

Nathan Kaplan

Contact

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Citizenship: United States

Professional Positions

- **University of California, Irvine** 7/2015-Present
– Assistant Professor of Mathematics. Irvine, CA
- **Yale University** 7/2013-07/2015
– Gibbs Assistant Professor of Mathematics. New Haven, CT

Research interests

- Number Theory, arithmetic algebraic geometry, coding theory, combinatorics.

Education

- **Harvard University** 9/2008-5/2013
– Ph.D. in Mathematics, May 2013. Cambridge, MA
– Adviser: Noam Elkies.
– Thesis: *Rational Point Counts for del Pezzo Surfaces over Finite Fields and Coding Theory.*
- **Cambridge University** 9/2007-6/2008
– C.A.S.M. Pure Mathematics (Part III) Cambridge, UK
- **Princeton University** 9/2003-6/2007
– A.B. Mathematics Princeton, NJ

Papers

1. D. Bowles, S. Chapman, N. Kaplan, and D. Reiser, *On delta sets of numerical monoids*, J. Algebra Appl. 5 (2006), no. 5, 695-718, <http://dx.doi.org/10.1142/S0219498806001958>.
2. C. Erickson, N. Kaplan, N. Mendoza, A. Pacelli, and T. Shayler, *Parametrized families of quadratic number fields with 3-rank at least 2*, Acta Arith. 130 (2007), no. 2, 141-147, <http://dx.doi.org/10.4064/aa130-2-3>.
3. N. Kaplan, *Flat cyclotomic polynomials of order three*, J. Num. Theory 127 (2007), no. 1, 118-126, <http://dx.doi.org/10.1016/j.jnt.2007.01.008>.
4. N. Kaplan, *Bounds for the maximal height of divisors of $x^n - 1$* , J. Num. Theory 129 (2009), 2673-2688, <http://dx.doi.org/10.1016/j.jnt.2009.04.015>.
5. S. Chapman, R. Hoyer, and N. Kaplan, *Delta sets of numerical monoids are eventually periodic*, Aequationes Math. 77 (2009), no. 3, 273-279, <http://dx.doi.org/10.1007/s00010-008-2948-4>.
6. N. Kaplan, *Flat cyclotomic polynomials of order four and higher*, Integers 10 (2010), 357-363, <http://dx.doi.org/10.1515/INTEG.2010.030>.
7. S. Chapman, J. Daigle, R. Hoyer, and N. Kaplan. *Delta sets of numerical monoids using non-minimal sets of generators*. Comm. Algebra 38 (2010), no. 7, 2622-2634, <http://dx.doi.org/10.1080/00927870903045165>.

