

Hemanshu Kaul

Department of Applied Mathematics
Illinois Institute of Technology
10 West 32nd Street
Chicago, IL 60616

phone: (312) 567-3128
fax: (312) 567-3135
email: kaul@math.iit.edu
web: www.math.iit.edu/~kaul

Employment and Education

Assistant Professor, Fall 2006 - present

Department of Applied Mathematics, Illinois Institute of Technology, Chicago

Ph.D Mathematics, 2006

University of Illinois at Urbana-Champaign

Topics in Stochastic Combinatorial Optimization and Extremal Graph Theory

Advisors: Professors Sheldon H. Jacobson and Douglas B. West

M.Sc. Mathematics, 1999

Indian Institute of Technology, Bombay

B.Sc. (Honors) Mathematics, 1997

St. Stephen's College, Delhi

Awards and Support

Outstanding Undergraduate Research in Mathematics by the Illinois Section of Mathematics Association of America, awarded to my students YoungJu Jo (1st prize) and Chris Mitillos (2nd prize). April 2009.

AMS Project NExT Fellow, Mathematical Association of America. 2007-2008.

SIAM Student Travel Award, SIAM Conference on Discrete Mathematics, Victoria, Canada. June 2006.

Inter-disciplinary Research Award and Travel Grant, Applied Mathematics Program, University of Illinois at Urbana-Champaign. Spring 2006.

Conference Travel Grant, Graduate College, University of Illinois at Urbana-Champaign. Fall 2005.

Student Travel Award, Workshop on Stochastic Programming, The 10th International Conference on Stochastic Programming, Tucson. October 2004.

Support grants to attend DIMACS/DIMATIA/Renyi Combinatorial Challenges Conference 2006, MSRI Workshop on Models of Real-World Random Networks 2005, NSF-CBMS Workshop on the Combinatorics of Large Sparse Graphs 2004, IMA Workshop on Combinatorics and its Applications 2003.

Research Assistant, Simulation and Optimization Laboratory, University of Illinois at Urbana-Champaign, Fall 2001 to Spring 2006. Supervisor: Professor Sheldon H. Jacobson.

Research Assistant, Department of Mathematics, University of Illinois at Urbana-Champaign, Spring 2002, 2003. Supervisor: Professor Douglas B. West.

Fellowship for Academic Excellence, National Board for Higher Mathematics, India. 1997-1998 and 1998-1999.

Merit Scholarship, Visiting Students Research Program, Tata Institute of Fundamental Research (TIFR), Bombay. Summer 1998 and Summer 1999.

Merit Scholarship, Workshop on Advanced Mathematics for College Students. Indian Institute of Technology, Delhi. October 1996.

Certificate of Merit, for scoring 100% in Mathematics in the National High School Examination. All India Senior Secondary Certificate Examination (AISSCE). 1994.

Teaching Experience

Faculty Member, Department of Applied Mathematics, IIT, Fall 2006 - present.

- Instructor for the following courses: *Discrete Applied Math II* (Math 554), *Linear Optimization* (Math 435 & 535), *Graph Theory and applications* (Math 454 & 553), *Number Theory* (Math 410), *Elementary Linear Algebra* (Math 332), *Multivariate & Vector Calculus* (Math 251), *Calculus I* (Math 151).
- Undergraduate and graduate curriculum development, including particular courses like -
 - *Number Theory (Math 410)*, new course which has attracted undergraduate students from Applied Math, Computer Science, and ECE.
 - *Linear Optimization (Math 435 & 535)*, new course which has attracted graduate and undergraduate students from Applied Math, Computer Science, and ECE.
 - *Advanced Methods in Discrete Math (DAM II) (Math 554)*, new modern topics which have attracted graduate (and some talented undergraduate) students from Applied Math and Computer Science.
- Student advising and supervision -
 - *Stefan Matei, John Roman, Aimee Totleben* (Fall 2006), and *Alex Fugate, Kaya Sims* (Fall 2008), Applied Math Freshmen Project (expository report including self-discovered proofs and computer implementation) on ‘Theory and Algorithms for Stable Matchings’.
 - *YoungJu Jo*, Undergraduate student in Applied Math and ECE, Summer 2008 - Summer 2009
Original research in Discrete Geometry that improves previous known bounds on a long-standing conjecture to be published as “On Orthogonal Art Galleries with Holes”;
Awarded First prize for ‘Outstanding Undergraduate Research in Mathematics’ by the Illinois Section of Mathematics Association of America, April 2009;
Presentations at Nebraska Women’s Conference (January 2009), Department Seminar (March 2009), Illinois MAA conference (April 2009), Chicago Undergraduate Research Symposium (April 2009), Menger Day at IIT (April 2009).
 - *Christos Mitillos*, Undergraduate student in Applied Math and CS, Summer 2008 - Summer 2009
Original research in Graph Theory to be published as “On Fall-coloring of Graphs”;
Awarded Second prize for ‘Outstanding Undergraduate Research in Mathematics’ by the Illinois Section of Mathematics Association of America, April 2009;
Won the IIT College of Science and Letters’ Summer Scholarship 2008 to work with me;
Presentations at Department Seminar (March 2009), Illinois MAA conference (April 2009), Chicago Undergraduate Research Symposium (April 2009), Menger Day at IIT (April 2009).
 - *Joseph Srigiri*, Graduate Student in Applied Math, Spring 2009
M.S. project in Computational Discrete Geometry and Optimization on “Stochastic Models for the Art Gallery Problem: A Computational Study”.
 - *B. Bhattacharjya*, Graduate Student, Indian Institute of Technology, Kanpur
External member, Ph.D. Thesis committee, 2008-09.

