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RESEARCH INTERESTS

Arithmetic Geometry in any Characteristic, Computational Number Theory, Sphere Packing, Variants of Chabauty's Method for Computing Rational Points, and much more!

ACADEMIC POSITIONS

University of Georgia Aug. 2019 - present
Postdoctoral Research and Teaching Associate

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA June 2019
Doctor of Philosophy in Mathematics
Thesis: Restriction of Scalars, the Chabauty-Coleman Method, and $\mathbb{P}^1 \smallsetminus \{0, 1, \infty\}$.
Thesis Advisor: Bjorn Poonen

Cambridge University, Cambridge, CB, UK June 2014
Master of Advanced Study in Mathematics, with Distinction

University of Michigan, Ann Arbor, MI May 2013
Bachelor of Science, With Highest Distinction, GPA 4.0/4.0
Concentration: Highest Honors in Mathematics, High Honors in Computer Science
Honor Societies: Phi Beta Kappa, Phi Kappa Phi

FELLOWSHIPS SCHOLARSHIPS AND HONORS

- National Science Foundation Graduate Fellowship (2013)
- Churchill Scholarship Recipient (2013)
- Astronaut Scholarship Recipient (2012)
- Goldwater Scholarship Recipient (2011)
- Gates-Cambridge Scholarship Finalist, Declined Interview (2013)
- University of Michigan Nominee, Marshall Scholarship (2012)
- Eight-Term James B. Angell Scholar (2013)
- Sidney Fine Teaching Award (2013) for one University of Michigan student with demonstrated potential to become an inspiring teacher and scholar in any discipline.
- Honorable Mention on Putnam Math Competition (2012, 2013)
- 14th place on United States of America Math Olympiad (2008)

PUBLICATIONS AND PREPRINTS

- *There are no exceptional units in number fields of degree prime to 3 where 3 splits completely*, to appear in *Proceedings of the AMS, Series B* (2021).
- *Dual linear programming bounds for sphere packing via modular forms*, (with Henry Cohn), *Math. Comp.* (2021).
- *Two recent approaches towards the (effective) Mordell Conjecture*, (with Jennifer Balakrishnan, Alex Best, Francesca Bianchi, Brian Lawrence, Steffen Müller, and Jan Vonk), *Arithmetic L-functions and Geometric Differential Methods*, *Regulators IV* (2021).
- *Restriction of scalars, the Chabauty-Coleman method, and* $\mathbb{P}^1 \smallsetminus \{0, 1, \infty\}$., PhD thesis, MIT (2019).
- *Computing zeta functions of cyclic covers in large characteristic*, (with Vishal Arul, Alex Best, Edgar Costa, and Richard Magner), *Proceedings of ANTS XIII* (2018).

- *Distribution of eigenvalues of weighted, structured matrix ensembles*, (with Olivia Beckwith, Victor Luo, Steven J. Miller, and Karen Shen), Volume 15 *Integers* (2015).
- *Sharp threshold asymptotics for the emergence of additive bases*, (with Anant Godbole, Chang Mou Lim, and Vince Lyzinski), Volume 13 *Integers* (2013).

PREPRINTS

- *Restriction of Scalars Chabauty and the S-unit equation*, submitted (2021).
- *On the arithmetic of a family of superelliptic curves*, (with Sarah Arpin, Richard Griffon, and Libby Taylor), submitted (2021).
- *Determinantal expansions in random matrix theory and number theory*, (with Steven J. Miller), Preprint (2014).
- *Moment formulas of classical compact groups*, (with Geoffrey Iyer and Steven J. Miller), Preprint (2014).

