

Matthew Satriano

Associate Professor
Department of Mathematics
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EMPLOYMENT

University of Waterloo, Associate Professor, 2020–present
University of Waterloo, Assistant Professor, 2015–20
Johns Hopkins University, Postdoctoral Researcher, 2014–15
University of Michigan, Postdoc Assistant Professor, 2010–14

EDUCATION

University of California at Berkeley, 2010
Ph.D. Mathematics
Stacky Resolutions of Singular Schemes
Advisor: Martin Olsson
Princeton University, 2005
B.A. Mathematics, *summa cum laude*

INTERESTS

Algebraic Geometry, Arithmetic Dynamics, Equivariant Geometry and Stack Theory

REFEREED PUBLICATIONS

Accepted or Published:¹

1. Jason P. Bell, Fei Hu**, Matthew Satriano. Height Gap Conjectures, D -Finiteness, and a Weak Dynamical Mordell–Lang Conjecture. *Mathematische Annalen*, (2020), 20 pages, accepted.
2. Nguyen-Bac Dang**, Dragos Ghioca, Fei Hu**, John Lesieutre, and Matthew Satriano. Higher arithmetic degrees of dominant rational self-maps. *Annali della Scuola Normale Superiore di Pisa, Classe di Scienze*, (2020), 16 pages, accepted.
3. David McKinnon and Matthew Satriano. Approximating rational points on toric varieties. *Transactions of the American Mathematical Society*, (2020), 21 pages, accepted.
4. Yoav Len** and Matthew Satriano. Lifting tropical self intersections. *Journal of Combinatorial Theory, Series A*, 170 (2020), 105138, 21 pp.
5. Jason Bell, Dragos Ghioca, and Matthew Satriano. Dynamical Uniform Bounds for Fibers and a Gap Conjecture. *International Mathematics Research Notices*, (2019), 10 pages, accepted.
6. John Lesieutre** and Matthew Satriano. Canonical heights on hyper-Kähler varieties and the Kawaguchi–Silverman conjecture. *International Mathematics Research Notices*, (2019), 38 pages, accepted.
7. John Lesieutre** and Matthew Satriano. A rational map with infinitely many points of distinct arithmetic degrees. *Ergodic Theory and Dynamical Systems*, (2019), 6 pages, accepted.
8. Dan Edidin and Matthew Satriano. Towards an Intersection Chow Cohomology Theory for GIT Quotients. *Transformation Groups*, (2019), 22 pages, accepted.
9. Jenna Rajchgot, Matthew Satriano, and Wanchun Shen*. Some combinatorial cases of the three matrix analog of Gerstenhaber’s theorem. Proceedings of the 2019 AWM Research Symposium, Association for Women in Mathematics Series, (2019), 17 pages, accepted.

¹Co-authors who were graduate or undergraduate students at the time a paper was written have been marked with (*) and Postdoctoral Fellows with (**).

