Avinash (Avi) Kulkarni

Contact Information

Dartmouth College
Department of Mathematics
27 N Main St
Hanover, NH, USA 03755

Phone: +1 434-282-9302
E-mail: avinash.a.kulkarni@dartmouth.edu
Website: https://math.dartmouth.edu/~akulkarn

Research Interests

Arithmetic geometry, Computer algebra, Integral geometry.

Education

Doctor of Philosophy in Mathematics, **Simon Fraser University**
Thesis: *Aspects of the arithmetic of uniquely trigonal genus four curves: arithmetic invariant theory and class groups of cubic number fields*
Senior supervisor: Dr. Nils Bruin

Master of Science in Mathematics, **Simon Fraser University**
Thesis: *On Jacobians of dimension* $2g$ *that decompose into Jacobians of dimension* g
Senior supervisor: Dr. Nils Bruin

Bachelor of Mathematics, **University of Waterloo**
Major in pure mathematics, Minor in computer science
Graduated "with distinction" on dean's honor list

Academic Employment

Dartmouth College. Hanover, NH, USA.
Post-doctoral researcher (Simons Collaboration on Arithmetic Geometry, Number Theory, and Computation) — **Jan 2020** – Present

TU Kaiserslautern. Kaiserslautern, DE.
*Post-doctoral researcher (*OSCAR *software development)* — **Sept 2019** – **Dec 2019**

Max Planck Institute for Mathematics in the Sciences. Leipzig, DE.
Post-doctoral researcher — **Nov 2018** – **Aug 2019**

Simon Fraser University. Burnaby, BC, CA.
Graduate teaching assistant — **Sept 2012** – **Dec 2017**

Fields Institute. Toronto, ON, CA.
Undergraduate research assistant — **July 2011** – **Aug 2011**

University of Waterloo. Waterloo, ON, CA.
Undergraduate teaching assistant — **Apr 2012** – **Jan 2012** & **Sept 2009** – **Dec 2010**

Honors and Awards

Department of Mathematics Graduate Scholarship — **Sept 2018**
Awarded by the Dean of Graduate Studies for academic excellence at the graduate level

CD Nelson Entrance Scholarship — **Sept 2014**
Simon Fraser University Provost's Prize of Distinction — **Sept 2014**
NSERC Post Graduate Scholarship - Doctoral — **Sept 2014**
Simon Fraser University Graduate Fellowship — **May 2014**
Simon Fraser University Graduate Fellowship — **May 2013**
University of Waterloo President's Scholarship — **Sept 2008**

Publications

1. Kathryn Heal, Avinash Kulkarni, and Emre Can Sertöz. Deep learning Gauss-Manin connections. *Adv. Appl. Clifford Algebr.*, 32(2):Paper No. 24, 41, 2022

2. Avinash Kulkarni and Tristan Vaccon. Super-linear convergence in the p-adic QR-algorithm. *Linear and Multilinear Algebra*, 0(0):1–20, 2021

3. Avinash Kulkarni and Antonio Lerario. p-adic integral geometry. *SIAM J. Appl. Algebra Geom.*, 5(1):28–59, 2021

4. T. O. Celik, F. Galuppi, A. Kulkarni, and M.-S. Sorea. On the eigenpoints of cubic surfaces. *Le Mathematiche*, 75(2):611–625, 2020

5. Avinash Kulkarni. Solving p-adic polynomial systems via iterative eigenvector algorithms. *Linear and Multilinear Algebra*, 0(0):1–22, 2020

6. Turku Ozlum Celik, Avinash Kulkarni, Yue Ren, and Mahsa Sayyary Namin. Tritangents and their space sextics. *J. Algebra*, 538:290–311, 2019

7. Avinash Kulkarni, Niki Myrto Mavraki, and Khoa D. Nguyen. Algebraic approximations to linear combinations of powers: an extension of results by Mahler and Corvaja-Zannier. *Trans. Amer. Math. Soc.*, 371(6):3787–3804, 2019

8. Jonathan D. Hauenstein, Avinash Kulkarni, Emre C. Sertöz, and Samantha N. Sherman. Certifying reality of projections. In *Mathematical software—ICMS 2018*, volume 10931 of *Lecture Notes in Comput. Sci.*, pages 200–208. Springer, Cham, 2018