8. D. Anderson, S. Chapman, N. Kaplan, and D. Torkornoo. *An algorithm to compute ω -primality in a numerical monoid*. Semigroup Forum 82 (2011), no. 1, 96-108, <http://dx.doi.org/10.1007/s00233-010-9259-5>.
9. N. Kaplan, *Counting numerical semigroups by genus and some cases of a question of Wilf*. J. Pure Appl. Algebra 216 (2012), no. 5, 1016-1032, <http://dx.doi.org/10.1016/j.jpaa.2011.10.038>.
10. N. Kaplan and L. Ye, *The proportion of Weierstrass semigroups*, J. Algebra 373 (2013), 377-391, <http://dx.doi.org/10.1016/j.jalgebra.2012.09.041>.
11. N. Elkies and N. Kaplan, *Extended Abstract: An application of weighted theta functions to t -core partitions and numerical semigroups*, in Optimal and Near Optimal Configurations on Lattices and Manifolds, C. Bachoc, P. Grabner, E. Saff, and A. Schürmann eds., Oberwolfach Reports (2013), 2453-2456.
12. N. Kaplan, *Rational Point Counts for del Pezzo Surfaces over Finite Fields and Coding Theory*. Ph.D. Thesis, Harvard University, 2013. 203 pp. https://www.math.uci.edu/~nckaplan/research_files/kaplanthesis.pdf
13. S. Chapman, N. Kaplan, T. Lemburg, A. Niles, and C. Zlogar, *Shifts of generators and delta sets of numerical monoids*, Internat. J. Algebra Comput. (2014), no. 5, 655-669, <http://dx.doi.org/10.1142/S0218196714500271>.
14. N. Kaplan, *MacWilliams identities for m -tuple weight enumerators*. SIAM J. Discrete Math. 28-1 (2014), 428-444, <http://dx.doi.org/10.1137/120876356>.
15. A. Bucur, C. David, B. Feigon, N. Kaplan, M. Lalín, E. Ozman, and M. Matchett Wood, *The distribution of \mathbb{F}_q -points on cyclic ℓ -covers of genus g* . Int. Math. Res. Not. IMRN (2016), no. 14, 4297-4340, <http://dx.doi.org/10.1093/imrn/rnv279>.
16. N. Kaplan, J. Marcinek, and R. Takloo-Bighash, *Distribution of orders in number fields*. Res. Math. Sci. 2 (2015), Art. 6, 57 pp. <http://dx.doi.org/10.1186/s40687-015-0027-8>.
17. J. Clancy, N. Kaplan, T. Leake, S. Payne, and M. Matchett Wood, *On a Cohen-Lenstra heuristic for Jacobians of random graphs*. J. Algebraic Combin. 42 (2015), no. 3, 701-723, <http://dx.doi.org/10.1007/s10801-015-0598-x>.
18. N. Kaplan and I. Petrow, *Traces of Hecke operators and refined weight enumerators of Reed-Solomon codes*. (2016), Accepted Trans. Amer. Math. Soc. (2017), 25 pp. <http://dx.doi.org/10.1090/tran/7089>.
19. H. Constantin, B. Houston-Edwards, and N. Kaplan, *Numerical sets, core partitions, and integer points in polytopes*. Accepted Combinatorial and Additive Number Theory II: CANT 2015 and 2016. Springer Proc. Math. (2017), 29 pp. <http://arxiv.org/abs/1509.06077>
20. J. Balakrishnan, W. Ho, N. Kaplan, S. Spicer, W. Stein, and J. Weigandt, *Databases of elliptic curves ordered by height and distributions of Selmer groups and ranks*. LMS J. Comput. Math. 19 (2016), issue A, 351-370, <http://dx.doi.org/10.1112/S1461157016000152>.
21. S. Colton and N. Kaplan, *The realization problem for delta sets of numerical semigroups*. J. Commut. Algebra 9 (2017), no. 3, 313-339, <http://dx.doi.org/10.1216/JCA-2017-9-3-313>

22. N. Kaplan and I. Petrow, *Elliptic curves over a finite field and the trace formula*. Accepted Proc. London Math. Soc. (2017), 61 pp. <http://arxiv.org/abs/1510.03980>
23. N. Kaplan, *Where should I open my restaurant?*. Accepted Math. Mag. (2016), 9 pp. http://www.math.uci.edu/~nckaplan/research_files/Kaplan-RestaurantLocation.pdf
24. N. Kaplan, *Counting numerical semigroups*. Accepted Amer. Math. Monthly, (2017), 14 pp. <https://arxiv.org/abs/1707.02551>
25. S. Atanasov, N. Kaplan, B. Krakoff, and J. Menzel, *Counting finite index subrings of \mathbb{Z}^n and $\mathbb{Z}[x]/(x^n)$* . (2017), Submitted. 20 pp. <https://arxiv.org/abs/1609.06433v2>
26. D. Short, N. Kaplan, and D. Narayan, *Flanking numbers and arankings of cyclic graphs*. J. Combin. Math. Combin. Comput. 99 (2016), 131-150.
27. S. Anderson, W. Halbawi, N. Kaplan, H. H. López F. Manganiello, E. Soljanin, and J. Walker, *Representations of the multicast network problem*. Accepted Proceedings of the IPAM Conference on Algebraic Geometry for Cryptography and Coding Theory. (2017), 23 pp. <https://arxiv.org/abs/1701.05944>
28. N. Kaplan, S. Kimport, R. Lawrence, L. Peilen, and M. Weinreich, *Counting arcs in the projective plane via Glynn's algorithm*. Accepted J. Geometry, (2017) 17 pp. <http://dx.doi.org/10.1007/s00022-017-0391-1>
29. B. Braun, H. Corrales, S. Corry, L. García Puente, D. Glass, N. Kaplan, J. Martin, G. Musiker, and C. Valencia, *Counting arithmetical structures on paths and cycles*. (2017), Submitted. 21 pp. <https://arxiv.org/abs/1701.06377>
30. G. Chinta, N. Kaplan, and S. Koplewitz, *The cotype zeta function of \mathbb{Z}^d* . (2017), Preprint. 21 pp. <https://arxiv.org/abs/1708.08547>

