JOSEPH RABINOFF

CURRICULUM VITÆ

CONTACT INFORMATION

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Citizenship: United States of America

EMPLOYMENT HISTORY

2019–present **Associate Professor**, Duke University.

2018–2019 **Associate Professor**, Georgia Institute of Technology.

2013–2018 **Assistant Professor**, Georgia Institute of Technology.

2009–2013 **Benjamin Peirce Assistant Professor**, Harvard University.

EDUCATION

2009 **Stanford University**, Stanford, California.
Ph.D. in Mathematics.
Dissertation: *Higher-level canonical subgroups for p-divisible groups*.
Advisors: Brian Conrad, Ravi Vakil.

2003 **Harvard University**, Cambridge, Massachusetts.
A.B., summa cum laude and highest honors in Mathematics.
Senior thesis: *The Bruhat-Tits building of a p-adic Chevalley group and an application to representation theory*.
Senior thesis advisor: Stephen DeBacker.

FUNDING

Uniform Manin–Mumford and uniform Mordell
National Science Foundation DMS-1601842
$150,000, 2016–2019 (NCE through 2021)

Berkovich skeleta, tropicalizations, and applications
National Security Agency award number H98230-15-1-0105
$20,000, 2015–2016

RESEARCH INTERESTS

I am interested in the intrinsic geometry of non-Archimedean analytic spaces and tropical varieties, and their applications to classical algebraic geometry and number theory.

LANGUAGES

- English: native tongue.
- French: good conversational and written ability.

Publications and Preprints

1. Taylor Dupuy, Eric Katz, Joseph Rabinoff, and David Zureick-Brown, *Total p-differentials on schemes over* $\mathbf{Z}/p^2$, `arXiv:1712.09487` (11 pages). To appear in the Journal of Algebra.
2. Taylor Dupuy and Joseph Rabinoff, *A rigid analytic proof that the Abel-Jacobi map extends to compact-type models*, `arXiv:1705.03034` (6 pages). Preprint.
3. Tyler Foster, Joseph Rabinoff, Farbod Shokrieh, and Alejandro Soto, *Non-Archimedean and tropical theta functions*, `arXiv:1705.08212` (20 pages). To appear in Mathematische Annalen.
4. Eric Katz, Joseph Rabinoff, and David Zureick-Brown, *Diophantine and tropical geometry, and uniformity of rational points on curves*, Algebraic geometry: Salt Lake City 2015, 231–279, Proc. Sympos. Pure Math., 97.2, Amer. Math. Soc., Providence, RI, 2018 (48 pages).
5. Walter Gubler, Joseph Rabinoff, and Annette Werner, *Tropical Skeletons*, Ann. Inst. Fourier (Grenoble) **67** (2017), no. 5, 1905–1961 (56 pages).
6. Eric Katz, Joseph Rabinoff, and David Zureick-Brown, *Uniform bounds for the number of rational points on curves of small Mordell–Weil rank*, Duke Math. J. **165** (2016), no. 16, 3189–3240 (51 pages).
7. Walter Gubler, Joseph Rabinoff, and Annette Werner, *Skeletons and Tropicalizations*, Adv. Math. **294** (2016), 150–215 (65 pages).
8. Matthew Baker and Joseph Rabinoff, *The skeleton of the Jacobian, the Jacobian of the skeleton, and lifting meromorphic functions from tropical to algebraic curves*, Int. Math. Res. Not. IMRN **16** (2015), 7436–7472 (36 pages).
9. Omid Amini, Matthew Baker, Erwan Brugallé, and Joseph Rabinoff, *Lifting harmonic morphisms I: metrized complexes and Berkovich skeleta*, Res. Math. Sci **2** (2015), Art. 7 (67 pages).