10. Dragos Ghioca and Matthew Satriano. Density of orbits of dominant regular self-maps of semiabelian varieties. *Transactions of the American Mathematical Society*, 371 (2019), no. 9, 6341–6358.
11. J. William Helton, Kyle P. Meyer*, Vern I. Paulsen, and Matthew Satriano. Algebras, Synchronous Games and Chromatic Numbers of Graphs. *New York Journal of Mathematics*, 25 (2019), 328–361.
12. Wei Ho and Matthew Satriano. Galois closures of non-commutative rings and an application to Hermitian representations. *International Mathematics Research Notices*, (2018), 31 pages, accepted.
13. Jenna Rajchgot and Matthew Satriano. New classes of examples satisfying the three matrix analog of Gerstenhaber’s theorem. *Journal of Algebra*, 516 (2018), 245–270.
14. Dan Edidin and Matthew Satriano. Strong cycles and intersection products on good moduli spaces. *K-Theory – Proceedings of the International Colloquium, Mumbai, 2016*, 223–238, Hindustan Book Agency, New Delhi, 2018.
15. Anton Geraschenko and Matthew Satriano. A “Bottom Up” characterization of smooth Deligne–Mumford stacks. *International Mathematics Research Notices*, 2017, no. 21, 6469–6483.
16. Jason P. Bell, Dragos Ghioca, Zinovy Reichstein, and Matthew Satriano. On the Medvedev–Scanlon conjecture for minimal threefolds of non-negative Kodaira dimension. *New York Journal of Mathematics*, 23 (2017), 1185–1203.
17. Jason P. Bell, Matthew Satriano, and Susan J. Sierra, On a dynamical Mordell–Lang conjecture for coherent sheaves. *Journal of the London Mathematical Society*, 2017, (2) 96 (2017), no. 1, 28–46.
18. Matthew Satriano. When is a variety the quotient of a smooth variety by a finite group? *Oberwolfach Reports* 19 (2016), 992–996.
19. Benjamin Linowitz, Matthew Satriano, and Roope Vehkalahti. A non-commutative analogue of the Odlyzko bounds and bounds on performance for space-time lattice codes. *IEEE Trans. Inform. Theory*, 61 (2015), no. 4, 1971–1984.
20. Anton Geraschenko and Matthew Satriano. Torus quotients as global quotients by finite groups. *Journal of the London Mathematical Society* (2) 92 (2015), no. 3, 736–759.
21. Anton Geraschenko and Matthew Satriano. Toric stacks I: The theory of stacky fans. *Transactions of the American Mathematical Society*, 367 (2015), no. 2, 1033–1071.
22. Anton Geraschenko and Matthew Satriano. Toric Stacks II: Intrinsic characterization of toric stacks. *Transactions of the American Mathematical Society*, 367 (2015), no. 2, 1073–1094.
23. Manjul Bhargava and Matthew Satriano. On a notion of “Galois closure” for extensions of rings. *Journal of the European Mathematical Society*, 16 (2014), no. 9, 1881–1913.
24. Christian Liedtke and Matthew Satriano. On the birational nature of lifting. *Advances in Mathematics*, 254 (2014), 118–137.
25. Dan Abramovich, Qile Chen, Danny Gillam, Yuhao Huang, Martin Olsson, Matthew Satriano, and Shenghao Sun. Logarithmic Geometry and Moduli. *Handbook of moduli*. Vol. I, 1–61, Adv. Lect. Math. (ALM), 24, Int. Press, Somerville, MA, 2013.
26. Dan Edidin, Anton Geraschenko, and Matthew Satriano. There is no degree map for 0-cycles on Artin stacks. *Transformation Groups*, 18 (2013), no. 2, 385–389.
27. Qile Chen and Matthew Satriano. Chow quotients of toric varieties as moduli of stable log maps. *Algebra & Number Theory*, 7 (2013), no. 9, 2313–2329.

28. Matthew Satriano. Canonical Artin stacks over log smooth schemes. *Mathematische Zeitschrift* (2013), no. 3-4, 779–804
29. Matthew Satriano. de Rham theory for tame stacks and schemes with linearly reductive singularities. *Annales de l'Institut Fourier*, 62, No. 6, 2013–2051 (2012).
30. Matthew Satriano. The Chevalley-Shephard-Todd theorem for finite linearly reductive group schemes. *Algebra & Number Theory*, 6 (2012), no. 1, 1–26

Submitted:

31. Matthew Satriano and Jeremy Usatine**. Stringy invariants and toric Artin stacks. <https://arxiv.org/pdf/2009.04585.pdf>, (2020), 38 pages, submitted.
32. Jiahui Huang*, David McKinnon, and Matthew Satriano. What fraction of an S_n -orbit can lie on a hyperplane?. <https://arxiv.org/pdf/2001.09123.pdf>, (2020), 16 pages, submitted.
33. Dan Edidin and Matthew Satriano. An intrinsic characterization of cofree representations of reductive groups. <https://arxiv.org/pdf/1905.04845.pdf>, (2019), 41 pages, submitted.

Mathematical Biology Publications:

34. Sherman TD*, Kagohara LT, Cao R, Cheng R, Satriano M, Considine M, et al. CancerInSilico: An R/Bioconductor package for combining mathematical and statistical modeling to simulate time course bulk and single cell gene expression data in cancer. *PLOS Computational Biology* (2019) 12 pages.

