

Education

- **Harvard University** Cambridge, USA
Ph.D. in Mathematics 2002 - 2006
- **Massachusetts Institute of Technology** Cambridge, USA
S.B. in Mathematics, Physics, and Computer Science 1998 - 2002

Academic positions

- Visiting research scholar, Stony Brook University, September 2014 - present.
- Associate professor, Massachusetts Institute of Technology, July 2012 - June 2015.
- Assistant professor, Massachusetts Institute of Technology, July 2007 - June 2012.
- Postdoctoral researcher, Microsoft Research theory group, June 2006 - June 2007.

Grants and Fellowships

- Solomon Buchsbaum Research grant, MIT, 2013 - 2015.
- MIT India Innovation Fund grant, December 2012 - August 2014.
- NSF CAREER Grant, March 2010 - Feb 2015 (DMS-0952486).
- NSF Research Grant, 2008-2011 (DMS-0757765).
- Solomon Buchsbaum Research grant, MIT, 2007 - 2013.
- Clay Liffoff Fellowship, Clay Math Institute, 2006.
- Harvard Graduate School of Arts and Sciences Merit Fellowship, Harvard University, 2005-2006.
- William Lowell Putnam Fellowship, Harvard University, 2002-2006.

Publications and Preprints

1. *Inose's construction and elliptic K3 surfaces with Mordell-Weil rank 15 revisited*, with M. Kuwata, Higher Genus Curves in Mathematical Physics and Arithmetic Geometry, 131–141, Contemp. Math. 703, [arXiv:1604.00738](#).
2. *The sphere packing problem in dimension 24*, with H. Cohn, S. D. Miller, D. Radchenko and M. Viazovska, Ann. of Math. 185 (2017), 1017–1033, [arXiv:1603.06518](#).
3. *Algebraic models and arithmetic geometry of Teichmüller curves in genus two*, with R. Mukamel, Internat. Math. Res. Notices 22 (2017), 6894–6942, doi:10.1093/imrn/rnw193, [arXiv:1406.7057](#).
4. *Real multiplication through explicit correspondences*, with R. Mukamel, LMS Journal of Comput. Math. (Special Issue A) (2016), 29–42, [arXiv:1602.01924](#).
5. *Orbit parametrizations for K3 surfaces*, with M. Bhargava and W. Ho, Forum of Math. Sigma, Vol. 4, e18, 86 pages, doi:10.1017/fms.2016.12, [arXiv:1312.0898](#).

