Jeffrey Hatley

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Education

University of Massachusetts, Amherst, MA

Ph.D. in Mathematics, 2015
Thesis Advisor: Tom Weston

University of Massachusetts, Amherst, MA

M.S. in Mathematics, 2011

The College of New Jersey, Ewing, NJ

B.A. in Mathematics with honors, 2009
Minor: Art History; Phi Beta Kappa

Employment

Union College, Schenectady, NY

Associate Professor, September 2023 – Present
Assistant Professor, September 2018 – August 2023
Visiting Assistant Professor, September 2015 – August 2018

Teaching Experience

Union College Fall 2015 - Present

- Calculus I, Calculus II, and Multivariable Calculus with Linear Algebra
- Introduction to Logic & Set Theory
- Number Theory
- Real Variable Theory
- Complex Analaysis
- Mathematical Cryptology
- Ordinary Differential Equations
- Applied Linear Algebra
- Independent studies: Algebraic Number Theory, p-adic numbers, Galois theory, commutative algebra

- Intermediate Algebra (AOP Summer Session)
- Senior Theses (available on my website)
  - ☐ Frank Rocco, *Elliptic Curve Cryptology* (2017)
  - ☐ Casey Bruck, *A Concrete Example of Prime Behavior in Quadratic Fields* (2017)
  - ☐ Allegra Dawes, *Geometric Group Theory and Hyperbolic Groups* (2019)
  - ☐ Nicholas Kender, *Symmetric Polynomials: The Fundamental Theorem and Uniqueness* (2019)
  - ☐ Edward Winters, *Analysis of the Doomsday Algorithm* (2020)
  - ☐ Zachary Porat, *Classification of Torsion Subgroups for Mordell Curves* (2020)
  - ☐ Thomas Farina, *The Relationship Between Zeros of the Riemann Zeta Function and Primes* (2021)
  - ☐ Haoxuan Huang, *Primitive Root Theorem* (2022)
  - ☐ John Andre, *Exploration and Proof of the Primitive Root Theorem* (2022)
  - ☐ Daniel Tyebkhan, *Factoring Integers with Elliptic Curves* (2023)
  - ☐ Khai Dong, *Attacks on Discrete-Log Cryptography on Elliptic Curves* (2024)
  - ☐ Mayah Teplitskiy, *Elliptic Curves and Diophantine Stability* (2024)
- Undergraduate Research
  - ☐ Casey Bruck, *Composite Sequences and Covering Systems* (Summer 2017)
  - ☐ Jason Stack and Tzu-Ruei Huang, *Noncongruence witnesses for elliptic curves* (Summer 2020)
  - ☐ Jason Stack, *Infinite families of elliptic curves of large rank* (Fall 2021); See Publication #12
  - ☐ Mayah Teplitskiy, *Polynomials over fields of characteristic p which commute under composition* (Winter 2022-Spring 2022); See Publication #15

University of Massachusetts Amherst, Fall 2009- Spring 2015

- Calculus I, Calculus II, Calculus II for Life Sciences and Business
- Linear Algebra

Research Publications

Note: † indicates undergraduate coauthor

[18] *On a conjecture of Mazur predicting the growth of Mordell–Weil ranks in $\mathbb{Z}_p$-extensions* (with Rylan Gajek-Leonard, Debanjana Kundu, and Antonio Lei), preprint. arXiv:2401.07792

[17] *Statistics for anticyclotomic Iwasawa invariants of elliptic curves* (with Debanjana Kundu and Anwesh Ray), **Mathematische Zeitschrift**, Vol. 407, No. 49 (2024).

[16] *λ-invariant stability in families of modular Galois representations* (with Debanjana Kundu), **Research in the Mathematical Sciences**, Vol. 10, No. 33 (2023). https://doi.org/10.1007/s40687-023-00396-w

[15] *Polynomials in $\mathbf{F}_p[x]$ which commute under composition* (with Mayah Teplitskiy†), **PUMP Journal of Undergraduate Research**, Vol. 6 (2023), 102–114.

[14] *The vanishing of anticyclotomic μ-invariants for non-ordinary modular forms* (with Antonio Lei), **Comptes Rendus Mathématique**, Vol. 361 (2023), 65–72.

