Daniel R. Hast

email: drhast@bu.edu
`https://math.bu.edu/people/drhast`

Dept. of Mathematics & Statistics
Boston University
111 Cummington Mall
Boston, MA 02215

EMPLOYMENT		
Boston University: postdoc affiliated with Simons Collaboration on Arithmetic Geometry, Number Theory, and Computation	**2019 –**
Rice University: G. C. Evans Instructor	**2018 – 2019**
University of Wisconsin–Madison: Graduate Assistant (Research Assistant in spring & summer 2014–2017; Teaching Assistant in fall 2013–2018 and spring 2018)	**2013 – 2018**

EDUCATION		
University of Wisconsin–Madison Ph.D. in Mathematics Advisor: Prof. Jordan S. Ellenberg	**2013 – 2018**
University of Michigan, Ann Arbor B.S. with High Honors in Mathematics (with minor in physics)	**2009 – 2013**

RESEARCH INTERESTS

My main areas of interest are in arithmetic algebraic geometry, Diophantine geometry, p-adic analysis, arithmetic statistics, and post-quantum cryptography.

PUBLICATIONS

"A study of error floor behavior in QC-MDPC codes" (with S. Arpin, T. R. Billingsley, J. B. Lau, R. Perlner, and A. Robinson), in *Post-Quantum Cryptography*, proceedings of PQCrypto 2022. DOI: 10.1007/978-3-031-17234-2_5.

"Explicit two-cover descent for genus 2 curves" (in collection *ANTS XV*), *Research in Number Theory* (2022). DOI: 10.1007/s40993-022-00375-0.

"Functional transcendence for the unipotent Albanese map", *Algebra & Number Theory* (2021). DOI: 10.2140/ant.2021.15.1565.

"Rational points on solvable curves over $\mathbb{Q}$ via non-abelian Chabauty" (with J. S. Ellenberg), *International Mathematics Research Notices* (2021). DOI: 10.1093/imrn/rnab141.

"Higher moments of arithmetic functions in short intervals: a geometric perspective" (with V. Matei), *International Mathematics Research Notices* (2019). DOI: 10.1093/imrn/rnx310.

TEACHING

Postdoc, Boston University (as instructor of record):

Math 742 (Commutative Algebra)	**Spring 2022**
Math 123 (Calculus I)	**Fall 2021**

G. C. Evans Instructor, Rice University (as instructor of record):

Math 306 (Elements of Abstract Algebra)	**Spring 2019**
Math 102 (Single Variable Calculus II)	**Fall 2018**
Math 365 (Number Theory)	**Fall 2018**

Teaching Assistant, University of Wisconsin–Madison:

	Math 376 (Multivariable Calculus & Differential Equations)	**Spring 2018**
	Math 375 (Multivariable Calculus & Linear Algebra)	**Fall 2017**
	Graduate Algebra Summer Enhancement Program (SEP)	**Summer 2017**
	Math 114 (Algebra and Trigonometry)	**Fall 2016**
	Math 234 (Multivariable Calculus)	**Fall 2015, Fall 2014**
	Math 221 (Calculus & Analytic Geometry)	**Fall 2013**

RESEARCH PRODUCTS

Produced a dataset of several thousand elliptic curves over number fields of degree up to 5 for use in testing implementations of various algorithms in arithmetic geometry.

REFEREE WORK

Referee for *Algebra & Number Theory*, *Communications in Algebra*, *Compositio Mathematica*, *Duke Mathematical Journal*, and *Mathematische Annalen*.

PROGRAMMING EXPERIENCE

Proficient with HTML, Java, JavaScript, LaTeX, Macaulay2, Magma, Python, R, Ruby, Rust, and SageMath.

OUTREACH, ORGANIZATION, & MENTORSHIP

Supervising a student research project on Steiner's conic problem over non-algebraically closed fields.	**Summer 2022**
Designed and led an interactive workshop on the mathematics of redistricting and gerrymandering for middle school Math Circle students at Rice. Presented the same workshop to high school math teachers through the Rice University School Mathematics Project's professional development program, and shared curriculum materials for the teachers' use.	**Spring 2019**
Mentored three Rice University undergraduates in a Rice Geometry Lab project on p-adic numbers, which culminated in the students designing and presenting an expository poster.	**Spring 2019**
Member of the Current Math Seminar committee, which organizes expository talks by graduate students in preparation for colloquium, at Rice University.	**2018 – 2019**
Directed a reading course on algebraic geometry and elliptic curves with a Rice University undergraduate.	**Fall 2018**
Helped organize the Geometry of Redistricting conference at UW–Madison in partnership with Tufts University's Metric Geometry and Gerrymandering Group.	**Oct. 2017**
Co-founder and seminar organizer for the UW–Madison AMS Student Chapter.	**2014 – 2017**
President of the AMS Student Chapter at UW–Madison.	**2015 – 2017**

