David Corwin

Contact Information

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Languages: English, French (Fluent), Dutch, German Hebrew, Norwegian (Conversational), Japanese (Basic)

Education

A.B., Mathematics *2013*
Princeton University, Princeton, NJ, USA.

Ph.D., Mathematics *2018*
Ph.D. Defense: April 2018
Massachusetts Institute of Technology, Cambridge, MA, USA.

Study Abroad, Mathematics *Spring 2012*
Université de Paris VI - Jussieu, Paris, France.

Chateaubriand Fellowship, Mathematics *Spring 2017*
Ecole Normale Supérieure, Paris, France.

Academic Employment

RTG Post-doctoral Scholar *2018-present*
UC Berkeley, Berkeley, CA, USA.

MSRI Postdoctoral Fellowship *Fall 2020*
MSRI, Berkeley, CA, USA.

Published Papers

Elliptic Curves with Full 2*-Torsion and Maximal Adelic Galois Representation*, joint with T. Feng, S. Trebat-Leder, and Z. Li, *Mathematics of Computation* Math. Comp., **83** (2014), pages 2925-2951.

On Cohen-Macaulayness of S_n-invariant subspace arrangements, joint with A. Brookner, P. Etingof, and S. Sam, *International Mathematics Research Notices* IMRN, **no. 7** (2016), pages 2104-2126.

The polylog quotient and the Goncharov quotient in computational Chabauty-Kim theory II, joint with I. Dan-Cohen, *Transactions of the American Mathematical Society* Trans. Amer. Math. Soc., **373** (2020), pages 6835-6861.

The polylog quotient and the Goncharov quotient in computational Chabauty-Kim theory I, joint with I. Dan-Cohen, *International Journal of Number Theory* IJNT, **16** (2020), pages 1859-1905.

Preprints

Brauer and Etale Homotopy Obstructions to Rational Points on Open Covers, joint with T. Schlank. arXiv 2006.11699.

See `math.berkeley.edu/~dcorwin` for papers in preparation and updates to this list.

Ongoing and Future Research Projects

Explicit Motivic Chabauty-Kim Theory, with Ishai Dan-Cohen. Continuing our previous work.

Etale Homology and Homotopy Obstructions for Del Pezzo Surfaces over $\mathbb{Q}_p(t)$, with Tomer Schlank.

Motivic Chabauty-Kim Theory for Elliptic and Higher Genus Curves, discussions with Owen Patashnick, Ishai Dan-Cohen, Stefan Wewers, and others.

Etale and Motivic Homotopy Types of Rational Surfaces, with Ambrus Pal. Found rational surfaces that are homotopy equivalent over every completion of $\mathbb{Q}$ but not over $\mathbb{Q}$, working on finding two surfaces that are etale homotopy equivalent but not $\mathbb{A}^1$-homotopy equivalent over $\mathbb{Q}$.

Mathematical Interests

Primary interests: number theory and its connections to algebraic geometry and topology
Secondary interests: logic, representation theory, physics

Research Talks Given

Etale Homotopy Obstructions and Section Conjectures in Fibrations, Homotopical Arithmetic Geometry Seminar, Online, October 2020.
Local-Global Principles for Diophantine Equations and Topology, Connecticut Summer School in Number Theory, Online, June 2020.
Explicit Motivic ChabuatyKim, Stanford Number Theory Seminar, Stanford, October 2019.
Local-Global Principles for Diophantine Equations and Topology, The 9th Algebra and Number Theory Day, Beer Sheva, August 2019.
Explicit Non-Abelian Chabauty via Motivic Periods, Oxford Number Theory Seminar, Oxford, June 2019.
Brauer and Homotopy Obstructions to Rational Points, Number Theory Seminar, University of Washington, May 2019.
Polylogarithms, Chabauty's method, and the S-unit equation, Berkeley Arithmetic Geometry and Number Theory Seminar, UC Berkeley, October 2018.
Mixed Tate Motives and the S-Unit Equation, Explicit Methods in Number Theory, Oberwolfach, July 2018.
Motivic non-Abelian Chabauty's Method, RIMS NT/AG Seminar, RIMS, December 2017.
Obstructions to the Local-Global Principle Applied to Open Subvarieties, Suuron Goudou Seminar, RIMS, December 2017.
Etale Homotopy Obstructions for Rational Points Applied to Open Subvarieties, Harvard Number Theory Seminar, Harvard University, October 2017.
Cohen-Macaulayness of S_n-invariant subspace arrangements, The Prospects for Commutative Algebra, Osaka, July 2017.
Motivic Periods and Coleman Functions, Algophant 2017, Bordeaux, June 2017.
Beyond the Etale-Brauer Obstruction, Universität Duisburg-Essen, January 2016.
Surjectivity of Adelic Galois Representations Associated to Elliptic Curves, Bar Ilan University, May 2015.