   || **Winner** Best Paper Award for Research in the Mathematical Sciences
10. Omid Amini, Matthew Baker, Erwan Brugallé, and Joseph Rabinoff, *Lifting harmonic morphisms II: tropical curves and metrized complexes*, Algebra Number Theory **9** (2015), no. 2, 267–315 (48 pages).
11. Mihran Papikian and Joseph Rabinoff, *Optimal quotients of Mumford curves and component groups*, Canad. J. Math. **68** (2016), no. 6, 1362–1381 (19 pages).
12. Brian Osserman and Joseph Rabinoff, *Lifting non-proper tropical intersections*, Tropical and Non-Archimedean Geometry, 15–44, Contemp. Math., 605, Amer. Math. Soc., Providence, RI, 2013 (29 pages).
13. Matthew Baker, Sam Payne, and Joseph Rabinoff, *On the structure of non-archimedean analytic curves*, Tropical and Non-Archimedean Geometry, 93–121, Contemp. Math., 605, Amer. Math. Soc., Providence, RI, 2013 (28 pages).
14. Matthew Baker, Sam Payne, and Joseph Rabinoff, *Non-Archimedean geometry, tropicalization, and metrics on curves*, Algebr. Geom. **3** (2016), no. 1, 63–105 (42 pages).
15. Joseph Rabinoff, *Tropical analytic geometry, Newton polygons, and tropical intersections*. Adv. Math. **229** (2012), 3192–3255 (63 pages).
16. Joseph Rabinoff, *Higher-level canonical subgroups for p-divisible groups*. J. Inst. Math. Jussieu **11** (2012), no. 2, 363–419 (56 pages).
17. Joseph Rabinoff, *Hybrid Grids and the Homing Robot*, Disc. Appl. Math. **140** (2004), 155–168 (13 pages).
18. Joseph Rabinoff, *The Bruhat-Tits building of a p-adic Chevalley group and an application to representation theory* (my senior thesis), available on my website (72 pages).

TEXTBOOKS

I co-wrote a free online linear algebra textbook called Interactive Linear Algebra:

http://textbooks.math.gatech.edu/ila/

HONORS AND AWARDS

2019 **Herman Fulmer Prize** (School of Mathematics, Georgia Tech)
In recognition of instructors who exhibit genuine regard for undergraduate students.

2018 **CTL/BP Junior Faculty Teaching Excellence Award** (CTL, Georgia Tech)
An Institute-level award in recognition of excellent teaching and educational innovation by junior faculty.

2012 **Certificate of Teaching Excellence** (Derek Bok Center, Harvard University)
Awarded to outstanding lecturers and preceptors each semester.

2008 **G.J. Lieberman Fellow in the Natural Sciences** (Stanford University)
Awarded in recognition of outstanding scholarship, teaching, university service, and demonstrated potential for leadership roles in the academic community.

2007 **Centennial Teaching Award** (Stanford University)
Recognizes and rewards outstanding teaching by Stanford teaching assistants in the Schools of Humanities and Sciences, Engineering, and Earth Sciences.

2003 **Thomas T. Hoopes Prize** (Harvard University)
Awarded for outstanding scholarly work or research.

2002 **Certificate for Distinction in Teaching** (Derek Bok Center, Harvard University)
Awarded to outstanding teaching fellows, teaching assistants, preceptors, and lecturers each semester.

COURSES TAUGHT

At Duke:

Fall, 2019 **Math 218:** Matrices and Vector Spaces

At Georgia Tech:

Fall, 2018 **Math 1553:** Introduction to Linear Algebra
Fall, 2017 **Math 1553:** Introduction to Linear Algebra
Fall, 2016 **Math 1553:** Introduction to Linear Algebra
Spring, 2016 **Math 4107:** Abstract Algebra I
Fall, 2015 **Math 4803/8803:** Introduction to Algebraic Number Theory
Fall, 2015 **Math 6421:** Algebraic Geometry I
Spring, 2015 **Math 4108:** Abstract Algebra II
Fall, 2014 **Math 4107:** Abstract Algebra I
Fall, 2014 **Math 6121:** Algebra I
Spring, 2014 **Math 6122:** Algebra II
Fall, 2013 **Math 2602:** Linear and Discrete Mathematics

At Harvard:

Spring, 2013 **Math 223b:** Graduate Algebraic Number Theory II
Fall, 2012 **Math 223a:** Graduate Algebraic Number Theory I

Fall, 2012 **Math 21a:** Multivariable Calculus

Fall, 2011 **Math 21b:** Linear Algebra and Differential Equations

Fall, 2010 **Math 121:** Linear Algebra and Applications

Spring, 2010 **Math 272x:** Analytic Spaces and Modular Forms

Fall, 2009 **Math 1a:** Introduction to Calculus

Other teaching activities

Math Circle instructor
For three semesters starting in the spring of 2014, I served as an instructor at the Emory Math Circle, an enrichment program for talented and motivated middle- and high-school students.