	Directed five undergraduate reading courses on elementary number theory, elliptic curves, algebraic geometry, history of mathematics, and *p*-adic analysis through the Directed Reading Program.	**2015 – 2017**
	Co-organizer for a seminar on R. Lazarsfeld's *Positivity in Algebraic Geometry*.	**Fall 2016**
	Served on a UW–Madison Department of Mathematics committee on inclusion and discrimination.	**Fall 2016**
	Co-organizer for the UW–Madison Directed Reading Program, a program where undergraduates work with graduate student mentors on a reading course and a presentation to their peers.	**Fall 2016**
	Ran a booth demonstrating the Monty Hall problem at Saturday Science, a public outreach event at the Wisconsin Institute for Discovery.	**Aug. 2016**
	Gave a presentation on my research in number theory to a group of high school interns with the Wisconsin IceCube Particle Astrophysics Center.	**Feb. 2015**
	Gave a presentation on modular arithmetic and quadratic reciprocity to a group of high school students in the Madison Math Circle.	**Oct. 2014**
CONFERENCE PRESENTATIONS	"Quadratic Chabauty over imaginary quadratic fields," in AMS Special Session on Arithmetic Geometry Informed by Computation, JMM 2023	**Jan. 2023**
	"Explicit two-cover descent for genus 2 curves," in AMS Special Session on Excursions in Arithmetic Geometry, JMM 2023	**Jan. 2023**
	"A study of error floor behavior in QC-MDPC codes," in AMS Special Session on Rethinking Number Theory, JMM 2023	**Jan. 2023**
	"A study of error floor behavior in QC-MDPC codes," talk in PQCrypto 2022, online.	**Sep. 2022**
	"Explicit two-cover descent for genus 2 curves," talk in Algorithmic Number Theory Symposium 2022, Bristol, UK.	**Aug. 2022**
	"Explicit two-cover descent for genus 2 curves," talk at Park City Mathematics Institute 2022 in Park City, Utah.	**Jul. 2022**
	"Explicit two-cover descent for genus 2 curves," talk in the Spec(Qbar) workshop at the Fields Institute, Toronto.	**Jul. 2022**
	"Rational points, unipotent fundamental groups, and the non-abelian Chabauty method," talk in the ADDING workshop at University of Georgia.	**Apr. 2022**

	"Functional transcendence for the unipotent Albanese map," invited talk in "Unlikely intersections, Diophantine geometry, and related fields" workshop.	**Apr. 2021**
	"Rational points on varieties and the unipotent Albanese map," invited talk in the AMS Special Session on Rational Points on Algebraic Varieties: Theory and Computation at the 2020 JMM.	**Jan. 2020**
	"Rational points and unipotent fundamental groups," invited talk at the Texas Algebraic Geometry Seminar at Texas A&M.	**Nov. 2018**
	"Rational points and unipotent fundamental groups," invited talk in the *From Hyperelliptic to Superelliptic Curves* AMS Special Session at the AMS Sectional Meeting in Ann Arbor.	**Oct. 2018**
	"Diophantine finiteness via Selmer varieties and unramified correspondences," poster at RTG Lectures in Arithmetic Geometry at Rice University.	**Feb. 2017**
	"Higher Moments of Arithmetic Functions in Short Intervals," talk at the Midwest Number Theory conference at University of Illinois at Chicago.	**Oct. 2015**
	"The Geometry of Short Intervals in Function Field Arithmetic," talk at the Midwest Algebraic Geometry Graduate Conference at University of Illinois at Chicago.	**Apr. 2015**
WORKSHOPS	Participated in rational points group at the Modular Curves Workshop at MIT	**Mar. 2022**
	Participated in "BIKE Decoders and Error Detection" project at Rethinking Number Theory 2 online workshop	**Jul. 2021**
	Ran problem session on "Fundamental Groups of Curves" at the 2020 Arizona Winter School	**Mar. 2020**
	Participated in "The Arithmetic of Hyperelliptic Curves" summer school and workshop at the International Centre for Theoretical Physics in Trieste, Italy	**Aug. 2017**
	Participated in the Arizona Winter School in Arithmetic Geometry:	
	– Bhargav Bhatt's project group	**Mar. 2017**
	– Ravi Vakil's project group	**Mar. 2015**
	– Jordan Ellenberg's project group	**Mar. 2014**
SEMINAR TALKS	"Explicit two-cover descent for genus 2 curves," number theory seminar talk at Boston University.	**Oct. 2020**
	Invited talk at University of Georgia's number theory seminar.	**Feb. 2020**
	Invited talk at Boston University's number theory seminar.	**Oct. 2019**
	Invited talk at New York University's number theory seminar.	**Oct. 2019**

Invited talk at Berkeley's number theory seminar.	**May. 2019**
Invited talk at Northwestern University's number theory seminar.	**Mar. 2019**
"Rational points and unipotent fundamental groups," invited talk at Ohio State University's algebraic geometry seminar.	**Oct. 2018**
"Rational points and unipotent fundamental groups," at Rice University's algebraic geometry/number theory seminar.	**Sept. 2018**
"Rational points on solvable curves over $\mathbb{Q}$ via non-abelian Chabauty," invited talk at UC Irvine number theory seminar.	**Jan. 2018**
Talk in the AMS Contributed Paper Session on Number Theory at the 2018 Joint Mathematics Meetings in San Diego.	**Jan. 2018**
"Rational points on solvable curves over $\mathbb{Q}$ via non-abelian Chabauty," research talk in the UW–Madison number theory and representation theory seminar.	**Sept. 2017**
"Finiteness of integral points on curves via the Chabauty–Coleman–Kim method," talk on ongoing research in the UW–Madison number theory and representation theory seminar.	**Dec. 2015**
"The Geometry of Arithmetic Functions in Short Intervals," talk on my research with Vlad Matei, in the UW–Madison graduate number theory seminar.	**Sept. 2014**
Twelve expository talks on a variety of topics in the UW–Madison graduate number theory and graduate algebraic geometry seminars.	**2013–2017**