Expository Talks Given

Rational and Integral Points on Algebraic Curves, DDC Introductory Seminar, September-October 2020.
Review of Cohomology, Berkeley Number Theory Seminar, January 2019.
The Local Albanese Map and the Hodge Filtration, MIT STAGE, April 2018.
Connections and Local Systems, MIT STAGE, February 2018.
Class Groups of Cyclotomic Fields, continued., MIT STAGE, September 2017.
Reconstruction of Cusps and Inertia Subgroups, Paris Anabelian Seminar, March 2017.
Multizeta Values, MIT PUMGRASS, October 2016.
From Quadratic Reciprocity to the Langlands Program, MIT PUMGRASS, March 2016.
Mumford's On Equations Defining Abelian Varieties II, MIT STAGE, November 2015.
Nilpotent Thickenings and Differential Calculus, MIT PUMGRASS, November 2015.
Fontaine's Il n'y a pas de variété abélienne sur $\mathbb{Z}$ Part 3, MIT STAGE, April 2015.
The Mysterious Relationship Between Number Theory and Topology, MIT PUMGRASS, February 2015.
Reduction of Brown's Proof, MIT STAGE, Fall 2014.
The de Rham Period Ring I, Learning seminar on p-adic Hodge theory, Fall 2014.
Milnor K-Theory, Seminar on higher dimensional class field theory, Fall 2014.
Survey of Algebraic K-Theory, Seminar on higher dimensional class field theory, Fall 2014.
Topological aspects of the fundamental group of the projective line minus three points, MIT STAGE, Fall 2014.
Purity Theorem Implies Target Theorem, MIT STAGE, Spring 2014.
Henniart's Proof of Local Langlands, BU Seminar on Local Langlands, Spring 2014.
The Nisnevich Site, MIT Juvitop, Spring 2014.
Admissible p-adic Representations, BU Seminar on Local Langlands, Spring 2014.
Etale Homotopy Theory, 18.915: MIT Graduate Seminar in Topology, Fall 2013.
Topological K-Theory, 18:915: MIT Graduate Seminar in Topology, Fall 2013.

Valuation Spectra, MIT STAGE, Fall 2013.
Cohomology of Eilenberg-Maclane Spaces, 18.915: MIT Graduate Seminar in Topology, Fall 2013.
Model Theory and the Ax-Grothendieck Theorem, Princeton University Undergraduate Math Colloquium, Fall 2012.
Introduction to Riemann Surfaces, Canada/USA Mathcamp, Summer 2009.

Teaching Experience

Teacher, Russian School of Mathematics - Acton, Summer 2020.
Taught a course on basic ring theory and quadratic algebraic number theory for high school students.

Instructor, UC Berkeley, Fall 2018-present.
Taught Math 185: Complex Analysis and Math 113: Introduction to Abstract Algebra twice each.

Directed Reading Program Mentor, MIT, January 2018.
Directing one student in learning about basic algebraic geometry during MIT's Independent Activities Period (IAP).

AoPS Online Instructor, Art of Problem Solving, 2016-2017.
Taught online math classes through the Art of Problem Solving (AoPS).

HCSSiM Junior Counselor, Hampshire College, 2016.
Taught and assisted in classes for advanced high school students at the Hampshire College Summer Studies in Mathematics (HCSSiM).

Recitation Instructor, MIT, 2016.
Teaching a recitation at MIT for the course 18.03: Differential Equations.

PRIMES Mentor, MIT, 2016.
Mentoring a high school student on a research project in number theory.

MIT Splash, MIT, 2015.
Taught five diverse math classes for high school students over the course of a weekend.

PRIMES Mentor, MIT, 2015.
Mentoring a high school student on a research project in number theory.

Directed Reading Program Mentor, MIT, January 2015.
Directing one student in learning p-adic zeta functions during MIT's Independent Activities Period (IAP).

SPUR Mentor, MIT, Summer 2014.
Mentored MIT undergrads on research projects in mathematics.

PRIMES-USA Mentor, MIT, 2014.
Mentored a high school student long-distance on a research project in number theory.

Directed Reading Program Mentor, MIT, January 2014.
Directed two students in learning class field theory during MIT's Independent Activities Period (IAP).

PROMYS Counselor, Boston University, Summer 2013.
Counseled high school students in the Program in Mathematics for Young Scientists (PROMYS) program at BU.

Course Assistant for Commutative Algebra, Princeton University, Fall 2012.

Ran weekly problem sessions for students in commutative algebra taught by Dr. Kevin Tucker at Princeton.

Conference and Workshop Participation

Arizona Winter School: Non-Abelian Chabauty (assistant), Tucson, March 2020.

Geometry and Arithmetic of Algebraic Varieties, Bonn, June 2019.

Masterclass: Elliptic Motives, Stockholm, May 2019.

Reinventing Rational Points, Paris, May-July 2019.

Arizona Winter School: Topology and Arithmetic, Tucson, March 2019.