RESEARCH TALKS

- *Nonexistence of exceptional units via modified Skolem-Chabauty*, Groningen Algebra seminar, Groningen, Netherlands (Zoom), March 2021.
- *Computing Isolated Points on Modular Curves*, Virtual Seminar on Number Theory and Arithmetic Geometry (VaNtAGe), Zoom, November 2020.
- *Nonexistence of exceptional units via Skolem-Chabauty's method*, MSRI Diophantine Problems Seminar, Berkeley, CA (Zoom), November 2020.
- *Restriction of Scalars, Chabauty's Method, and* $\mathbb{P}^1 \smallsetminus \{0, 1, \infty\}$, Chicago Number Theory Days, Chicago, IL (Zoom), June 2020.
- *Restriction of Scalars, Chabauty's Method, and* $\mathbb{P}^1 \smallsetminus \{0, 1, \infty\}$, University of Washington Number Theory Seminar, Seattle, WA, November 2019.
- *Restriction of Scalars, Chabauty's Method, and* $\mathbb{P}^1 \smallsetminus \{0, 1, \infty\}$, Weslyan University Algebra Seminar, Middletown, CT, November 2019.
- *Restriction of Scalars, Chabauty's Method, and* $\mathbb{P}^1 \smallsetminus \{0, 1, \infty\}$, Rice University Number Theory Seminar, Houston, TX September 2019.
- *Restriction of Scalars, Chabauty's Method, and* $\mathbb{P}^1 \smallsetminus \{0, 1, \infty\}$, University of Georgia Number Theory Seminar, Athens, GA, September 2019.
- *The Chabauty-Coleman method: variants and computational aspects*, University of Georgia AGANT Oberseminar, Athens, GA, August 2019.
- *Restriction of Scalars, Chabauty's Method, and* $\mathbb{P}^1 \smallsetminus \{0, 1, \infty\}$, Boston University/Keio University Workshop at Boston University, Boston, MA, June 2019.
- *Restriction of Scalars, Chabauty's Method, and* $\mathbb{P}^1 \smallsetminus \{0, 1, \infty\}$, Arithmetic of Low-Dimensional Abelian Varieties at ICERM, Providence, RI, June 2019.
- *Restriction of Scalars, Chabauty's Method, and* $\mathbb{P}^1 \smallsetminus \{0, 1, \infty\}$, MIT Thesis Defense, Cambridge, MA, April 2019.
- *Restriction of Scalars, Chabauty's Method, and* $\mathbb{P}^1 \smallsetminus \{0, 1, \infty\}$, AMS Graduate Student Conference in Algebra and Number Theory at Brown University, Providence, RI, April 2019.
- *Restriction of Scalars, Chabauty's Method, and* $\mathbb{P}^1 \smallsetminus \{0, 1, \infty\}$, Emory Algebra and Number Theory Seminar, Atlanta, GA, March 2019.
- *The Method of Chabauty-Coleman-Skolem for Restrictions of Scalars*, Harvard Number Theory Seminar, Cambridge, MA, March 2019.
- *Variants of Chabauty's method and the thrice-punctured projective line*, Joint Meetings of the American Mathematical Society, AMS Contributed Paper Session on Number Theory III, Baltimore, MD, January 2019.

- *Computing zeta functions of cyclic covers in large characteristic*, Joint Meetings of the American Mathematical Society, AMS Special Session on Number Theory, Arithmetic Geometry, and Computation, Baltimore, MD, January 2019.
- *The method of Chabauty-Coleman-Skolem for restrictions of scalars*, Junior Number Theory Days, Rutgers University – Newark, November 2018.
- *Computing zeta functions of cyclic covers in large characteristic*, AMS Fall Sectional Meeting, Special Session on from Hyperelliptic to Superelliptic Curves, University of Michigan – Ann Arbor, October 2018.
- *Computing zeta functions of cyclic covers in large characteristic*, ANTS XIII, University of Wisconsin – Madison July 2018.
- *The Szpiro conjecture for hyperelliptic curves* (joint presentation with Sam Schiavone), PhD Summer school "Curves, L-functions, and Galois Representations", ICTP Trieste, September 2017.
- *Determinantal expansions in random matrix theory and number theory*, Joint Meetings of the American Mathematical Society, San Diego, CA, January 2013.
- *Determinantal expansions in random matrix theory and number theory*, Maine-Quebec Number Theory Conference, Quebec City, QC, September 2012.
- *Distributions of eigenvalues of variations of Hermitian Toeplitz matrix ensembles*, Young Mathematicians Conference, Columbus, OH, July 2012.
- *Omnimosaics*, Joint Meetings of the American Mathematical Society, New Orleans, LA, January 2011.
- *Omnisequences and omnimosaics*, Undergraduate Math Club, University of Michigan – Ann Arbor, January 2011.

RESEARCH POSTERS

- *Limitations from modular forms on LP-bounds for sphere packing*, ANTS XIII, University of Wisconsin – Madison, July 2018. Available online at:
`http://www-math.mit.edu/~ngtriant/papers/poster_ants_v4.pdf`
- *Limitations from modular forms on LP-bounds for sphere packing*, Workshop Arithmetic Geometry and Computer Algebra, Carl von Ossietzky Universität, July 2017. Available online at:
`http://www-math.mit.edu/~ngtriant/papers/sphere_packing_poster_2017.pdf`

