd abelian number fields: structures and heuristics" (with Ila Varma and John Voight), Submitted, arXiv:1910.00449.
- 2. "Fourier transforms on $SL_2(\mathbb{Z}/p^n\mathbb{Z})$ and related numerical experiments" (with D. DeFord, Jason D. Linehan, Daniel N. Rockmore), arXiv:1710.02687
- "Wild Ramification in a family of low degree extensions arising from iteration" (with Rafe Jones, Tommy Occhipinti, Michelle Yuen), JP J. Algebra Number Theory Appl. 37(1) (2015), 69-104. arXiv:1507.02269

INVITED TALKS

• Infinitely many cyclic cubic fields with a totally positive system of fundamental units University of Wisconsin, Madison	December 2019
• Heuristics for narrow class groups in odd abelian number fields Five Colleges Number Theory Seminar, Amherst	November 2019
• Infinitely many cyclic cubic fields with a totally positive system of fundamental units Number Theory Seminar, Dartmouth College	October 2019
• Reflection Theorems for ray class groups in odd abelian number fields Number Theory Seminar, Vanderbilt University	September 2019
• Heuristics for narrow class groups in number fields of even degree AMS Special Session, Algebraic Number Theory, Boston University	April 2018
Research Presentations	
• On unit signatures and narrow class groups of odd abelian number fields University of Maine, Orono	October 2019
• On unit signatures and narrow class groups of odd abelian number fields Number Theory Seminar, Dartmouth	April 2019
• On unit signatures and narrow class groups of odd abelian number fields Joint Mathematics Meetings, Baltimore	January 2019
• Sampling totally real S ₄ -fields (2 nd place in the poster competition) Algorithms in Number Theory XIII (ANTS), University of Wisconsin, Madison	July 2018
• Rings of Hilbert modular forms Québec-Maine Number Theory Conference, Laval University, Quebec	October 2018
• The 2-Selmer group for number fields of even degree Québec-Maine Number Theory Conference, University of Maine, Orono	October 2017
• The 2-Selmer group of number fields Dartmouth Number Theory Seminar	April 2017
• Parameterization for rings of rank n Graduate Number Theory Seminar, Dartmouth College	May 2016
• Canonical rings of Hilbert modular forms Institute for Computational Research in Mathematics (ICERM), Brown University	May 2015
• Behavior of primes in extensions of iterated polynomials Carleton College, Northfield, MN	May 2014
• The different in cubic fields University of Massachusetts REU Convention, Amherst College	August 2013
TEACHING EXPERIENCE	

Dartmouth College

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Full Instructor	
Math 9 - Calculus with Linear Algebra	Fall 2018
Math 11 - Accelerated Multivariable Calculus	Fall 2017
Math 3 - Introduction to Calculus	Winter 2017

Teaching Assistant

Math 10 - Statistics	Spring 2016
Math 8 - Calculus in Several Variables	Winter 2016
Math 24 - Linear Algebra (Honors Section)	Winter 2015
Math 11 - Accelerated Multivariable Calculus	Fall 2014

$Teaching \ Awards$

Dartmouth Mathematics Kenneth P.	Bogart Teaching Award	2017
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The Dartmouth Mathematics Department gives this award annually to the graduate student who best exemplifies outstanding dedication to and excellence in advancing the educational mission of the department.

AWARDS AND HONORS

• Honorable Mention, NSF Graduate Research Fellowship	2015
• Dartmouth Graduate Fellowship	2014 - 2019
• Dartmouth GAANN Fellowship	2014 - 2015

ACTIVITIES AND OUTREACH

Simons Collaboration, multiple institutes on Arithmetic Geometry, Number Theory, and Computation Advancing computational infrastructure for Hilbert modular forms in Magma.	'resent
• L-functions and modular forms database (LMFDB), multiple institutes Developing and maintaining the Hilbert modular forms section in the LMFDB	resent
• Sage Days 87, University of Vermont <i>p</i> -adics in Sage and the LMFDB Computed Galois splitting models for the local fields section of the LMFDB	2017
• John Hopkins Center for Talented Youth, Dartmouth College Nash equilibrium and Matrix games Developed a workshop for high school students	2016
• Exploring Mathematics Camp, Dartmouth College Probability and Knot Theory Developed two week-long workshops for high school students	2015
• Dartmouth Mathematics Teaching Seminar, Dartmouth College <i>Topics: methods of assessment, cooperative and active learning, inclusive classrooms.</i> Attended an 8-week discussion based course focused on pedagogy and teaching techniques.	2015