Explicit Methods in Number Theory, Oberwolfach, July 2018.

Witt Vectors, Deformations, and Absolute Geometry, Burlington, VT, July 2018.

Homotopy Theory and Arithmetic Geometry: Motivic and Diophantine Aspects, London, July 2018.

Arizona Winter School: Iwasawa Theory, Tucson, March 2018.

Motives for Periods, Berlin, August 2017.

The Prospects for Commutative Algebra, Osaka, July 2017.

Journées Algophantiennes Bordelaises 2017, Bordeaux, June 2017.

ECHoRaP: Emory Conference on Higher Obstructions to Rational Points, Atlanta, May 2017.

Galois Theory of Periods and Applications, MSRI, Berkeley, March 2017.

3rd Workshop on Interactions between Arithmetic and Homotopy, London, February 2017.

Super QVNTS: Kummer Classes in Anabelian Geometry, Burlington, VT, September 2016.

Analogies Between Number Fields and Function Fields, Lyon, June 2016.

Algebra and Number Theory, Conference Lyon/Ottawa, Lyon, June 2016.

Fundamental Groups in Arithmetic Geometry, Paris, June 2016.

AGNES, Yale, April 2016.

Georgia Algebraic Geometry Symposium, Atlanta, October 2015.

Workshop: Local-Global Principles and Their Obstructions, Philadelphia, October 2015.

LMS-CMI Summer School on Diophantine Equations, Hay-on-Wye, Wales, September 2015.

Algebraic Geometry Summer Institute, Salt Lake City, July 2015.

Grothendieck 2015, Montpellier, France, June 2015.

Algebraic Varieties and Their Moduli, Pisa, Italy, May 2015.

Three-Day Workshop in Homotopy Theory: Goodwillie Calculus, Caesaria, Israel, May 2015.

Arizona Winter School: Arithmetic and Higher-Dimensional Varieties, Tucson, March 2015.

Workshop on Fundamental Groups and Periods, IAS, Princeton, October 2014.

Spring School on Classical and p-adic Hodge Theories, Rennes, France, May 2014.

Arizona Winter School: Arithmetic Statistics, Tucson, March 2014.

Hot Topics: Perfectoid Spaces and Applications, MSRI, Berkeley, February 2014.

Joint Mathematics Meetings, Baltimore, January 2014.

Fundamental Groups in Arithmetic and Algebraic Geometry, Pisa, Italy, December 2013.

Cohomology of Arithmetic Groups, Chicago, May 2013.

Arizona Winter School: Modular Forms and Modular Curves, Tucson, March 2013.

Joint Mathematics Meetings, San Diego, January 2013.

Joint Mathematics Meetings, Boston, January 2012.

Graduate Coursework

18.708: Topics in Algebra	Prof. Pavel Etingof
Math 281x (Harvard): Arakelov Theory	Dr. Hector Pasten
Math 229x (Harvard): Analytic Number Theory	Dr. Arul Shankar
18.715: Representation Theory	Prof. Pavel Etingof
Math 268 (Harvard): Pure Motives and Rigid Local Systems	Dr. Stefan Patrikis
18.786: Number Theory II: Galois Representations	Prof. Sug Woo Shin
18.726: Algebraic Geometry II	Prof. François Charles
Math 255x (Harvard): Topics in Diophantine Geometry (audit)	Dr. Arul Shankar
18.S097: Special Subject in Mathematics: Etale Homotopy	Dr. Tomer Schlank
18.787: Topics in Number Theory: Rational Points on Algebraic Varieties	Prof. Bjorn Poonen
18.915: Graduate Seminar in Topology	Prof. Mark Behrens
18.965: Geometry of Manifolds	Prof. Paul Seidel
18.769: Topics in Lie Theory: D-Modules (audit)	Prof. Pavel Etingof
MA843 (BU): Advanced Number Theory: Shimura Varieties (audit)	Prof. Jared Weinstein

Summer Programs Attended

Emory Research Experience for Undergraduates, Emory University, 2012.
Participated in the REU at Emory University led by Prof. Ken Ono under the supervision of Prof. David Zureick-Brown.

Kupcinet-Getz Undergraduate Summer Program, Weizmann Institute of Science, 2011.
Learned mathematics under Prof. Stephen Gelbart.

Grader and Problem Writer, Art of Problem Solving Foundation, 2009-2010.
Gave students feedback on problems written for AoPS online classes and helped write problems for their alcumus system.

Canada/USA Mathcamp, 2007-2009.
Spent three summers as a camper.

Employment

Summer Intern, SolidWorks, Summer 2011.
Worked as a summer undergrad intern for the software company SolidWorks.

Contest Awards

Putnam Exam
Honorable Mention, 2012.

USA Mathematical Olympiad
Three-time qualifier, 2006-2008.
Score of 15, 2008.

US Physics Team
Two-time semifinalist, 2008-2009.

National French Exam
First place, 2006, 2008.

References

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