6. *K3 surfaces associated with the product of two elliptic curves*, with M. Kuwata, Nagoya Math. J. 228 (2017), 124–185, [arXiv:1409.2931](#).
7. *Simplices and optimal codes in projective spaces*, with H. Cohn and G. Minton, Geom. Topol. 20 (2016), no. 3, 1289–1357, [arXiv:1308.3188](#).
8. *Examples of abelian surfaces with everywhere good reduction*, with L. Dembélé, Math. Annalen 364 (2016), no. 3, 1365–1392, [arXiv:1309.3821](#).
9. *Hilbert modular surfaces for square discriminants and elliptic subfields of genus 2 function fields*, Res. Math. Sci. **2**: **24** (2015), [arXiv:1412.2849](#).
10. *K3 surfaces and equations for Hilbert modular surfaces*, with N. D. Elkies, Algebra Number theory 8 (2014), no. 10, 2297–2411., [arXiv:1209.3527](#).
11. *Formal duality and generalizations of the Poisson summation formula*, with H. Cohn, C. Reiher and A. Schürmann, Discrete Geometry and Algebraic Combinatorics, 123–140, Contemp. Math. 422, [arXiv:1306.6796](#).
12. *Metacommutation of Hurwitz primes*, with H. Cohn, Proc. Amer. Math. Soc. 143 (2015), no. 4, 1459–1469, [arXiv:1307.0443](#).
13. *Multiplicative excellent families of elliptic surfaces of type E_7 or E_8* , with T. Shioda, Algebra Number Theory 7 (2013) , no. 7, 1613–1641, [arXiv:1105.1715](#).
14. *Elliptic fibrations on a generic Jacobian Kummer surface*, J. Algebraic. Geom. 23 (2014), 599–667, [arXiv:1105.1715](#).
15. *Using elimination theory to construct rigid matrices*, with S. V. Lokam, V. M. Patankar and J. Sarma M. N., Comput. Complexity 23 (2014), no. 4, 531–563, [arXiv:0910.5301](#).
16. *Rigidity of spherical codes*, with H. Cohn, Y. Jiao and S. Torquato, Geom. Topol. 15 (2011), no. 4, 2235–2273, [arXiv:1102.5060](#).
17. *Point configurations that are asymmetric yet balanced*, with H. Cohn, N. D. Elkies and A. Schürmann, Proc. Amer. Math. Soc. 138 (2010), no. 8, 2863–2872, [arXiv:0812.2579](#).
18. *Ground states and formal duality relations in the Gaussian core model*, with H. Cohn and A. Schürmann, Physical Review E 80 (2009), 061116, [arXiv:0911.2169](#).
19. *Algorithmic design of self-assembling structures*, with H. Cohn, Proc. Nat. Acad. Sci. 106 (2009) no. 24, 9570–9575, [arXiv:0906.3550](#).
20. *Optimality and uniqueness of the Leech lattice among lattices*, with H. Cohn, Ann. of Math. 170 (2009), No. 3, 1003–1050. [arXiv:math.MG/0403263](#).
21. *Counterintuitive ground states in soft-core models*, with H. Cohn, Physical Review E 78 (2008), 061113, [arXiv:0811.1236](#).
22. *K3 surfaces associated with curves of genus two*, Internat. Math. Res. Notices 2008, no. 6, Art. ID rnm165, 26 pp., [arXiv:math.AG/0701669](#).
23. *Uniqueness of the $(22, 891, 1/4)$ spherical code*, with H. Cohn, New York J. Math. 13 (2007), 147–157, [arXiv:math.MG/0607448](#).
24. *Universally optimal distribution of points on spheres*, with H. Cohn, J. Amer. Math. Soc. 20 (2007), no. 1, 99–148.
25. *The D_4 root system is not universally optimal*, with H. Cohn, J. H. Conway and N. D. Elkies, Experiment. Math. 16 (2007), 313–320, [arXiv:math.MG/0607447](#).
26. *The densest lattice in twenty-four dimensions*, with H. Cohn, Electron. Res. Announc. Amer. Math. Soc. 10 (2004), 58–67, [arXiv:math.MG/0408174](#).

27. *A proof of Pieri's formula using generalized Schensted insertion algorithm for RC-graphs*, with M. Kogan, Proc. Amer. Math. Soc. 130 (2002), 2525-2534, [arXiv:math.CO/0010109](https://arxiv.org/abs/math/0010109).

Other Awards and Honors

- Jon A. Bucsele Prize for top undergraduate student in Mathematics, MIT, 2002.
- Joel Matthew Orloff Award for outstanding scholarship in physics, MIT, 2002.
- Member of Phi Beta Kappa, Sigma Xi and Tau Beta Pi honor societies (2002-present).
- William Lowell Putnam Undergraduate Mathematics Competition: 18th place in 1998, Putnam Fellow in 1999 and 2000, 16th place in 2001.
- Boston Area Undergraduate Physics contest: 2nd place in 1999, 3rd place in 2000, 4th place in 2001.
- International Math Olympiad: Silver medal in 1997, Gold medal in 1998.
- Indian Institute of Technology Joint entrance examination, 1998: first place, out of approximately 125,000 candidates.
- Indian National Talent Search scholar, 1996.