Grants

- PI for NSF Grant “Southern California Number Theory Day Conferences at UC Irvine” with co-PI Alice Silverberg, 2016-2020.
- NSA Young Investigator Grant, 2016-2018.
- AMS-Simons Travel Grant, 2015-2017.
- National Science Foundation Graduate Research Fellowship, 2007.

Honors and awards

- Certificate of Distinction in Teaching for EMR 14: Fat Chance, Fall 2010 and Spring 2011, and for Math Ma: Introduction to Functions and Calculus I, Fall 2012.
- Eric Cooper and Naomi Siegel Graduate Student Fellowship Fund I, 2011.
- AMS-MAA-SIAM Morgan Prize for Undergraduate Research, 2008.
- Peter A. Greenberg Memorial Prize for Excellence in Mathematics, Princeton, 2007.

Minicourse Talks

- IPAM, Algebraic Techniques for Combinatorial and Computational Geometry, Tutorials, March 2014. Two Lectures.

Colloquium Talks

- Claremont Center for Mathematical Sciences, September 2016.

- University of Oregon, May 2016.
- USC, March 2016.
- San Diego State University, December 2015.
- IDA: CCR, La Jolla, CA, December 2015.
- CCNY, March 2015.
- UC Irvine, January 2015.
- CCNY, October 2014.
- IDA: CCR, Princeton, NJ, September 2012.
- Sam Houston State, Huntsville, TX, November 2008.
- Universität Bremen, Bremen, Germany, April 2008.

Seminar Talks

- Rice University, Algebraic Geometry and Number Theory Seminar, September 2017.
- Claremont Center for the Mathematical Sciences, Algebra/Number Theory/Combinatorics Seminar, September 2017.
- CUNY, Number Theory Seminar, May 2017.
- Colorado State, Front Range Algebra, Geometry and Number Theory Seminar, March 2017.
- PIMS Explicit Methods in Abelian Varieties Multi-Site Seminar, March 2017.
- UCLA, Number Theory Seminar, March 2017.
- UCSD, Number Theory Seminar, March 2017.
- Tufts University, Algebra and Geometry Seminar, December 2016.
- Caltech, Combinatorics Seminar, October 2016.
- University of Oregon, Number Theory Seminar, May 2016.
- Claremont Center for the Mathematical Sciences, Algebra/Number Theory/Combinatorics Seminar, March 2016.
- Caltech, Number Theory Seminar, March 2016.
- University of Wisconsin, Number Theory Seminar, December 2015.
- UCLA, Combinatorics Seminar, November 2015.
- UC Irvine, Number Theory Seminar, April 2015.
- Rutgers University, Number Theory Seminar, March 2015.
- Rice, Algebraic Geometry and Number Theory Seminar, February 2015.
- Yale, Algebra and Number Theory Seminar, February 2015.
- University of Michigan, Group, Lie and Number Theory Seminar, December 2014.
- Wesleyan, Algebra Seminar, November 2014.
- EPFL, Lausanne, Switzerland, October 2014.
- Brown, Algebra Seminar, April 2014.
- CUNY, Collaborative Number Theory Seminar, February 2014.
- Williams, Faculty Seminar, November 2013.
- Quebec-Vermont Number Theory Seminar, McGill University, October 2013.
- Yale, Number Theory Seminar, October 2013.
- University of Connecticut, Algebra Seminar, February 2013.
- Boston University, Algebra Seminar, December 2012.
- Dartmouth College, Number Theory Seminar, November 2012.
- Yale, Number Theory Seminar, October 2012.
- Dartmouth College, Number Theory Seminar, October 2010.
- University of Illinois-Chicago, Number Theory Seminar, August 2009.