Teaching Assistant, Department of Mathematics, UIUC, Fall 1999-Spring 2006.

- Proposer, developer, and instructor for a semester-long graduate course, *Topics in Probabilis-*

tic Methods for Discrete Mathematics, Fall 2005.

- Independent Instructor for : *Introductory Linear Algebra, Calculus and Analytic Geometry II*.
Teaching Assistant for : *Linear programming, Graph Theory, Introduction to Combinatorics, Combinatorial Mathematics*.
- Co-author, successful proposal for graduate course on *Discrete and Convex Geometry*, 2003.

Research Interests

Discrete Applied Mathematics and Operations Research, including Graph Theory, Discrete Optimization, Discrete Geometry, Probabilistic Discrete Structures, and their applications.

Papers and Preprints

- *Global Optima Results for the Kauffman NK Model*, (with S.H. Jacobson), *Mathematical Programming*, Volume 106, 2006, 319-338.
- *New Global Optima Results for the Kauffman NK Model: Handling Dependency*, (with S.H. Jacobson), *Mathematical Programming*, Special issue on ‘Optimization under Uncertainty’, Volume 108, 2006, 475-494.
- *Extremal Graphs for a Graph Packing Theorem of Sauer and Spencer*, (with A. Kostochka), *Combinatorics, Probability and Computing*, Volume 16, 2007, 409-417.
- *Analyzing the Performance of Simultaneous Generalized Hill Climbing Algorithms*, (with D.E. Vaughan and S.H. Jacobson), *Computational Optimization and Applications*, Volume 37, 2007, 103-119.
- *On a Graph Packing Conjecture of Bollobas, Eldridge, and Catlin*, (with A. Kostochka and G. Yu), *Combinatorica*, Volume 28, 2008, 469-485.
- *Long Local Searches for Large Bipartite Subgraphs*, (with D.B. West), *SIAM Journal on Discrete Mathematics*, Volume 22, 2008, 1138-1144.
- *Distinguishing Chromatic Number of Cartesian Products of Graphs*, (with J. Choi and S. Hartke), *SIAM Journal on Discrete Mathematics*, to appear.
- *Reductions for the Stable Set Problem*, (with E.C. Sewell and S.H. Jacobson), submitted for publication.
- *Maximum Series-Parallel Subgraph: Approximation Algorithms*, (with G. Calinescu and C.G. Fernandes), submitted for publication.
- *Forbidden Subgraphs of Unit Disk Graphs*, (with R. Martin), submitted for publication.
- *Improved Bound for Guarding Orthogonal Art Galleries with Holes*, (with Y. Jo), preprint.
- *Fall coloring of Graphs*, (with C. Mitillos), preprint.
- *Counting Local Substructures in Turan-type Problems*, (with D. Mubayi), manuscript in preparation.
- *Exact Algorithms for the Maximum Independent Set Problem*, (with E.C. Sewell and S.H. Jacobson), manuscript in preparation.
- *Lectures on Modern Probabilistic Methods for Discrete Mathematics*, (with D.B. West), manuscript in preparation.

- *A Threshold for Random Geometric Graphs with a Hamiltonian cycle*, (with J. Balogh), manuscript.
- *Multi-Objective Optimization and Sensitivity Analysis For Discrete and Continuous Optimization Problems*, (with S.H. Jacobson, G.K. Kao, J.A. Stori and V. Venkat), Technical Report to Austral Engineering and Software, Inc., 2004.
- *On Queue number of Planar Graphs*, M.Sc. Thesis (under the guidance of S. Pemmaraju), Dept. of Mathematics, Indian Institute of Technology, Bombay, 1999.
- *An Elementary Construction of \mathbb{R} from \mathbb{Q}* , The Mathematica : Annual Journal of the Mathematics Society, St. Stephen's College, 1997.

Talks and Presentations

Mathematics Colloquium, Iowa State University, Ames, March 2008. (Invited Talk)

SIAM Minisymposium on Graph Coloring and Partitioning, Joint Mathematics Meetings, San Diego, January 2008. (Invited Talk)

21st MCCCC (Midwest Conference on Combinatorics, Cryptography & Computing), College of Charleston, Charleston, October 2007.

Mathematics Colloquium, University of Illinois, Chicago, April 2007. (Invited Talk)

86th Annual Meeting of the Illinois Section of the Mathematical Association of America, Western Illinois University, Macomb, Illinois, March 2007. (Invited 1-hour lecture)

Discrete Mathematics Seminar, Illinois Institute of Technology, 2006-present. (Multiple Talks)

13th SIAM Conference on Discrete Mathematics, Victoria, British Columbia, Canada, June 2006. (Invited Talk)

DIMACS/DIMATIA/Renyi Combinatorial Challenges Meeting, DIMACS Center, Rutgers University, New Jersey, April 2006.