[13] *Control theorems for fine Selmer groups, and duality of fine Selmer groups attached to modular forms* (with Debanjana Kundu, Antonio Lei, and Jishnu Ray), The Ramanujan Journal, Vol. 60 (2023), 237–258.

[12] *Two infinite families of elliptic curves with rank greater than one* (with Jason Stack†), **Integers**, Vol. 22 (2022), #A1.

[11] *Comparing anticyclotomic Selmer groups of positive coranks for congruent modular forms – Part II* (with Antonio Lei), **Journal of Number Theory**, Vol. 229 (2021), 342–363. arXiv:2009.03772

[10] *Λ-submodules of finite index of anticyclotomic plus and minus Selmer groups of elliptic curves* (with Antonio Lei and Stefano Vigni), to appear in **manuscripta mathematica**, Vol. 167, No. 3-4 (2021), 589–612.

[9] *Groups of generalized G-type and applications to torsion subgroups of rational elliptic curves over infinite extensions of* **Q** (with Harris B. Daniels and Maarten Derickx), **Transactions of the London Mathematical Society**, Vol. 6, No. 1 (2019), 22–52.

[8] *Comparing anticyclotomic Selmer groups of positive coranks for congruent modular forms* (with Antonio Lei), **Mathematical Research Letters**, Vol. 26, No. 4 (2019), 1115–1144.

[7] *Arithmetic properties of signed Selmer groups at nonordinary primes* (with Antonio Lei), **Annales de l'Institut Fourier**, Vol. 69, No. 3 (2019), 1259–1294.

[6] *Rank parity for congruent supersingular elliptic curves*, **Proceedings of the AMS**, Vol. 145 (2017), 3775–3786.

[5] *Modular forms of arbitrary even weight with no exceptional primes*, **Journal of Number Theory**, Vol. 166 (2016), 158–165.

[4] *Elliptic curves with maximally disjoint division fields* (with H. B. Daniels and J. Ricci), **Acta Arithmetica**, Vol. 175, No. 3 (2016), 211–223.

[3] *Obstruction criteria for modular deformation problems*, **International Journal of Number Theory**, Vol. 12, No. 1 (2016), 273–285.

[2] *The Probability of Relatively Prime Polynomials in $\mathbb{Z}_{p^k}[x]$* (with T. Hagedorn), **Involve, a Journal of Mathematics**, Vol. 3, No. 2 (2010), 223–232.

[1] *Numerical Evidence on the Uniform Distribution of Power Residues for Elliptic Curves* (with A. Hittson), **Involve, a Journal of Mathematics**, Vol. 2, No. 3 (2009), 306–321.

Recent and Upcoming Invited/Plenary Talks

• "Rational points on elliptic curves over (infinite) extensions," West Chester University Math Colloquium, March 20, 2024.

• "λ-invariant stability in families of modular Galois representations," AMS Special Session on Number Theory at Non-PhD Granting Institutions, Joint Math Meetings, January 5, 2023.

• "Arithmetic statistics for Iwasawa invariants of elliptic curves," AMS Sectional Meeting Special Session on Algebraic and Analytic Theory of Elliptic Curves (Amherst MA), October 2, 2022.

• "λ-invariant stability in families of modular Galois representations," AMS Sectional Meeting Special Session on Iwasawa Theory (Amherst MA), October 1, 2022.

• "Arithmetic Statistics for Iwasawa Invariants of Elliptic Curves," Five College Number Theory Seminar, March 8, 2022.

• "Recent progress in positive rank Iwasawa theory," Special session on algebraic number theory, Canadian Mathematical Society Summer Meeting, June 8, 2021. (Online)

• "Comparing positive rank Iwasawa modules," AMS Special Session on A Showcase of Number Theory at Undergraduate Institutions, Joint Math Meetings, January 6, 2021. (Online)

• "Iwasawa theory in the positive rank setting," Arizona State University Number Theory Seminar, November 20, 2020. (Online)

• "Iwasawa Theory and Goldfeld's Conjecture," unQVNTS (University of Vermont), October 31, 2019.

