CURRICULUM VITAE: DAVID J. ZYWINA

Department of Mathematics,
Cornell University,
Ithaca, NY 14853

https://pi.math.cornell.edu/~zywina
zywina@math.cornell.edu

Education

- University of California, Berkeley, 2003–2008
  Ph.D. in Mathematics
  Advisor: Bjorn Poonen
- McMaster University, 1999–2003
  B.Sc. (Honours) in Mathematics

Employment

- Cornell University, 2013–present
  Current position: Associate Professor
- Institute for Advanced Study, Member 2012–2013
- Queen's University, Postdoctoral fellow 2011–2012
- University of Pennsylvania, Lecturer 2008–2011

Research Interests

Arithmetic geometry with strong influences from Galois theory and computational number theory; Galois representations, abelian varieties, equidistribution, monodromy.

Honors/funding

- Simons Foundation's Collaboration Grants for Mathematicians, 2020-2024
- Junior Faculty Teaching Award, 2015
- Clay Liftoff Fellow, 2008.
- Herb Alexander Prize, for outstanding doctoral dissertation (UC Berkeley), 2008
- Outstanding Graduate Student Instructor Award - Berkeley 2006/2007
- Natural Sciences and Engineering Research Council of Canada (NSERC) Postgraduate Scholarship 2004-2006
- Governor General's Academic Medal, McMaster 2003

Graduate students supervised

- Zachary Couvillion – current Ph.D. student
- Emir Eray Karabiyik – current Ph.D. student
- Rakvi – Ph.D. 2021
  Dissertation: *A classification of genus* 0 *modular curves with rational points*
  First position: Hans Rademacher Instructor, University of Pennsylvania
- Theodore Hui – Ph.D. 2017
  Dissertation: *A Radical Characterization of Abelian Varieties*
  First position: Quantitative Researcher, Eastmore Group

Publications/Preprints[1]

- There are infinitely many elliptic curves over the rationals of rank 2, arXiv:2502.01957
- An elliptic surface with infinitely many fibers for which the rank does not jump, arXiv:2502.01026
- Drinfeld modules with maximal Galois action, arXiv:2502.01030
- Open image computations for elliptic curves over number fields,
  Res. Number Theory 11 (2025), no. 1, Paper No. 1, 24 pp.
- Improved bounds for integral points on modular curves using Runge's method, arXiv:2403.14904
- Explicit open images for elliptic curves over $\mathbb{Q}$, arXiv:2206.14959
- Torsion bounds for a fixed abelian variety and varying number field (with Samuel Le Fourn and Davide Lombardo), arXiv:2208.02345
- Explicit open images for elliptic curves over $\mathbb{Q}$, arXiv:2206.14959
- Determining monodromy groups of abelian varieties, arXiv:2009.07441
  Research in Number Theory 8 (2022), no. 4, Paper No. 89.
- Computing actions on cusp forms, arXiv:2001.07270
- Families of abelian varieties and large Galois images, arXiv:1910.14174
  To appear: *International Mathematics Research Notices*
- An effective open image theorem for abelian varieties, arXiv:1910.14171
- Possible indices for the Galois image of elliptic curves over $\mathbb{Q}$, arXiv:1508.07663
- On the possible images of the mod ℓ representations associated to elliptic curves over $\mathbb{Q}$, arXiv:1508.07660
- Modular forms and some cases of the inverse Galois problem, arXiv:1508.07916
  To appear: *Canadian Mathematical Bulletin*. DOI: 10.4153/S0008439522000534
- An explicit Jacobian of dimension 3 with maximal Galois action, arXiv:1508.07655
- Galois groups arising from families with big orthogonal monodromy, arXiv:2001.07273
  To appear: *International Journal of Number Theory*, DOI: 10.1142/S1793042123500057
- On the surjectivity of mod ℓ representations associated to elliptic curves, arXiv:1508.07661
  To appear: *Bulletin Of The London Mathematical Society*, DOI: 10.1112/blms.12701.
- The inverse Galois problem for orthogonal groups, arXiv:1409.1151
  To appear: *Transactions of the AMS*.
- Modular curves of prime-power level with infinitely many rational points (with Andrew Sutherland), *Algebra & Number Theory*, **11** (2017), no. 5, p. 1199–1229.
- Abelian varieties over large algebraic fields with infinite torsion, arXiv:1012.2477
  Israel Journal of Mathematics, **211** (2016), no. 1, 493–508.
- The Sato-Tate law for Drinfeld modules, arXiv:1110.4098
  Transactions of the American Mathematical Society, **368** (2016), p. 2185–2222.
- Bounds for the Lang-Trotter conjectures, arXiv:1508.07682
  Contemporary Mathematics **655** (2015), p. 235–256.
- The inverse Galois problem for $\mathrm{PSL}_2(\mathbb{F}_p)$, arXiv:1303.3646
  Duke Mathematical Journal, **164** (2015), no. 12, 225–2292.
- The splitting of reductions of an abelian variety, arXiv:1111.0624
  International Mathematics Research Notices, **18** (2014), p. 5042–5083.
- Splitting fields of characteristic polynomials of random elements in arithmetic groups (with Florent Jouve & Emmanuel Kowalski), arXiv:1008.3662
  Israel Journal of Mathematics, **193** (2013), no. 1, 263–307.
- Explicit class field theory for global function fields, arXiv:1110.3779
  Journal of Number Theory (volume in honor of David Hayes), **133** no. 3 (2013), p. 1062–1078