EXPOSITORY TALKS

- *Structure Theory of Groups of Multiplicative Type*, Serre on Zoom, UGA, Athens, GA, February, 2021.
- *The Ax-Schanuel Theorem*, Zannier on Zoom, UGA, Athens, GA, November 2020.
- *The Method of Chabauty and Coleman*, Pure Math Graduate Student Seminar, MIT, Cambridge, MA, April 2019.
- *Heights and quadratic Chabauty*, Number Theory Topics Course, Harvard University, Cambridge, MA, March 2019.
- *Classical Chabauty examples*, Number Theory Topics Course, Harvard University, Cambridge, MA, March 2019.
- *Rational points on the base of an abelian-by-finite family (from Lawrence-Venkatesh proof of the Mordell Conjecture)*, Seminar on Topics in Arithmetic, Geometry, Etc., MIT, Cambridge, MA, November 2018.
- *Hodge filtration on the de Rham fundamental group*, Seminar on Topics in Arithmetic, Geometry, Etc. (on Nonabelian Chabauty), MIT, Cambridge, MA, April 2018.
- *Cyclotomic units and Iwasawa's theorem*, Seminar on Topics in Arithmetic, Geometry,

Etc. (on Iwasawa theory), MIT, Cambridge, MA, October 2017.

- *Representations associated to weight 1 forms: end of the proof, and applications* Seminar on Topics in Arithmetic, Geometry, Etc. (on Modular representations of $\mathrm{Gal}(\overline{\mathbb{Q}}/\mathbb{Q})$), MIT, Cambridge, MA, February 2017.
- *Advances in sphere packing*, Pure Math Graduate Student Seminar, MIT, Cambridge, MA, November 2016.
- *Skeleton of the Jacobian: overview and uniformization*, Seminar on Topics in Arithmetic, Geometry, Etc. (on Tropical geometry), MIT, Cambridge, MA, October 2016.
- *The Siegel modular variety*, Seminar on Topics in Arithmetic, Geometry, Etc. (on Shimura varieties), MIT, Cambridge, MA, March 2016.
- *Dual abelian varieties*, Seminar on Topics in Arithmetic, Geometry, Etc. (on Moduli of abelian varieties), MIT, Cambridge, MA, October 2015.
- *Isogeny volcanoes*, Pure Math Graduate Student Seminar, MIT, Cambridge, MA, March 2015.
- *Finite flat group schemes*, Seminar on Topics in Arithmetic, Geometry, Etc. (on Abelian varieties), MIT, Cambridge, MA, February 2015.
- *Initial results on multiple zeta values*, Seminar on Topics in Arithmetic, Geometry, Etc. (on The projective line minus three points), MIT, Cambridge, MA, November 2014.
- *Modular polynomials and complex multiplication*, Part III Seminar Series, Cambridge University, Cambridge, CB, March 2014.

OTHER PROFESSIONAL EXPERIENCE

- **Microsoft Research New England** (6/2016-8/2016), Research on linear programming bounds for sphere packing under Henry Cohn.
- **Williams College** (6/2012-8/2012), Research in analytic number theory under Steven Miller.
- **Department of Defense** (6/2011-8/2011), Development of algorithms for algebraic geometry.
- **East Tennessee State University** (6/2010-8/2010), Research in combinatorics under Anant Godbole.
- **Mathematical Association of America** (6/2010), Assistant at the Math Olympiad Summer Program under Zuming Feng.

COMPUTER SKILLS

Programming Languages: C++, Python, R, SageMath, Magma (computer algebra)
Spreadsheet Tools: Microsoft Excel, Google Sheets
Presentation Software: LaTeX (Beamer), Powerpoint, OneNote
Collaboration Tools: GitHub, Dropbox, Zoom

TEACHING & DIVERSITY TRAINING

- Kauffman Teaching Certificate Program (MIT) – Semester-long course on active learning teaching practices with an emphasis on use in STEM classrooms.
- Certificate on Diversity and Inclusion (UGA) – Participation in a minimum of six seminar centered around strategies for creating a more inclusive workplace/classroom.

TEACHING EXPERIENCE

Instructor – MATH 4450/6450 (Comp. Number Theory & Crypto.) Fall 2021
University of Georgia, Athens, GA

- One section of a course on algorithms in computational number theory and cryptology for undergraduate math majors and master's students.

Instructor – MATH 2260 (Calculus II) Spring 2021
University of Georgia, Athens, GA

- One section of a course on integral calculus and series.
- Taught using a hybrid model (Zoom + in person).

Instructor – MATH 2250 (Calculus I) Fall 2020
University of Georgia, Athens, GA

- Two sections of a course on differential calculus.
- Taught using a hybrid model (Zoom + in person).

Instructor – MATH 1113 (Precalculus) Fall 2019
University of Georgia, Athens, GA

- Two sections of a course on polynomials, trigonometry, exponentials, and logarithms.

Teaching Assistant – 18.05 (Probability and Statistics) Spring 2018
Massachusetts Institute of Technology, Cambridge, MA

- Supported students in partially flipped-classroom style class.
- Gave occasional short lectures (about 15 minutes each) to the class.