9. Avinash Kulkarni, Yue Ren, Mahsa Sayyary Namin, and Bernd Sturmfels. Real space sextics and their tritangents. In *ISSAC'18—Proceedings of the 2018 ACM International Symposium on Symbolic and Algebraic Computation*, pages 247–254. ACM, New York, 2018

10. Avinash Kulkarni. An explicit family of cubic number fields with large 2-rank of the class group. *Acta Arith.*, 182(2):117–132, 2018

11. A. Kulkarni, G. Maxedon, and K. Yeats. Some results on an algebro-geometric condition on graphs. *Journal of the Australian Mathematical Society*, 104(2):218–254, 2018

Preprints

1. Peter Burgisser, Avinash Kulkarni, and Antonio Lerario. Nonarchimedean integral geometry. arXiv preprint https://arxiv.org/abs/2206.03708, 2022

2. Avinash Kulkarni. Sixteen points in $\mathbb{P}^4$ and the inverse galois problem for del pezzo surfaces of degree one. arXiv preprint https://arxiv.org/abs/2109.14106, 2021

3. Avinash Kulkarni and Sameera Vemulapalli. On intersections of symmetric determinantal varieties and theta characteristics of canonical curves. arXiv preprint https://arxiv.org/abs/2109.08740, 2021

4. A. Kulkarni. An arithmetic invariant theory of curves from E_8. arXiv preprint https://arxiv.org/abs/1711.08843, 2017

Talks

1. Banff International Research Station, Banff, AB, CA. *Deep learning Gauss-Manin connections.* Modern Breakthroughs in Diophantine Problems. June 2022.

2. University of Connecticut, Storrs, CT, USA. *The p-adic integral geometry formula.* (invited, plenary), Connecticut Summer School in Number Theory (CTNT). June 2022.

3. SIAM conference on applied algebraic geometry. *The p-adic integral geometry formula.* (invited, remote), August 2021.

4. University of Calgary, Calgary, AB, CA. *An explicit family of cubic number fields whose class group contains* $(\mathbb{Z}/2\mathbb{Z})^8$ **&** *Deep learning Gauss-Manin connections.* Algebra and Number Theory seminar (invited, remote), December 2020.

5. Universiteit Leiden, Leiden, NL. *The p-adic integral geometry formula.* Algebra, Geometry, and Number Theory seminar (invited, remote), November 2020.

6. ICERM, Providence, RI, USA. *The p-adic integral geometry formula.* Workshop on symmetry, randomness, and computations in real algebraic geometry (invited, remote), August 2020.

7. TU Braunschweig, Braunschweig, DE. *Superlinear convergence in the p-adic QR-algorithm.* ICMS 2020 (remote), July 2020.

8. University of British Columbia and Simon Fraser University. *pnumerical linear algebra.* QNTAG seminar (invited, remote), June 2020.

9. University of Bielefeld, Bielefeld, DE. *The p-adic integral geometry formula.* Oberseminar (invited), December 2019.

10. SISSA, Trieste, IT. *The p-adic integral geometry formula.* Mathematics seminar (invited), October 2019.

11. Max Planck Institute MiS, Leipzig, DE. *pNumerical linear algebra.* Seminar on nonlinear algebra, August 2019.

12. ICERM, Providence, RI, USA. *The p-adic integral geometry formula.* Workshop on arithmetic of low-dimensional abelian varieties (lightning talks), June 2019.

13. Carl von Ossietzky University of Oldenburg, Oldenburg, DE. *An explicit family of cubic number fields whose class group contains* $(\mathbb{Z}/2\mathbb{Z})^8$. Oberseminar (invited), April 2019.

14. University of Copenhagen, Copenhagen, DK. *The arithmetic of uniquely trigonal genus 4 curves.* Number theory seminar (invited), March 2019.

15. TU Kaiserslautern, Kaiserslautern, DE. *Approximate solutions of zero-dimensional polynomial systems over* $\mathbb{Q}_p$ **&** *The arithmetic of uniquely trigonal genus 4 curves.* Algebra, geometry, and computer algebra seminar (split talk, invited), February 2019.

16. Universität Bayreuth, Bayreuth, DE. *The arithmetic of uniquely trigonal genus 4 curves.* Oberseminar (invited), February 2019.