[1] In mathematics, authors are always listed in alphabetical order regardless of contribution. If all mathematicians wrote a paper, I would be last!

- The Chebotarev invariant of a finite group (with Emmanuel Kowalski), arXiv:1008.4909
  Experimental Mathematics, **21** no. 1 (2012), p. 38-56.
- A refinement of Koblitz's conjecture, arXiv:0909.5280
  Int. J. Number Theory, **3**, (2011) 739–769.
- Elliptic curves with maximal Galois action on their torsion points, arXiv:0809.3482
  Bull. London Math. Soc., **42** (2010) 811–826.
- Arithmetic E_8 lattices with maximal Galois action (with Anthony Várilly-Alvarado), arXiv:0803.3063
  LMS J. Comput. Math. **12** (2009) 144-165.
- An explicit integral polynomial whose splitting field has Galois group $W(E_8)$ (with Florent Jouve & Emmanuel Kowalski), arXiv:0801.1733
  Journal de théorie des nombres de Bordeaux, **20** no. 3 (2008), p. 761-782.

Conferences organized

- Upstate New York Number Theory Conference.
  Cornell, April 27–28th 2019. (Co-organized with Ravi Ramakrishna)
  NSF funding: $14,995.
  Union College, 2021, *University of Rochester, 2023*

- Upstate New York Number Theory Conference.
  Cornell, April 10–12th 2015. (Co-organized with Nicolas Templier)
  NSF funding: $15,000.
  University of Rochester, 2016; University of Binghamton, 2017; University of Buffalo, 2018

Teaching Experience

Assistant/Associate professor: Cornell University
Math 1120 - Calculus II – Spring 2014, Spring 2015 (×2), Spring 2021 (×2)
Math 1910 - Engineering calculus – Fall 2016 (×2)
Math 3110 - Introduction to Analysis – Fall 2019 (×2), Fall 2024 (×2)
Math 3320 - Introduction to number theory – Fall 2015, Fall 2017 (×2), Fall 2021–2022
Math 4310 - Linear algebra – Spring 2024 (×2)
Math 4330 - Honors linear algebra – Fall 2018
Math 6310 - Algebra – Fall 2018, Fall 2020
Math 6320 - Algebra – Spring 2016, Spring 2022
Math 6370 - Algebraic number theory – Fall 2015, Spring 2018, Spring 2023
Math 6490 - Lie algebras – Fall 2014
Math 7370 - Topics in Number Theory (elliptic curves) – Spring 2020
Math 7390 - Topics in Algebra (arithmetic of curves) – Fall 2013
AS 1102 - Arts & Sciences advising seminar – Fall 2020

Lecturer: Queen's University
Math 121: Calculus, Fall 2011–Winter 2012
Applied Science 171J: Calculus I, Winter 2012

Lecturer: University of Pennsylvania
Math 503: Abstract algebra, Spring 2011
Math 724: Topics in algebraic geometry, Fall 2010
Math 350: Number theory, Fall 2009, 2010
Math 240: Calculus III, Spring 2010

Math 170: Ideas in Mathematics, Fall 2009
Math 114: Calculus II, Fall 2008 & Spring 2009
Math 103: Introduction to Calculus, Fall 2008

Invited seminar and conference talks (partial list)