Conference Talks

- AMS/MAA Joint Mathematics Meeting, January 2018.
Special Session on Accessible Problems in Modern Number Theory.
- Foundations of Computational Mathematics: Workshop on Computational Number Theory, July 2017.
- CIRM, Arithmetic, Geometry, Cryptography and Coding Theory, June 2017.
- AMS Spring Eastern Sectional Meeting, May 2017.
Special Session on Finite Field and their Applications.
- AMS/MAA Joint Mathematics Meeting, January 2017.
Special Session on Mathematics of Cryptography.
- Algebraic Techniques for Combinatorial and Computational Geometry Reunion Conference, December 2016.
- AMS Fall Central Sectional Meeting, October 2016.
Special Session on Chip-Firing and Divisors on Graphs and Complexes
- AMS Fall Western Sectional Meeting, October 2015.
Special Session on Recent Advances in Number Theory.
- Biannual Algebraic and Tropical Meetings of Brown and Yale, April 2015.
- AMS/MAA Joint Mathematics Meeting, January 2015. Two Talks: Special Session on Factorization Theory and Its Applications, Special Session on Advances in Coding Theory.
- CUNY, Combinatorial and Additive Number Theory, May 2014.
- Algebraic Techniques for Combinatorial and Computational Geometry, IPAM, UCLA, Workshop: “Finding Algebraic Structures in Extremal Combinatorial Configurations”, May 2014.
- CUNY, Combinatorial and Additive Number Theory, May 2013.
- Atkin Memorial Lecture and Workshop: Cohen-Lenstra Heuristics, University of Illinois-Chicago, May 2013.
- AMS/MAA Joint Mathematics Meeting, January 2013.
Special Session on Arithmetic and Ideal Theory of Integral Domains and Monoids.
- Oberwolfach, “Optimal and Near Optimal Configurations on Lattices and Manifolds”, August 2012.
- CUNY, Combinatorial and Additive Number Theory, May 2012.
- CUNY, Combinatorial and Additive Number Theory, May 2011.
- AMS Sectional Meeting, NC State, April 2009. Special Session on Commutative Rings and Monoids.
- AMS/MAA Joint Mathematics Meeting, January 2009.
- Iberian Meeting on Numerical Semigroups, Porto, Portugal, March 2008.
- Communicating Mathematics: A Conference in Honor of the Thirtieth Anniversary of the Duluth REU, Duluth, MN, July 2007.
- AMS Sectional Meeting, Stevens Institute of Technology, Hoboken, NJ, April 2007.
Special Session on Number Theory.
- AMS/MAA Joint Mathematics Meeting, January 2007.
- AMS/MAA Joint Mathematics Meeting, January 2006.
- MAA Mathfest, August 2005.
- Young Mathematicians Conference, Ohio State, June 2004.

Outreach Talks

- San Diego State University REU Program, August 2017.
- Algebraic Techniques for Combinatorial and Computational Geometry Reunion Conference, Evening Talk for participants from all research programs, December 2016.
- UCI Math Circle, October 2016.
- Yale University, SUMRY Undergraduate Research Program Colloquium, June 2016.