GRANTS

2015–22	NSERC Discovery Grant	\$154,000
2015–17	University of Waterloo Startup	\$45,000
2011–14	National Science Foundation MSPRF Grant	\$108,000 USD

SELECTED AWARDS

2005	Top undergraduate thesis in mathematics at Princeton Phi Beta Kappa Highest GPA
2004	Barry M. Goldwater Scholarship New Jersey Beta Chapter of Phi Beta Kappa
2001	First Place Winner, Intel International Science and Engineering Fair Semi-Finalist, Intel Science Talent Search

INVITED CONFERENCE TALKS

Canadian Number Theory Association XVI, Toronto (June 2020), postponed due to COVID-19

Noncommutative Algebra and Noncommutative Geometry, Session of the Canadian Mathematical Society, University of Ottawa (June 2020), postponed due to COVID-19

Interpolating Between the Batyrev-Manin and Malle Conjectures, Canadian Western Algebraic Geometry Symposium, University of Saskatchewan (Mar. 2020)

New types of heights with connections to the Batyrev-Manin and Malle Conjectures, Arithmetic Dynamics, Special session of the American Mathematical Society, Denver, Colorado (Jan. 2020)

Lifting Tropical Self-Intersections, Convexity in Algebraic Geometry and Symplectic Geometry, Session of the Canadian Mathematical Society, University of British Columbia (Dec. 2019)

A counter-example to a finiteness conjecture of Kawaguchi and Silverman, Algebraic Geometry Session of the Canadian Mathematical Society, University of British Columbia (Dec. 2018)

Towards an Intersection Chow Cohomology Theory for GIT Quotients, Algebraic and Combinatorial Aspects of Tropical Geometry, Ohio State University (Mar. 2018)

On the Zhang–Amerik–Medvedev–Scanlon conjecture for threefolds of non-negative Kodaira dimension, Bridges between Noncommutative Algebra and Algebraic Geometry, Banff International Research Station (Sept. 2016)

When is a variety with quotient singularities a global quotient by a finite group?, Toric Geometry, Oberwolfach (Mar. 2016)

Is every variety with quotient singularities a global quotient by a finite group?, Equivariant Geometry and Algebraic Stacks, Australia National University (Mar. 2016)

Which varieties are quotients by finite groups?, New Trends in Toric Varieties, Special session of the American Mathematical Society, Eau Claire (Sept. 2014)

Toric Stacks and Applications to Cycle Theory, Algebraic Geometry days: A conference dedicated to the memory of Dan Laksov, Mittag-Leffler Institute (June 2014)

Stacky Resolutions, Algebraic Stacks: Progress and Prospects, Banff International Research Station (Mar. 2012)

Stacky Resolutions of Singular Schemes, Western Algebraic Geometry Symposium, Stanford University (Apr. 2011)

Stacky Resolutions and Applications, Special session on arithmetic, groups and geometry, American Mathematical Society Central Section meeting, Notre Dame (2010)

Invariant Theory and Canonical Artin Stacks, Equivariant algebraic geometry and related topics, University of California at Berkeley (2009)

**OTHER
INVITED
CONFERENCES**

Simons Symposium on Algebraic, Complex, and Arithmetic Dynamics, Schloss Elmau (May 2019)

Beyond Toric Geometry, Casa Matemática Oaxaca (May 2017)

Foundations of tropical schemes, American Institute of Mathematics (Apr. 2017)

**INVITED
SEMINAR
TALKS**

New types of heights with connections to the Batyrev–Manin and Malle Conjectures, Algebra, Geometry, and Combinatorics Online Seminar (July 2020)

On Height Gaps, D -finiteness, and a Weak Dynamical Mordell–Lang Conjecture, Arithmetic Dynamics International Online Seminar (May 2020)

Characterizing Smoothness of Quotients, Colloquium, Georgia Institute of Technology (Feb. 2020)

Characterizing Smoothness of Quotients, Colloquium, York University (Jan. 2020)