Mathematical Research Communities
In the summer of 2013, I led a successful MRC group in Snowbird, Utah.

Canada/USA Mathcamp
In the summer of 2012 I taught a week-long course entitled *Unique factorization and Fermat's last theorem*.

Selected invited talks

A. Talks at Research Conferences

10/2/19 **Regensburg Days on non-Archimedean geometry III**
Universität Regensburg, Germany
Abelian Schemes are Log Néron Models

5/17/17 **Simons Symposium on non-Archimedean and Tropical Geometry**
Elmau, Germany
Potential theory on curves, p-adic integration, and rational points

3/27/17 **Tropical Curve Counts, Motivic Integration and Nonarchimedean Geometry**
Universität Tübingen, Germany
The Tropical Skeleton

7/13/16 **Regensburg Days on non-Archimedean geometry II**
Universität Regensburg, Germany
Faithful Tropicalizations of Abelian Varieties

6/8/16 **SIAM Conference on Discrete Mathematics**
Georgia State University
Tropical Skeletons and the Section of Tropicalization

12/18/15 **Workshop on non-Archimedean analytic geometry II**
Mathematisches Forschungsinstitut Oberwolfach, Germany
Chabauty–Coleman on basic wide opens and applications to uniform boundedness

8/27/15 **Non-Archimedean Analytic Geometry: Theory and Practice**
Papeete, French Polynesia
The Tropical Skeleton

7/20/15 **AMS Summer Institute in Algebraic Geometry**
University of Utah
Uniform bounds on rational points via p-adic integration and Berkovich skeletons

7/1/15 **Rational points workshop 5**
Schney, Germany
p-adic analytic spaces and integration

6/2/15 **Non-Archimedean Geometry and its Applications**
University of Michigan
Attacking uniform Mordell and uniform Manin–Mumford via p-adic integration

4/30/15 **Bi-annual Algebraic and Tropical Meetings of Brown and Yale**
Brown University
Uniformity of rational points and tropical geometry
(plenary talk)

9/30/14 **Tropicalization, Realization, and Algebraic-Tropical Correspondence**
Eilat, Israel
Skeletons and tropicalizations in higher dimensions

11/8/13 **Commutative Algebra — Algebraic Geometry in the Southeast**
University of South Carolina
Continuous analogues of methods used to calculate component groups of Jacobians

10/2/13 **Regensburg Days on non-Archimedean geometry**
Universität Regensburg, Germany
The skeleton of the Jacobian and lifting rational functions from graphs to curves

4/1/13 **Simons Symposium on non-Archimedean and Tropical Geometry**
Saint John, US Virgin Islands
Analytic and tropical curves

11/8/12 **Workshop on non-Archimedean analytic geometry**
Mathematisches Forschungsinstitut Oberwolfach, Germany
Covers of curves and covers of skeleta

5/16/12 **Witt vectors in arithmetic, geometry, and topology**
University of New Mexico
The logarithm of a display

4/2/12 **Workshop on Tropical Geometry**
International Centre for Mathematical Sciences, Edinburgh, Scotland
The tropicalization of the Torelli map

5/12/11 **The Bellairs Workshop in Number Theory**
Barbados
Third nighttime lecture and fifth daytime lecture

B. Seminar and Colloquium Talks

9/4/18 **Duke University**
Seminar
From Diophantine Equations to p-adic Analytic Geometry

7/18/18 **Universität Regensburg** (Regensburg, Germany)
SFB Seminar
A Tale of Two (p-adic) Integrals