- UC Irvine, The Man Who Knew Infinity- Panel Discussion and Q&A, May 2016.
- UC Irvine, Undergraduate Pizza Seminar, May 2016.
- Southern California MathCounts Competition, March 2016.
- UC Irvine, Anteater Math Club, February 2016.
- Hunter College High School Science Research Seminar, December 2015.
- Yale University, “Math Mornings”, February 2015.
- Museum of Mathematics, New York, “Family Fridays Program”, April 2014.
- Yale Undergraduate Math Society, March 2014.
- Long Island Math Circle, November 2013.
- University of Connecticut Math Club, February 2013.
- Sam Houston State University Math Club, November 2008.
- Budapest Semesters in Mathematics, Budapest, Hungary, April 2008.

Selected Workshops

- IPAM, Algebraic Geometry for Coding Theory and Cryptography, Los Angeles, CA 2016.
- BIRS-Oaxaca, Sandpile Groups. Oaxaca, Mexico 2015.
- AMS Summer Research Institute on Algebraic Geometry, University of Utah, Salt Lake City, Utah 2015.
- IPAM, Algebraic Techniques for Combinatorial and Computational Geometry, Los Angeles, CA 2014 (One Month Total).
- Arizona Winter School: Arithmetic Statistics, University of Arizona, Tucson, AZ 2014.
- American Institute of Mathematics: Arithmetic Statistics over Finite Fields and Function Fields, Palo Alto, CA 2014.
- Sage Days 56: Computational Number Theory and the Cloud, Oahu, HI 2014.
- Atkin Memorial Lecture and Workshop: Cohen-Lenstra Heuristics, University of Illinois-Chicago, Chicago, IL 2012.
- Optimal and Near Optimal Configurations on Lattices and Manifolds, Oberwolfach, Germany 2012.
- AMS Mathematical Research Communities: Arithmetic Statistics, Snowbird, UT 2012.
Project Group: Data for Distributions of Selmer Groups and Ranks
- Atkin Memorial Lecture and Workshop: Elliptic Curves over $\mathbb{Q}(\sqrt{5})$, University of Illinois-Chicago, Chicago, IL 2012.
- MAA/AMS Joint Meetings, Boston, MA 2012.
Minicourse: Computing with Elliptic Curves Using Sage
- Arizona Winter School: Stark-Heegner Points, University of Arizona, Tucson, AZ 2011.
Project Group: Overconvergent Modular Symbols
- Arizona Winter School: Quadratic Forms, University of Arizona, Tucson, AZ 2009.
Project Group: Theta Functions of Lattices

Teaching

- **University of California, Irvine**
 - Fall 2017: Math 232A: Algebraic Number Theory. (Graduate Course)
 - Fall 2017: Math 3A: Introduction to Linear Algebra.
 - Spring 2017: Math 3A: Introduction to Linear Algebra. (Two sections)
 - Winter 2017: Math 175: Combinatorics.
 - Fall 2016: Math 233A: Algebraic Geometry. (Graduate Course)
 - Winter 2016: Math 120A: Group Theory.
 - Winter 2016: Math 230B: Algebra. (Graduate Course)
 - Fall 2015: Math 230A: Algebra. (Graduate Course)

- **Yale University**
 - Spring 2015: Math 354: Number Theory.
 - Spring 2015: Math 719: Asymptotic Problems in Number Theory. (Graduate Course)
 - Fall 2014: Math 244: Discrete Mathematics.
 - Spring 2014: Math 766: Elliptic Curves. (Graduate Course)
 - Fall 2014: Math 244: Discrete Mathematics.
 - Fall 2014: Math 120: Multivariable Calculus.
- **Harvard University**
 - Spring 2013: Math 21B: Linear Algebra and Differential Equations.
 - Fall 2012: Graduate Course Fellow, Math Ma: Introduction to Functions and Calculus I.
 - Summer 2011: Mathematics Department Tutorial: “Coding Theory”.
 - * Developed a six-week seminar for mathematics majors on the theory of error-correcting codes. Wrote notes together with undergraduate participants:
http://www.math.uci.edu/~nckaplan/teaching_files/kaplancodingnotes.pdf
 - Spring 2012, Fall 2010: Head Teaching Fellow, EMR 14: Fat Chance.
 - * Assisted in the development of a new probability and statistics course in Harvard’s Program in General Education and served as teaching fellow for two weekly sections.
 - January 2011: Graduate Student Minicourse: “A Mathematical Look at Some Popular Games”.
 - * Selected by Harvard Graduate Student Council to develop a 10-hour course on mathematics and games.