Instructor – 18.01 IAP (Calculus I and II Review Class) January 2017
Massachusetts Institute of Technology, Cambridge, MA

- Four weeks of lecture to review all of 18.01 (Calculus I and II) for students who almost passed during the fall semester.
- Worked with individual students to fill weaknesses in background knowledge, test taking strategies, etc.

Teaching Assistant – 18.821 Project Lab in Mathematics Spring 2016
Massachusetts Institute of Technology, Cambridge, MA

- Mentored teams of students on short-term research projects.
- Provided concrete suggestions for improving overall paper structure and general mathematical writing.

Instructor – Art of Problem Solving (various classes) 2015 to present

- Taught mathematical problem-solving based online classes to bright middle and high-school students.

Instructor – Games and Puzzles Fall 2012
University of Michigan, Ann Arbor, MI

- Designed and taught course on games and puzzles for Honors freshmen.
- Taught mathematical problem solving skills as related to economics, computer science, psychology, and education.

Course Assistant – Honors Analysis I, II Fall 2012 - Spring 2013
University of Michigan, Ann Arbor, MI

- Prepared and gave weekly lectures as discussion section leader.
- Evaluated and suggested improvements to students' proof writing and solutions.

Course Assistant – Data, Functions, and Graphs Fall 2012
University of Michigan, Ann Arbor, MI

- Worked directly with students to support small group work in class.

Course Assistant – Honors Mathematics I, II Fall 2011 - Spring 2012
University of Michigan, Ann Arbor, MI

- Prepared and gave weekly lectures as discussion section leader.
- Held weekly office hours on introductory analysis.

Course Assistant – Explorations in Randomness Spring 2011
University of Michigan, Ann Arbor, MI

- Held twice-weekly office hours on combinatorics and probability.

Grader Summer 2010
Mathematical Olympiad Summer Program, Lincoln, NE

- Worked with small groups of the nation's best mathematics students to teach creative problem solving in combinatorics.
- Evaluated and suggested improvements to students' mathematical rigor and proof-writing style.

STUDENTS SUPERVISED

High School Research

- 2016-2017: Matthew Hase-Liu, fast point-counting on trinomial curves

Undergraduate Supervised Reading

- 2019: Kevin Catellanos. MIT., Deven Lahoti. MIT.
  Arithmetic Geometry ed. by Cornell and Silverman
- 2018: Zixuan Xu. MIT.
  Problems in Algebraic Number Theory by Murty and Esmonde
- 2017: Max Vargas. MIT.
  An Invitation to Algebraic Geometry by Smith, Kahanpää, Kekäläinen, and Traves
- 2015: Linh Nguyen. MIT.
  Multiplicative Number Theory by Davenport

SERVICE

2020-2021

- Papers refereed for IMRN, Journal of Comp. Math.
- Papers reviewed for MathSciResNet, ZBMath.

2019-2020

- Arizona Winter School 2020, Study group leader on classical Chabauty.
- AMS Special Session on Explicit Methods in Arithmetic Geometry in Characteristic p (a Mathematics Research Communities Session) at the Joint Math Meetings 2020, Co-organizer

2018-2019

- Contributed Talk Session on number theory at Joint Math Meetings 2019, co-chair
- MIT Corporation Joint Advisory Committee, Member
- Sidney-Pacific Graduate Community Board of Trustees, Chair

2017-2018

- MIT Institute Committee on Graduate Stipends, Co-chair
- MIT Institute Working Group on Graduate Housing, Member
- MIT Graduate Student Council, Housing and Community Affairs Co-chair - supported subcommittees focused on mental health and on support for underpriviledged and/or minority students.
- MIT Seminar on Topics in Arithmetic, Geometry, Etc. (on Nonabelian Chabauty), Co-organizer

2016-2017

- President of Sidney-Pacific Graduate Community (responsible for social and academic programming for a 670+ person graduate apartment building)
- Founder and co-organizer of Sidney-Pacific Graduate Student Seminar (an interdisciplinary, expository seminar series by graduate students for graduate students)
- Graduate student representative to MIT Math Visiting Committee (an evaluation body for the department)

2015-2016

- MIT Pure Math Graduate Student Seminar, Co-organizer

2014

- Volunteer in middle school classrooms through STIMULUS program

2013

- Contributed Talk Session on number theory at Joint Math Meetings 2013, co-chair

2010 - 2013

- Undergraduate Assistant, Michigan Math Circle (MMC) – MMC provides area middle and high school students who enjoy mathematics with the opportunity to learn exciting topics that fall outside of the standard curriculum.
- Grader, United States of America Math Olympiad

2012

- Assistant Coach, Michigan team for American Regional Mathematics League

2011

- Chair of Contributed Talk Session on combinatorics at Joint Math Meetings

2005 - 2009

- Coach, Saginaw Arts and Sciences Academy MATHCOUNTS team