3/13/18 **Institut Mittag-Leffler** (Sweden)
Weekly Seminar
Tropical and non-Archimedean theta functions

11/27/15 **Instituto Nacional de Matemática Pura e Aplicada** (Brazil)
Colloquium of Geometry and Arithmetic
Attacking uniform Mordell and uniform Manin–Mumford via p-adic integration

5/8/15 **Stanford University**
Algebraic Geometry Seminar
Integration on wide opens and uniform Manin–Mumford

4/22/15 **University of Georgia**
Number Theory Seminar
Uniform bounds on rational points via p-adic integration and Berkovich skeletons

7/11/14 **Goethe-Universität Frankfurt am Main** (Frankfurt, Germany)
Colloquium
Jacobians of curves and graphs

7/10/14 **Universität Regensburg** (Regensburg, Germany)
Colloquium
Jacobians of curves and graphs

2/4/14 **Emory University**
Number Theory Seminar
Continuous analogues of methods used to calculate component groups of Jacobians

11/5/13 **University of Georgia**
Joint Athens–Atlanta Number Theory Seminar
Lifting covers of metrized complexes to covers of curves

10/30/13 **Clemson University**
Algebraic Geometry and Number Theory Seminar
Newton Polygons, Bernstein's theorem, and tropical intersection theory

10/25/13 **University of Virginia**
Algebra Seminar
Newton Polygons, Bernstein's theorem, and tropical intersection theory

6/20/13 **Universität Regensburg** (Regensburg, Germany)
Colloquium
Newton polygons, Bernstein's theorem, and tropical intersection theory

3/28/13 **Yale University**
Algebraic and Tropical Geometry Seminar
An analytic version of Raynaud's theorem on component groups

2/5/13 **University of North Carolina**
Number Theory Seminar
Constructing covers of curves with prescribed behaviour on component groups of Jacobians: a Berkovich perspective

2/6/12 **University of Michigan**
Group, Lie and Number Theory Seminar
The skeleton of the Jacobian and the Jacobian of the skeleton

2/1/12 **Harvard University**
Number Theory Seminar
The skeleton of the Jacobian and the Jacobian of the skeleton

1/27/12 **University of Pennsylvania**
Galois Seminar
The skeleton of the Jacobian and the Jacobian of the skeleton

11/04/11 **Brown University**
Algebraic Geometry Seminar
Bernstein's theorem, Newton polygons, and tropical intersections

10/28/11 **Stanford University**
Number Theory Seminar
Bernstein's theorem, Newton polygons, and tropical intersections

10/26/11 **University of California, Berkeley**
Number Theory Seminar
Bernstein's theorem, Newton polygons, and tropical intersections

04/19/11 **Yale University**
Algebra Seminar
Tropicalization, Berkovich curves, and implicitization

04/11/11 **Harvard University**
Faculty Colloquium
Implicitization via harmonic analysis on graphs, non-Archimedean analytic curves, and tropicalization

03/17/11 **Georgia Institute of Technology**
Algebra Seminar
Canonical subgroups for p-divisible groups

11/17/09 **Massachusetts Institute of Technology**
Harvard-MIT Algebraic Geometry Seminar
Tropical intersection numbers and canonical subgroups

C. Talks at Educational Conferences

03/18/19 **Gardner Institute Gateway Course Experience Conference**
Atlanta, Georgia
Teaching Assistant Experiences in Blended Learning Settings and Open Educational Resource Development for Introductory Linear Algebra Courses

Service Activities

A. Conferences organized

Spring, 2018 **Georgia Algebraic Geometry Seminar**
Co-organized a conference at Georgia Tech.

Spring, 2014 **Special session organizer**
I co-organized a special session entitled *Tropical and Nonarchimedean Analytic Geometry* at the Joint Mathematics Meetings in Baltimore in January of 2014.

B. Committee Work

At Georgia Tech:

2015–2019 **Undergraduate Committee**

2013–2014 **Colloquium Committee**

At Harvard:

2012–2013 **Graduate Admissions Committee**
2011–2012 **Number Theory Seminar Organizer**
2010–2011 **Colloquium Committee**