Interpolating Between the Batyrev–Manin and Malle Conjectures, Algebra and Number Theory Seminar, Brown University (Nov. 2019)

On a GIT Characterization of Cofreeness, Institute for Basic Science, Center for Geometry and Physics, Pohang, Korea (Aug. 2019)

Cofreeness of representations, purity of the strictly semistable locus, and the periodic table, Algebraic Geometry Seminar, University of Arizona (Feb. 2019)

Interpolating Between the Batyrev–Manin and Malle Conjectures, Algebra and Algebraic Geometry Seminar, University of Washington (Dec. 2018)

Towards an Intersection Chow Cohomology Theory with a Primer on Toric Stacks, Pre-talk for graduate students, University of Washington, (Dec. 2018)

Interpolating Between the Batyrev–Manin and Malle Conjectures, Algebraic Geometry Seminar, Central Michigan University (Nov. 2018)

Interpolating Between the Batyrev–Manin and Malle Conjectures, Algebra and Algebraic Geometry, University of British Columbia (Sept. 2018)

Interpolating Between the Batyrev–Manin and Malle Conjectures, Algebra and Number Theory Seminar, Penn State University (Apr. 2018)

Interpolating Between the Batyrev–Manin and Malle Conjectures, Algebraic Geometry Seminar, Ohio State University (Dec. 2017)

The Medvedev–Scanlon Conjecture for Semiabelian Varieties and certain 3-folds, Algebra Seminar, University of Missouri (Oct. 2017)

Algebraic and quantum colorings of graphs, SUMRY Colloquium, Yale (Aug. 2017)

Stacky Resolutions, Invariant Theory, and Hodge Theory, Colloquium, University of Saskatchewan (Feb. 2017)

On the Medvedev–Scanlon Conjecture in dimension 3, Group, Lie and Number Theory Seminar, University of Michigan (Dec. 2016)

On the Medvedev–Scanlon Conjecture in dimension 3, Algebra and Number Theory Seminar, University of Maryland (Nov. 2016)

An Introduction to Toric Stacks, and Conjectures in Cycle Theory, Algebraic Geometry Seminar, University of British Columbia (Nov. 2016)

Stacky resolutions and applications, Colloquium, University of Western Ontario (Nov. 2016)

On the Medvedev–Scanlon Conjecture in dimension 3, Geometric Representation Theory Seminar, University of Toronto (Oct. 2016)

Toric Stacks and Applications, Geometric Structures Seminar, University of Toronto (Aug. 2015)

When is a variety a quotient of a smooth variety by a finite group?, Algebraic Geometry Seminar, University of Wisconsin (Nov. 2015)

Toric Stacks and Applications to Cycle Theory, Algebraic Geometry Seminar, Ohio State University (Nov. 2015)

Stacky Resolutions of Singularities, Colloquium, University of Waterloo (Feb. 2014)

Stacky Resolutions of Singularities, Colloquium, University of Missouri (Feb. 2014)

Stacky Resolutions of Singularities, Colloquium, University of Arizona (Jan. 2014)

Stacky Resolutions of Singularities, Colloquium, University of Notre Dame (Jan. 2014)

On the birational nature of lifting, Algebraic Geometry Seminar, University of Colorado at Boulder (Nov. 2013)

Stacky Resolutions of Singularities, Algebraic Geometry Seminar, University of Illinois at Urbana-Champaign (Oct. 2013)

A User’s Guide to Stacks, Colloquium, University of Maryland (Feb. 2013)

On the birational nature of lifting, Algebra and Number Theory Seminar, University of Maryland (Feb. 2013)

Stacky Resolutions, Colloquium, Purdue University (Jan. 2013)

Toric Stacks with Applications to Cycle Theory, Algebraic Geometry Seminar, Stanford University (Nov. 2012)

Stacky Resolutions of Singular Schemes, Algebra and Number Theory Seminar, Emory University (Sept. 2012)

On the birational nature of lifting, Working Algebraic Geometry Seminar, Purdue University (Apr. 2012)

When is a variety a quotient of a smooth variety by a finite group?, Algebraic Geometry Seminar, Brown University (Dec. 2011)

