

Curriculum Vitae

Abhinav Kumar

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Personal Details

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Education

2002 - 2006 Ph.D. in Mathematics, Harvard University

1998 - 2002 S.B. in Mathematics, Physics, and Computer Science, Massachusetts Institute of Technology

Employment

- Assistant professor, Massachusetts Institute of Technology, July 2007 - present.
- Postdoctoral researcher, Microsoft Research theory group, June 2006 - June 2007.

Interests

Number theory, sphere packing, algebraic geometry, combinatorics,
quantum physics, theoretical computer science.

Grants and Fellowships

- NSF Research Grant, 2008-2011 (DMS-0757765).
- Solomon Buchsbaum Research grant, MIT, 2007.
- Clay Liftoff Fellowship, 2006.
- Harvard GSAS Merit Fellowship, 2005-2006.
- Harvard Putnam Fellowship, 2002-2006.

- *Ground states and formal duality relations in the Gaussian core model*, with H. Cohn and A. Schuermann, preprint, 2009 (submitted).
- *Point configurations that are asymmetric yet balanced*, with H. Cohn, N. D. Elkies and A. Schuermann, preprint, 2008 (submitted), arXiv:0812.2579.
- *Algorithmic design of self-assembling structures*, with H. Cohn, Proc. Nat. Acad. Sci. 106 (2009) no. 24, 9570–9575, arXiv:0906.3550.
- *Counterintuitive ground states in soft-core models*, with H. Cohn, Physical Review E 78 (2008), 061113, 2008, arXiv:0811.1236.
- *K3 surfaces associated with curves of genus two*, Internat. Math. Res. Notices 2008, arXiv:math.AG/0701669.
- *Uniqueness of the $(22, 891, 1/4)$ spherical code*, with H. Cohn, New York J. Math. 13 (2007), 147–157, arXiv:math.MG/0607448.
- *Universally optimal distribution of points on spheres*, with H. Cohn, J. Amer. Math. Soc. 20 (2007), no. 1, 99–148.
- *The D_4 root system is not universally optimal*, with H. Cohn, J. H. Conway and N. D. Elkies, to appear in Experimental Mathematics, arXiv:math.MG/0607447.
- *The densest lattice in twenty-four dimensions*, with H. Cohn, Electron. Res. Announc. Amer. Math. Soc. 10 (2004), 58–67, arXiv:math.MG/0408174.
- *Optimality and uniqueness of the Leech lattice among lattices*, with H. Cohn, to appear in Annals of Mathematics, arXiv:math.MG/0403263.
- *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.

Other Awards and Honors

- Jon A. Bucsela Prize in Mathematics, MIT, 2002.
- Member of Sigma Xi, Phi Beta Kappa, Sigma Pi Sigma, Tau Beta Pi honor societies.
- Fourth place in Boston Area Undergraduate Physics contest 2001.
- 16th place in William Lowell Putnam contest 2001.
- Third place in Boston Area Undergraduate Physics contest 2000.
- Putnam Fellow in William Lowell Putnam contest 2000.
- Second place in Boston Area Undergraduate Physics contest 1999.
- Putnam Fellow in William Lowell Putnam contest 1999.
- 18th place in William Lowell Putnam contest 1998.
- First place in Indian Institute of Technology Joint Entrance Exam 1998.
- Gold medal at International Math Olympiad 1998.
- Silver medal at International Math Olympiad 1997.
- Indian National Talent Search scholar, 1996.

- University of Magdeburg: Algebra and Geometry seminar, June 2009.
- MIT STAGE seminar, March 2009.
- New York Joint Number theory seminar, February 2009.
- MIT Geometry Seminar, November 2008.
- MIT Number theory seminar, October 2008.
- Québec-Vermont Number theory seminar, May 2008.
- Massachusetts Institute of Technology: Number theory seminar, December 2007.
- Universite Catholique de Louvain (Belgium), A day about the Delsarte bound, October 2007.
- University of Talca (Chile),
International conference on the algebraic and arithmetic theory of quadratic forms, December 2007.
- Microsoft Research India (Bangalore), August 2007.
- Nagoya University, Conference on Birational automorphisms of compact complex manifolds
and dynamical systems, August 2007.
- Jacobs University Bremen, Workshop on Rational Points, July 2007.
- University of Washington: Combinatorics seminar, May 2007.
- University of Washington: Number theory seminar, May 2007.
- University of Washington: Number theory seminar, January 2007.
- Microsoft Research India (Bangalore), December 2006.
- Indian Institute of Science, December 2006.
- AMS Eastern Section Meeting, University of Connecticut, October 2006.
- Brandeis University: Everytopic seminar, October 2006.
- Harvard-MIT Algebraic Geometry seminar, September 2006.
- Columbia University: Algebraic Geometry seminar, February 2006.
- University of Pittsburgh: Mathematics Department colloquium, January 2006.
- University of Michigan: Number theory seminar, January 2006.
- Microsoft Research, January 2006.
- Harvard University: Number theory seminar, October 2005.
- Kyushu University: Second COE Workshop on Sphere Packings, June 2005.
- Calgary Workshop in Discrete Geometry, May 2005.
- Wesleyan University: Algebra seminar, March 2005.
- Mathematisches Forschungsinstitut Oberwolfach:
Workshop on Lattices and Applications, January 2005.
- American Institute of Mathematics:
Workshop on Sphere packings, Lattices and Infinite dimensional algebra, August 2004.
- Harvard University: Theory of computing seminar, April 2004.
- Princeton University / IAS: Number theory seminar, March 2004.

Teaching

- Instructor for Seminar in Number Theory (lattices and quadratic forms), MIT, fall 2008.
- Instructor for Algebraic Geometry, MIT, fall 2008.
- Instructor for Topics in Algebraic Geometry (algebraic surfaces), MIT, spring 2008.
- Instructor for Analysis I, MIT, fall 2007.
- Instructor for seminar on Sphere Packing, Harvard University, spring 2006.
- Instructor for Linear Algebra, Harvard University, spring 2005.
- Teaching Combinatorics and Computational Number Theory at the Math Circle, (a special program for talented middle and high school students), Northeastern University, fall 2004.
- Instructor for Multivariable Calculus, Harvard University, fall 2003.
- Instructor for "Topics in Group theory" tutorial, Harvard University, summer 2003.
- Tutoring math and physics at MIT and Harvard.
- Counselor at PROMYS, a math camp for high school students, Boston University, summer 1999.

Other Research Experience

- Visiting researcher at Microsoft Research theory group, Jan 2003, August 2003, May 2005.
- Research intern at Microsoft Research theory group, summer 2004. Worked on potential energy minimization problem.
- Research intern at Microsoft Research theory group, summer 2002. Worked on sphere packing problems.
- Undergraduate Research Opportunities Program, MIT, summer 2001. Continued work on combinatorics and Schubert calculus.
- Summer Program in Undergraduate Research, MIT, summer 2000. Worked on combinatorics and Schubert calculus.

Professional Activities

- Refereed articles for journals: International Math Research Notices, Journal of Combinatorial Theory A, SIAM Journal of Discrete Math, American Math Monthly.
- Graduate students: Tathagata Sengupta (3rd year).
- Thesis committee member for Chris Davis (MIT, graduating 2009).
- Reviewed grant proposal for NSA.
- Member of the American Mathematical Society.