17. Oxford University, Oxford, UK. *The arithmetic of uniquely trigonal genus 4 curves.* Junior number theory seminar (invited) February 2018.

18. Max Planck Institute MiS, Leipzig, DE. *Tritangents and Space Sextics.* Seminar on nonlinear algebra, November 2018.

19. Max Planck Institute MiS, Leipzig, DE. *The arithmetic of uniquely trigonal genus 4 curves.* Seminar on nonlinear algebra (invited), March 2018.

20. Tutte Institute, Ottawa, ON, CA. *The arithmetic of uniquely trigonal genus 4 curves.* (invited), January 2018.

21. University of Waterloo, Waterloo, ON, CA. *An arithmetic invariant theory from* E_8. CMS winter meeting, session on explicit finiteness of integral points on hyperbolic curves (invited), December 2017.

22. Simon Fraser University, Burnaby, BC, CA. *Reading graphs into SAGE from an IPE diagram.* Discrete mathematics seminar, July 2017.

23. Simon Fraser University, Burnaby, BC, CA. *Picard groups of surfaces and* 2*-torsion in cubic number fields.* Number theory seminar, November 2016.

24. Pacific Grove, CA, USA. *Identities of Kloosterman sums.* West coast number theory, Dec 2015.

25. University of British Columbia, Vancouver, BC, CA. *On Jacobians of dimension* $2g$ *that decompose into Jacobians of dimension* g. Number theory seminar, October 2014.

26. Fields Institute, Toronto, ON, CA. *The Constraint Satisfaction Problem.* (with Blazsik, Z. Liu, H. Perkins, D. Tossenberger, A. and Wu, Y.) Fields-MITACS undergraduate summer research program Mini-Conference, August 2011.

Computer Skills

Advanced proficiency:	Magma, Julia
Intermediate proficiency:	Python (including multiprocessing library), Sage
Basic knowledge:	Bertini, Maple, C, Java, Unix

Teaching

- Instructor for *Math 25 (Elementary Number Theory)*, **Sept 2022 - Dec 2022**
  Instructor for *Math 117 (1-week graduate topics course)* **Aug 2022**
  Lead instructor for *Math 3 (Introduction to Calculus)*, **Jan 2021 - Mar 2021**
  Instructor for *Math 3 (Introduction to Calculus)*, **Sept 2020 - Dec 2020**
  Dartmouth College
- Course assistant for *Hodge theory and periods of varieties*, **May 2019**
  Max Planck Institute MiS summer lecture series

Administrative Service

- Organizer for Dartmouth Algebra and Number Theory Seminar **Sept 2022** – Present
- Organizer for *"Parallelism in Magma"* programming workshop (Simons collaboration monthly meeting, remote) **July 2022**
- Organizer for *"Branching from Number Theory: p-adics in the sciences"* at MPI Leipzig **Aug 2021**
- Organizer for the SFU Graduate Seminar **Sept 2017 - Dec 2017**
- SFU liason for the PIMS Young Researchers conference **June 2017**
- Mathematics Graduate Caucus secretary **Jan 2016 - Dec 2017**
- Teaching Support Staff Union Mathematics department steward **Sept 2014 - Apr 2016**
- Teaching Support Staff Union finance committee member **Jan 2014 - Dec 2015**
- University of Waterloo Mathematics Society council representative **Sept 2011 - Dec 2011**

Invited Visits

- University of Bielefeld, Bielefeld, DE. (*visiting Christopher Voll*) **Dec 2019**
- SISSA, Trieste, IT. (*visiting Antonio Lerario*) **Oct 2019**
- University of Oldenburg, Oldenburg, DE. (*visiting Andreas Stein*) **Apr 2019**
- University of Copenhagen, Copenhagen, DK. (*visiting Fabian Pazuki*) **Mar 2019**
- TU Kaiserslautern, Kaiserslautern, DE. (*visiting Claus Fieker*) **Feb 2019**
- Universität Bayreuth, Bayreuth, DE. (*visiting Michael Stoll*) **Feb 2019**
- Max Planck Institute MiS, Leipzig, DE. (*visiting Bernd Sturmfels*) **Jan 2018 - Mar 2018**
- Oxford University, New College. Oxford, UK. (*visiting Victor Flynn*) **Feb 2018**