When is a variety a quotient of a smooth variety by a finite group?, Algebraic Geometry Seminar, Ohio State University (Nov. 2011)

Chow quotients of toric varieties as moduli of stable log maps, Algebraic Geometry Seminar, Caltech (Oct. 2011)

Toric Stacks, Algebraic Geometry Seminar, Rice University (Sept. 2011)

Chow quotients of toric varieties as moduli of stable log maps, Representation Theory, Geometry and Combinatorics Joint Seminar, UC Berkeley (Apr. 2011)

Toric Artin Stacks, Geometry-Topology Seminar, University of Missouri (Feb. 2011)

Stacky Resolutions of Singular Schemes, Algebraic Geometry Seminar, University of Wisconsin (Nov. 2010)

Stacky Resolutions of Singular Schemes, Algebraic Geometry Seminar, University of Michigan (Jan. 2010)

Stacky Resolutions of Singular Schemes, Number Theory and Arithmetic Geometry Seminar, University of Illinois at Chicago (Oct. 2009)

Stacky Resolutions of Singular Schemes, Algebraic Geometry Seminar, University of Illinois at Urbana-Champaign (Oct. 2009)

SUPERVISION

Postdoctoral Fellows:

Daren Cheng ¹	2020–22	
Fei Hu	2019–21	
Andrew Staal ¹	2019–21	
Simon Crawford ²	2018–20	Heilbronn Postdoc at Bristol
Ali Aleyasin ¹	2017–19	
Michael Bailey ¹	2017–18	
Ivan Kobzyev	2017	Machine Learning Researcher at RBC
Yoav Len	2016–18	Prof. at St. Andrew's
Akos Nagy ¹	2016–17	Postdoc at Duke University
Yi Zhu ²	2015–17	PNC

¹ jointly supervised with Geometry and Topology Group

² jointly supervised with Bell, McKinnon, and Moosa

Ph.D. Students:

Sean Monahan	2020–
Nicole Kitt	2020–
Yash Singh	2020–
Brett Nasserden	2016–

Masters Students:

Nicole Kitt	2019–20	
Sean Monahan	2019–20	
Jeffrey Samuelson	2018–19	
David Urbanik ³	2017–18	PhD student at University of Toronto

³ co-supervised with David Jao

NSERC Undergraduate Research Experiences:

Rindra Razafy	Spring 2020	
Austin Sun	Spring 2020	
Spencer Whitehead	Spring 2020	
Ron Meng	Spring 2019	
Alexander Slamen	Spring 2019	Master's student at Toronto
Jiahui Huang	Winter 2019	
Clair Xinle Dai	Winter 2019	PhD student at Harvard
Rosie Wanchun Shen	Winter 2019	PhD student at Harvard
Stephen Wen	Spring 2018	PhD student at Waterloo
Akshay Tiwary	Winter 2018	PhD student at UCSD
Trevor Gunn	Spring 2017	PhD student at Georgia Tech
Xiaoyu Xie	Spring 2016	

Undergraduate Reading Courses:

Chenfangrui Wu Fall 2017
Raymond Cheng Winter 2016 PhD student at Columbia University

**CONFERENCES
ORGANIZED**

Combinatorial Algebraic Geometry (with Jenna Rajchgot), Session of the Canadian Mathematical Society, Toronto (Dec. 2019)
Noncommutative Surfaces and Artin's Conjecture (with Jason Bell and Colin Ingalls), American Institute of Mathematics (Sept. 2019)
Toric and Convex Geometry (with Greg Smith), Session of the Canadian Mathematical Society, Waterloo (Dec. 2017)

**JOURNALS
REFEREED**

Advances in Mathematics
Algebra & Number Theory
Acta Mathematica
Bulletin of the London Mathematical Society
Central European Journal of Mathematics
Communications in Algebra
Compositio Mathematica
Crelle's Journal, Journal für die reine und angewandte Mathematik
Geometry & Topology
International Mathematics Research Notices
Inventiones
Journal of Algebra
Journal of Algebraic Geometry
Journal of Commutative Algebra
Journal of the European Mathematical Society
Journal of Pure and Applied Algebra
Mathematical Research Letters
Mathematische Zeitschrift
Münster Journal of Mathematics
Proceedings of the American Mathematical Society
Publications mathématiques de l'IHÉS
Forum of Mathematics, Sigma