Mathematics Colloquium, University of Dayton, February 2006. (Invited Talk)

Mathematics Colloquium, Western Washington University, January 2006. (Invited Talk)

Mathematics Colloquium, Southern Illinois University, January 2006. (Invited Talk)

Mathematics Colloquium, University of Central Florida, Orlando, November 2005. (Invited Talk)

INFORMS Annual Meeting, San Francisco, November 2005.

Applied Mathematics Seminar, Illinois Institute of Technology, Chicago, October 2005. (Invited Talk)

19th MCCCC (Midwest Conference on Combinatorics, Cryptography & Computing), Rochester Institute of Technology, Rochester, October 2005. (Two Talks)

XLI MIGHTY (Midwest Graph Theory Conference), Middle Tennessee State University, Murfreesboro, September 2005.

Graph Theory with Altitude - J. Hutchinson's Birthday Conference, University of Colorado, Denver, May 2005.

Mathematics and Engineering Colloquium, University of Georgia, Athens, March 2005. (Invited Talk)

Applied Mathematics Colloquium, Illinois Institute of Technology, Chicago, March 2005. (Invited Talk)

Industrial Engineering Colloquium, University of Minnesota, Minneapolis-St.Paul, February 2005. (Invited Talk)

Graph Theory and Combinatorics Seminar, Dept. of Mathematics, UIUC, March 2005; March 2004; April 2003.

Nonlinear Dynamics and Complex Systems Seminar, Dept. of Physics, UIUC, December 2004. (Invited Talk)

Discrete Mathematics Seminar, University of Central Florida, Orlando, November 2004. (Invited Talk)

The 10th International Conference on Stochastic Programming, University of Arizona, Tuc-

son, October 2004.

Symposium on Complex Systems - Networks, UIUC, May 2004.

Symposium on Optimization and Applied Probability, UIUC, June 2003. (Invited Talk)

Random Graphs and Logic Seminar, Dept. of Mathematics, UIUC, March 2002.

Generating Functions Seminar, Dept. of Mathematics, UIUC, February 2002.

Approximation Algorithms Seminar, Dept. of Chemical Engineering, UIUC, October 2000.

Academic Service

In the Professional Community:

Member, MAA National Committee on Minority Participation in Mathematics, 2009-2012.

Associate Editor, European Journal of Pure and Applied Mathematics, 2007-present.

Referee for the journals: Ars Combinatoria, Complexity, Discrete Mathematics (multiple papers), Journal of Combinatorial Mathematics and Combinatorial Computing, Naval Research Logistics (multiple papers), SIAM Journal on Discrete Mathematics (multiple papers), Operations Research.

Co-Organizer, 47th Midwest Graph Theory Conference (MIGHTY), IIT, Chicago, November 2008.

Co-Organizer, Special Session on *Graph Theory*, AMS Central Section Meeting, Bloomington, April 2008.

Judge, MAA Student Poster Competition, Joint Mathematics Meeting, San Diego, January 2008.

Co-Organizer, Project NExT panel discussion on ‘*Grants: possible sources and proposal writing*’, Joint Mathematics Meeting, San Diego, January 2008.

Co-Organizer, Special Session on *Graph Theory*, AMS Central Section Meeting, Chicago, October 2007.

Co-Organizer, Joint Depaul University-IIT Reading Seminar in Discrete Mathematics, Fall 2006-Fall 2008.

Chair, Session on *Special Topics in Networks and Graphs*, INFORMS annual meeting, November 2005.

Within the Home Institution:

Member, Wireless Network and Communications Research Center (WinCom), IIT, Spring 2007-present.

Organizer, Applied Mathematics Colloquium, IIT, 2008-09.

Organizer, Student Poster Competition, Menger Day, IIT, April 2008 and April 2009.

Member, University Library Committee, IIT, 2007-present.

Member, Mathematics General Education Committee, IIT, 2009-present.

MAA Liaison, IIT, 2007-present.

Department Representative, Graduate School Fair, Joint Mathematics Meeting, January 2008 (San Diego) and January 2009 (Washington D.C.).

Organizer, Discrete Applied Mathematics Research Seminar, IIT, 2007-08.

Member, Examination Committee, Undergraduate Math Competition, IIT, May 2008.

Department Representative, Graduate School Fair, Chicago Area Undergraduate Research Symposium, Chicago, April 2008.

Interviewer, CAMRAS scholarship applicants, IIT, March 2008.

Judge, Graduate Student Poster Competition, IIT Research Day, April 2007.

Member, Examination committee, Regional Mathematics Olympiad, Indian Institute of Technology, Bombay, 1998.

Student Organizer, Popular Lecture Series in Mathematics, Indian Institute of Technology, Bombay, 1997-1999.

Professional Societies

AMS, American Mathematical Society

INFORMS, Institute for Operations Research and Management Sciences

MAA, Mathematical Society of America

SIAM, Society for Industrial and Applied Mathematics