Seattle, Joint Mathematical Meetings, Special Session on Mathematics Informed by Computing, January 2025
Albany, AMS Fall Eastern Sectional Meeting, October 2024
Wake Forest University, PANTS (Palmetto Number Theory Series), September 2024
MIT, Sixteenth Algorithmic Number Theory Symposium (ANTS XVI), July 2024
Brin Mathematics Research Center, Vistas in Number Theory, June 2024
University of Pennsylvania, Algebra seminar, April 2024 University of Warwick, Modular Curves and their Arithmetic, December 2023
Poznań, Arithmetic Algebraic Geometry Seminar, March 2023
Around Frobenius distributions and related topics III, October 2022
Bristol University, Heilbronn Number Theory Seminar, May 2021
VaNTAGe seminar on Sato-Tate conjecture for abelian varieties, May 2020,
Simons foundation, January 2020, Simons Collaboration on AGNTC, Annual Meeting
Quebec City, July 2018, Canadian Number Theory Association (CNTA) Conference XV
Oberwolfach, June 2018, Workshop: Field Arithmetic
University of Michigan, February 2018, Group, Lie and Number Theory Seminar
Adam Mickiewicz University, Poznań, Poland, July 2017, Abelian Varieties & Galois actions
Banff, May 2017, Arithmetic Aspects of Explicit Moduli Problems
NYU, December 2016, NYC Joint Number Theory Seminar
Fields Institute, May 2016, Montreal-Number Number Theory Workshop
MIT, March 2016, BC-MIT Number Theory
ICERM, September 2015, Modular Forms and Curves of Low Genus: Computational Aspects
Banff, September 2015, The Use of Linear Algebraic Groups in Geometry and Number Theory
University of Chicago, January 2015, Number theory seminar
Northwestern, January 2015, Number theory seminar
University of Luxembourg, November 2014, Workshop on Galois representations
Montreal, September 2014, CRM workshop: Statistics and number theory
Stanford University, May 2014, Number theory seminar
SUNY Buffalo, April 2014, Upstate New York Number Theory Conference
University of Connecticut, April 2013, Algebra seminar
ETH Zürich, March 2013, Number Theory Days
CIRM Luminy, February 2013, Workshop: Frobenius distributions
Oberwolfach, June 2013, Workshop: The Arithmetic of Fields
University of Colorado Boulder, April 2013, AMS Spring Western Section
Binghamton University, April 2013, Upstate New York Number Theory Conference
University of Pennsylvania, March 2013, Algebra seminar
Harvard University, March 2013, Number theory seminar
MIT, March 2013, Number theory seminar
Boston University, March 2013, Number theory seminar
Cornell University, January 2013, The Oliver Club
Princeton, January 2013, IAS and Princeton number theory seminar
University of Illinois at Urbana–Champaign, January 2013, Colloquium
Penn State, January 2013, Colloquium
McGill, December 2012, Colloquium
Montreal, December 2012, CMS Winter meeting

Michigan State, December 2012, Colloquium
University of Illinois at Urbana–Champaign, November 2012, Number theory seminar
New York, October 2012, Joint Columbia-CUNY-NYU number theory seminar
Institute for Advanced Study, October 2012, Postdoctoral talk
Queen's University, October 2011, Number theory seminar
Emory University, February 2011, Colloquium
McMaster University, January 2011, Colloquium
Emory University, December 2010, Algebra and number theory seminar
University of Maryland, College Park, October 2010, Algebra and number theory seminar
University of Wisconsin-Madison, October 2010, Number theory seminar
Princeton University, April 2010, IAS and Princeton Number theory seminar
MIT, December 2009, Number theory seminar
Montréal, March 2009, Québec-Vermont number theory seminar
University of Pennsylvania, February 2009, Algebra seminar.
Oberwolfach, February 2009, Workshop on field arithmetic
Waterloo, July 2008, Canadian Number Theory Association X meeting
ETH Zürich, March 2008, Number theory seminar.
MIT, October 2007, Seminar on Topics in Arithmetic, Geometry, Etc. (STAGE)
UC Berkeley, May 2007, Number theory seminar

Department service

- 1st Year Advising Committee, 2022–2023
- Computer Committee, 2019–2020
- Curriculum Committee, 2018–2019, 2024–2025
- Engineering Placement Exam Committee, 2016–2017, 2017–2018
- Graduate admissions committee, 2014–2015, 2015–2016, 2017–2018, 2021-2022, 2023-2024, 2024–2025
- Math Majors Committee, 2014–2015, 2015–2016, 2020-2021, 2021-2022
- Oliver Club Secretary, 2013–2014, 2016–2017
- Library Committee, 2013–2014

Other service

- NSF research funding panel, 2021
- Outside member on a Ph.D. defense committee: Queen's University 2020, University of Bristol 2021.