**THESIS
COMMITTEES**

Ph.D. Thesis Committees:

Ehsaan Hossain	University of Waterloo	May 2020
Cameron Marcott	University of Waterloo (Internal-External)	Aug. 2019
Nickolas Rollick	University of Waterloo	June 2019
Amir Nasr-Azadani	University of New Brunswick (External-External)	Dec. 2018
Tyrone Ghaswala	University of Waterloo	June 2017
Ivan Kobzyev	University of Western Ontario (External-External)	Aug. 2016

Masters Thesis Committees:

Xingchi Ruan	University of Waterloo	Aug. 2020
Andrej Vukovic	University of Waterloo	Aug. 2019
David Urbanik	University of Waterloo	Aug. 2018
Brandon Doherty	University of Waterloo	Aug. 2017
Anthony McCormick	University of Waterloo	July 2017
Dylan Butson	University of Waterloo	Sept. 2016
Nickolas Rollick	University of Waterloo	July 2016

TEACHING**Courses Taught at Waterloo:**

PMATH 965: Deformation Theory with a Viewpoint Toward Moduli Spaces Enrolment: TBA	Fall 2020
PMATH 764/464: Algebraic Geometry Enrolment: 26	Winter 2020
MATH 235: Linear Algebra 2 for Honors Mathematics Enrolment: two sections each 117	Fall 2019
PMATH 641/441: Algebraic Number Theory Enrolment: 16	Winter 2019
MATH 135: Algebra for Honors Mathematics Enrolment: 39	Winter 2019
PMATH 347: Groups and Rings Enrolment: 70	Fall 2018
MATH 135: Algebra for Honors Mathematics Enrolment: 41	Winter 2018
PMATH 764/464: Algebraic Geometry Enrolment: 28	Spring 2017
PMATH 347: Groups and Rings Enrolment: 59	Spring 2017
PMATH 965: Toric Varieties Enrolment: 6	Winter 2017
MATH 135: Algebra for Honors Mathematics Enrolment: 66	Winter 2017
PMATH 764/464: Algebraic Geometry Enrolment: 17	Winter 2016
MATH 235: Linear Algebra 2 for Honors Mathematics Enrolment: 105	Fall 2015

SERVICE

Wrote and graded Algebra Comprehensive Exam (with Ruxandra Moraru)	2020–21
Coordinator for Chinese University of Hong Kong Summer Research Exchange Program	2019–20
Oral Comprehensive Examiner for Ben Lovitz	Winter 2020
Ran Learning Seminar on Arakelov Geometry	Winter 2020
Course Coordinator for MATH 235	Fall 2019

Math Faculty Graduate Council Representative	2019–20
Graduate Committee	2017–20
Graduate Admissions Subcommittee	2017–19
Ran Learning Seminar on Valuative Trees	2019–20
Engendering Resident Pathways and Communities Focus Group Participant	2018
Ran Learning Seminar on work of Baker–DeMarco	2018–19
Algebra Seminar, co-organizer	2018–20
Committee to select the Pure Math Chair	2017–18
Math Faculty Representative to the Environment Faculty Council	2015–17
Ran Hot Topics Seminar on Hodge Theory for Combinatorial Geometries	2016–17
Oral Comprehensive Examiner for Nickolas Rollick	Winter 2015
Undergraduate math club talk (PMC)	2015–16
Hot Topics Seminar on Berkovich Spaces and Model Theory, co-organizer	2015–16
Wrote and graded Algebra Comprehensive Exam (with Yu-Ru Liu)	2015–16
Geometry and Topology Seminar, co-organizer	2015–20

**GRANT PANEL
REVIEWER**

Natural Sciences and Engineering Research Council Grant Reviewer, 2019
National Science Foundation Grant Panel Member, 2018

MEMBERSHIPS

Canadian Mathematical Society