Talks

1. *Moduli spaces of genus 2 curves with split Jacobians through K3 surfaces*, Workshop on Explicit Methods for Modularity of K3 Surfaces and Other Higher Weight Motives, ICERM, 2015.
2. *Moduli spaces of reducible Jacobians of genus 2 curves via Hilbert modular surfaces of square discriminant*, Harvard Number Theory seminar, 2015.
3. *Lattices, packings, and energy minimization*, Workshop on Crystals, Quasicrystals and Random Networks, ICERM, 2015.
4. *Moduli spaces of abelian surfaces via elliptic K3 surfaces with Shioda-Inose structure*, Arithmetic and Algebraic Geometry (Shioda 75), Tokyo, 2015.
5. *Lattices and K3 surfaces*, International Conference on the Algebraic and Arithmetic Theory of Quadratic Forms, Chile, 2013.
6. *Equations for Hilbert modular surfaces, and applications*, Caltech Number Theory seminar, 2013.
7. *Lattices, codes and potential energy: some geometric optimization problems*, Caltech math colloquium, 2013.
8. *Tight simplices and codes in compact spaces*, Retrospective Workshop on Discrete Geometry, Optimization, and Symmetry, Fields Institute, 2013.
9. *Moduli spaces of genus 2 curves with reducible Jacobians*, MIT Number Theory seminar, 2013.
10. *Lattices, codes and potential energy: some geometric optimization problems*, Brown University math colloquium, 2013.
11. *Neron-Severi lattices of K3 surfaces of high rank, and arithmetic applications*, AMS Western Sectional Meeting, Special session on Heights, Diophantine Problems, and Lattices, 2013.

12. *Inverse problems in potential energy minimization, and algorithms for self-assembly*, Northeastern Theory of Computation Seminar, 2013.
13. *K3 surfaces and arithmetic questions*, AIM workshop on Algebraic modular forms, 2013.
14. *Equations for Hilbert modular surfaces*, Emory University Algebra and Number Theory seminar, 2013.
15. *Existence of tight simplices and other codes in compact spaces*, AMS Eastern Sectional Meeting, Special Session on Discrete Geometry of Polytopes, 2013.
16. *Real multiplication abelian surfaces with everywhere good reduction*, New York Joint Number theory seminar, 2013.
17. *Multiplicative excellent families of elliptic surfaces of type E_7 or E_8* , New Trends in Arithmetic and Geometry of Algebraic Surfaces, CIRM Marseilles, 2013.
18. *Moduli spaces of elliptic K3 surfaces*, Brown University Algebra seminar, 2013.
19. *Real multiplication abelian surfaces with everywhere good reduction*, BC-MIT Number Theory seminar, 2013.
20. *Periodic packings, potential energy and formal duality*, UCLA Combinatorics seminar, 2013.
21. *Metacommutation of Hurwitz primes*, Joint Math Meetings (San Diego), Special session on Arithmetic theory of quadratic forms and lattices, 2013.
22. *Formally dual configurations in Euclidean space and in abelian groups*, Joint Math Meetings (San Diego), Special session on Discrete Geometry and Algebraic Combinatorics, 2013.
23. *Lattices, sphere packings and spherical codes: geometric optimization problems*, Cornell University Number Theory seminar, 2012.
24. *Abelian surfaces with everywhere good reduction*, Northwestern University Number Theory seminar, 2012.
25. *Abelian surfaces with everywhere good reduction*, Harvard University Number Theory seminar, 2012.
26. *On some kissing configurations in low dimensions*, Mathematisches Forschungsinstitut Oberwolfach: Workshop on optimal and near optimal configurations on lattices and other manifolds, 2012.
27. *Inverse problems in potential energy minimization*, Shanghai conference on Algebraic Combinatorics, 2012.
28. *Multiplicative excellent families of elliptic surfaces of type E_7 or E_8* , Rikkyo university, 2012.
29. *Rational elliptic surfaces with high Mordell-Weil rank and multiplicative bad fibers*, MIT number theory seminar, 2012.
30. *Matrix rigidity and elimination theory*, workshop on Questions in geometry arising in the sciences, Texas A&M, 2012.
31. *Rational elliptic surfaces with high Mordell-Weil rank and multiplicative bad fibers*, Texas Algebraic Geometry Symposium, 2012.
32. *Rigidity of spherical codes, and kissing numbers*, Fourth conference in Discrete Geometry and Algebraic Combinatorics, Brownsville, 2012.
33. *Rational elliptic surfaces with Mordell-Weil lattice E_8 and multiplicative reduction*, Joint Math Meetings (Boston), Special session on Rational Points on Varieties, 2012.
34. *K3 surfaces, orbit parametrizations and generalizations of Rubik's cube*, Arithmetic invariant theory seminar, Princeton, 2011.
35. *Energy minimization for lattices and periodic configurations, and formal duality*, Banff workshop on diophantine methods, lattices and arithmetic theory of quadratic forms, 2011.
36. Northeastern University research seminar in mathematics, 2011.