• "The Birch and Swinnerton-Dyer Conjecture," The College of New Jersey Mathematics Colloquium, September 25, 2019.

• "Variation of arithmetic invariants in families," Front Range Number Theory Day (CU Boulder), April 27, 2019.

• "Torsion subgroups of rational elliptic curves over infinite extensions," AMS Sectional Meeting Special Session on Algebraic Number Theory (Hartford CT), April 14, 2019.

• "Anticyclotomic Iwasawa Theory in the Positive Rank Setting," Cornell University Number Theory Seminar, November 16, 2018.

• "Heads or tails? Coin-flipping with elementary number theory," MAA Session on Innovative Teaching Practices in Number Theory, Joint Math Meetings 2018.

• "Anticyclotomic Iwasawa theory in the positive corank case," Five College Number Theory Seminar, December 5, 2017.

• "Rank parity in families of nonordinary modular forms," University of Connecticut Algebra Seminar, November 1, 2017.

• "Unobstructed Modular Deformation Theory," Université Laval séminaire d'algèbre et de géométrie gradué, March 7, 2016.

• "Pairs of Elliptic Curves with Large Galois Image," Five College Number Theory Seminar, February 9, 2016.

Recent Contributed Talks

These are talks for which my submitted abstract was selected by the conference or session organizers.

• "Torsion subgroups of rational elliptic curves over infinite extensions," CNTA XV at Université Laval, July 11, 2018.

• "Comparing Selmer groups of positive corank," CTNT 2018 at the University of Connecticut Storrs, June 1, 2018.

• "Comparing Selmer groups of positive corank," Upstate New York Number Theory Conference, April 29, 2018.

• "Comparing anticyclotomic Selmer groups of positive coranks for congruent modular forms," AMS Session on Number Theory I, Joint Math Meetings 2018.

• "Rank parity for congruent modular forms," Upstate New York Number Theory Conference, May 6, 2017.

• "Arithmetic properties of signed Selmer groups at nonordinary primes," Joint Math Meetings 2017.

• "Rank parity for congruent supersingular elliptic curves," Conférence de Théorie des Nombres Québec-Maine, October 8, 2016.

• "Pairs of Elliptic Curves with Large Galois Image," Five College Number Theory Seminar, February 9, 2016.

Grants

• 2019-2022 NSF Collaborative grant. DMS-1901866 *Upstate New York Number Theory Conference* (collaborative with Ravi Ramakrishna and Doug Haessig)

Professional Service

• Local organizer: Upstate New York Number Theory Conference 2021

• Undergraduate poster judge at JMM 2021

• Master's thesis committee for Cédric Dion, *Fonction L p-adique d'une forme modulaire*, 2020. Université Laval

• Referee for Transactions of the AMS, Proceedings of the AMS, Proceedings of the LMS, Bulletin of the LMS, Annales mathématiques du Québec, the International Journal of Number Theory, Rad HAZU, and American Mathematical Monthly

• Founding organizer of the Upstate New York Online Number Theory Colloquium

• Author of Mathematical Reviews for MathSciNet

Departmental Service

• Co-organizer for Student Seminar, Union College (Spring 2022-Winter 2023)

• Curriculum Committee (Fall 2021 - Present)

• Admissions co-liason (Fall 2018 - Spring 2020)

• Graduate school liason, Union College (Fall 2015 - Spring 2018)

• REU liason, Union College (Fall 2015 - Present)

• Departmental website co-editor (Winter 2019- Present)

• Co-organizer of the 2016 and 2019 Union College Math Conferences

• Co-organizer for Student Seminar, Union College (Winter-Spring 2017)

• Search committee member (multiple searches)

Union College Service

• Faculty Review Board, Center 2 non-tenured representative (Fall 2021 - Spring 2022)

• Undergraduate Research Committee Division III Representative (Winter 2019 - Present)

• Writing Board Division III Representative (Winter 2019)

• Ad hoc tenure committee (Fall 2023)

Honors and Awards

- Departmental Distinguished PhD Thesis Award, UMass Amherst, 2015
- Phi Beta Kappa Membership, Delta of New Jersey, 2009