Academic Advising and Mentoring

- Research Mentor, PROMYS, Summer 2017.
 - Developed research problem in discrete math for a group of high school students.
- UC Irvine, Advising Ph.D. student Hayan Nam, 2016-Present.
- Yale University, Co-advising Ph.D. student Shaked Koplewitz, 2015-2017.
- UC Irvine, Supervisor for Student Reading Courses, 2016-Present.
 - Supervised reading courses for undergraduates on number theory.
 - Supervised a graduate student independent research course.
- SUMRY, Yale University Mathematics Department, Summer 2014, Summer 2015.
 - Helped develop a new summer research program for math majors at Yale. Supervised two undergraduates on a research project in combinatorics. The paper resulting from their work will be published in the proceedings of the 2014 and 2015 CANT conference.
 - Helped plan the second year of the program and supervised three student research groups of three students each. Two of these projects have resulted in papers submitted to journals.
- Yale University Mathematics Department, 2015.
 - Served as thesis advisor for a project on pseudorandom number generators and a project on ranks of elliptic curves. Supervised an individual research project on generalized numerical semigroups.
- Science Research Mentorship Program, Hunter College High School, Summer 2014.
 - Supervised a summer research project in algebra by a high school student. Project won a national award from the AMS at the Intel ISEF competition and has resulted in a joint paper in Journal of Commutative Algebra.
- Non-Resident Mathematics Tutor, Lowell House, Harvard University, 2010-2013.
 - Volunteered as a non-resident tutor advising math majors on course selection and other issues.
- Graduate Assistant, University of Minnesota Duluth REU, Summer 2008, 2009.
 - Assisted undergraduates with individual research projects in number theory, graph theory, and

combinatorics.

- Graduate Assistant, Trinity University REU, Summer 2007.
 - Assisted two undergraduate research groups with projects in factorization theory resulting in four published joint research papers.

Organizational Activities

- Co-organizer for AMS/MAA 2017 Joint Mathematics Meeting Special Session “Mathematics of Cryptography”.
- Co-organizer for Southern California Number Theory Day at UCI, October 2016, October 2017.
- Local organizer, Conference on Mathematics of Cryptography, UC Irvine, August 2015.
- Co-organizer for Biannual Algebraic and Tropical Meetings of Brown and Yale (2014-2015).
- Co-organizer for the UCI Number Theory Seminar (2015-present).
- Co-organizer for the Yale Number Theory Seminar (2013-2015).
- Co-organizer for the Yale Algebraic and Tropical Geometry Seminar (2014-2015).

Other Service

- UCI Graduate Studies Committee, 2016-2017.
- UCI Algebra Qualifying Exam Committee, Fall 2015, Spring and Fall 2016, Spring and Fall 2017.
- UCI Graduate Admissions Committee, 2015-2016.
- Served as referee for 32 articles in 19 journals and 2 conference proceedings.
- Wrote reviews of 30 articles and 2 books for Math Zentralblatt and 3 articles for Math Reviews.
- Reviewed a general audience mathematics book for Princeton University Press.
- Barge Prize Exam Committee, Yale University, Spring 2014.

Other Experience

- Intern, Microsoft Research New England (Supervisor: Henry Cohn), Fall 2011.