- (a) *Linear programming bounds in geometry and coding theory*
 - (b) *Potential energy minimization and universal optimality.*
37. *Rigidity of spherical codes, and kissing numbers in high dimensions*, Fields Institute workshop on Rigidity and Symmetry, 2011.
 38. *Elliptic fibrations on a generic Jacobian Kummer surface*, Wesleyan University Algebra Seminar, 2011.
 39. *Equations for abelian surfaces with real multiplication*, First Latin American School on Algebraic Geometry, La Cumbre, 2011.
 40. *Rigidity of spherical codes, and kissing numbers*, University of Cordoba, 2011.
 41. *Elliptic fibrations on Kummer surfaces*, Fields institute workshop on arithmetic and geometry of K3 surfaces and Calabi-Yau 3-folds, 2011.
 42. *Rigidity of spherical codes*, Workshop on sphere packing and amorphous materials, ICTP, Trieste, 2011.
 43. *Equations for Hilbert modular surfaces through K3 surfaces*, Stanford University Number theory seminar, 2011.
 44. *Jamming of spherical codes, Linear programming and Kissing numbers*, University of Calgary: Fejes Toth lecture in Discrete Geometry, 2011.
 45. *Packing problems and energy minimization*, University of Calgary math colloquium, 2011.
 46. *K3 surfaces and Hilbert modular surfaces*, Harvard University Number Theory seminar, 2011.
 47. *Jamming of spherical codes, Linear programming and Kissing numbers*, Northeastern University: Geometry-Algebra-Singularities-Combinatorics seminar, 2011.
 48. *Lattices, periodic configurations and Gaussian potential energy*, Joint Math Meetings (New Orleans), Special session on Quadratic forms, 2011.
 49. *Lattices, periodic configurations and Gaussian potential energy*, AMS - SOMACHI joint meeting (Pucon, Chile), Special session on Arithmetic of Quadratic forms and Integral Lattices, 2010.
 50. *Rigidity of Spherical codes, and Linear programming*, MIT Combinatorics seminar, 2010.
 51. *All the elliptic fibrations on a generic Jacobian Kummer surface*, Southern California Algebraic Geometry seminar, 2010.
 52. *K3 surfaces, genus 2 curves and Hilbert modular surfaces*, Michigan State university Algebra seminar, 2010.
 53. *All the elliptic fibrations on a generic Jacobian Kummer surface*, Harvard-MIT Algebraic Geometry seminar, 2010.
 54. *Explicit equations for Hilbert modular surfaces, and connections to modular forms*, ICM Satellite conference on Automorphic forms and Number theory at Goa, India, 2010.
 55. *Rigidity and Jamming properties of spherical codes*, Microsoft Research India (Bangalore), 2010.
 56. *All the elliptic fibrations on a generic Jacobian Kummer surface*, Humboldt Universitat: Workshop on Elliptic and K3 surfaces, 2010.
 57. *Energy minimization and connections with sphere packing and spherical codes*, (plenary talk) Vanderbilt University: conference on "Optimal Structures", 2010.
 58. *Inverse optimization problems: designing potential functions for target structures*, University of Hyderabad, 2010.
 59. Institute for Mathematical Sciences, Chennai, 2010. Lecture series:

- (a) *Lattices, sphere packings, spherical codes and energy minimization*
 - (b) *K3 surfaces, Kummer surfaces and genus 2 curves*
 - (c) *Explicit equations for Hilbert modular surfaces.*
60. *Hilbert modular surfaces through K3 surfaces*, Princeton University/IAS Number theory seminar, 2009.
 61. *Lattices, sphere packings, spherical codes, and energy minimization*, Emory University Algebra Seminar, 2009.
 62. *K3 surfaces and Hilbert modular surfaces*, AMS Southeastern Sectional Meeting, Special Session on Arithmetic Geometry, 2009.
 63. *Inverse optimization problems: designing potential functions for target structures*, University of Magdeburg: Algebra and Geometry seminar, 2009.
 64. *Parameterizing Hilbert modular surfaces via K3 surfaces*, Boston University Algebra Seminar, 2009.
 65. *K3 Surfaces, Shioda-Inose Structures, and Real Multiplication*, New York Joint Number theory seminar, 2009.
 66. *Configurations of points on spheres, and energy minimization*, MIT Geometry Seminar, 2008.
 67. *Lattices, sphere packings and potential energy minimization*, MIT Number theory seminar, 2008.
 68. *Lattices, Sphere packings and Energy minimization*, AMS Fall Sectional Meeting, Special Session in Number Theory, 2008.
 69. *Kummer surfaces, Shioda-Inose Structures, and real multiplication*, Québec-Vermont Number theory seminar, 2008.
 70. *Optimal geometric structures and Energy minimization*, Hausdorff Institute for Mathematics: workshop on Optimal Geometric Structures, 2008.
 71. *K3 surfaces and real multiplication*, Massachusetts Institute of Technology: Number theory seminar, 2007.
 72. *Linear Programming Bounds for Potential Energy and Universally Optimal Configurations*, Universite Catholique de Louvain (Belgium), A day in honor of Philippe Delsarte, 2007.
 73. *The E_8 and the Leech lattices in the context of energy minimization*, University of Talca (Chile), International conference on the algebraic and arithmetic theory of quadratic forms, 2007.
 74. *Elliptic surfaces and K3 surfaces*, Microsoft Research India (Bangalore), 2007.
 75. *K3 surfaces associated to genus 2 curves via Shioda-Inose structure*, Nagoya University, Conference on Birational automorphisms of compact complex manifolds and dynamical systems, 2007.
 76. *K3 Surfaces Corresponding To Genus 2 Curves*, Jacobs University Bremen, Workshop on Rational Points, 2007.
 77. *Uniqueness of some spherical codes related to the E_8 and Leech lattices*, University of Washington: Combinatorics seminar, 2007.
 78. *K3 surfaces of high rank and Kummer surfaces*, University of Washington: Number theory seminar, 2007.
 79. *The densest lattices in eight and twenty-four dimensions*, Microsoft Research India (Bangalore), 2006.
 80. *Universally optimal distribution of points on spheres*, Indian Institute of Science, 2006.
 81. *K3 surfaces of high rank and Kummer surfaces*, AMS Eastern Section Meeting, Special Session in Number theory, University of Connecticut, 2006.
 82. *Universally optimal distribution of points on spheres*, Brandeis University: Everytopic seminar, 2006.
 83. *K3 surfaces of high rank*, Harvard-MIT Algebraic Geometry seminar, 2006.

84. *K3 surfaces with high Neron-Severi rank*, Columbia University: Algebraic Geometry seminar, 2006.
85. *K3 surfaces with high Neron-Severi rank*, University of Pittsburgh: Mathematics Department colloquium, 2006.
86. *K3 surfaces with high Neron-Severi rank*, University of Michigan: Number theory seminar, 2006.
87. *K3 surfaces of high rank and isogenies to Kummer surfaces*, Microsoft Research, 2006.
88. *The densest lattice in twenty-four dimensions*, Harvard University: Number theory seminar, 2005.
89. *Optimality and uniqueness of the Leech lattice among lattices*, Kyushu University: Second COE Workshop on Sphere Packings, 2005.
90. *Universally optimal distribution of points on spheres*, Calgary Workshop in Discrete Geometry, 2005.
91. *The optimal lattice packing in 24 dimensions*, Wesleyan University: Algebra seminar, 2005.
92. *Optimality and uniqueness of the Leech lattice among lattices*, Mathematisches Forschungsinstitut Oberwolfach: Workshop on Lattices and Applications, 2005.
93. *The densest lattice packings in 8 and 24 dimensions*, American Institute of Mathematics: Workshop on Sphere packings, Lattices and Infinite dimensional algebra, 2004.
94. *The optimal lattice packing in 24 dimensions*, Harvard University: Theory of computing seminar, 2004.
95. *The optimal lattice packing in 24 dimensions*, Princeton University/IAS: Number theory seminar, 2004.