Susan Margulies

margulie at usna dot edu

United States Naval Academy, Department of Mathematics, Annapolis, MD 21402

Research Interests

Optimization, Graph Theory, Computer Algebra, Algorithms and Complexity, Quantum Computing

Awards and Fellowships

Office of Naval Research grant ($19,160) for research on combinatorial optimization (Summer 2015)
Office of Naval Research grant ($28,530) for research on Pfaffian circuits (Summer 2014)
2010 INFORMS Computing Society Prize
Chancellor's Teaching Fellowship, Spring 2008
Graduate Student Association Travel Award, July 2008

Education and Research Employment

Mathematics Department, US Naval Academy — **August 2013 - present**
Assistant Professor — *Annapolis, MD*

Mathematics Department, Pennsylvania State University — **August 2011 - August 2013**
Research Associate — *State College, PA*
  Topics: Quantum Computing, #P Problems, Tensor Contraction Networks

Computational and Applied Math, Rice University — **August 2008 - 2011**
Pfeiffer-VIGRE Post-doctoral Instructor — *Houston, TX*
  Topics: Branch-decompositions, Graph Theory, Optimization

University of California, Davis — **August 2008**
Ph.D., Computer Science Department — Davis, CA
  Advisor: Jesús De Loera (Mathematics Department).
  Title: "Combinatorics, Computer Algebra and Complexity Theory:
      Hilbert's Nullstellensatz and NP-Complete Problems"

Graduate Mathematics Program — **Summer 2005**
National Security Agency — *Fort Meade, Maryland*

Encryption Framework Intern — **Summer 2004, Summer 2005**
Sun Microsystems — *Palo Alto, California*

University of California, Berkeley — *Berkeley, CA*
Bachelor of Arts, Astrophysics and English — *May, 1993*

Publications

1. J.A. De Loera, S. Margulies, M. Pernpeintner, E. Riedl, D. Rolnick, G. Spencer, D. Stasi, J. Swenson *Graph-Coloring Ideals: Nullstellensatz Certificates, Gröbner Bases for Chordal Graphs, and Hardness of Gröbner Bases*, Interntl. Symposium on Symbolic and Algebraic Computation (ISSAC 2015).

2. S. Margulies, J. Morton, *Polynomial-time Solvable #CSP Problems via Algebraic Models and Pfaffian Circuits*, accepted to Journal of Symbolic Computation, May 2015.

3. K. Choudhary, S. Margulies, I.V. Hicks, *A Note on Integer Domination of Cartesian Product Graphs*, accepted to Journal of Discrete Math, Jan. 2015.

4. S. Margulies, S. Onn, D.V. Pasechnik, *On the Complexity of Hilbert Refutations for Partition*, Journal of Symbolic Computation, 66, 70–83, February 2015.

5. J.A. De Loera, J. Lee, S. Margulies, J. Miller, *Weak Orientability of Matroids and Polynomial Equations*, accepted to the European Journal of Combinatorics June 2014.

6. K. Choudhary, S. Margulies, I.V. Hicks, *A Note on Total and Paired Domination of Cartesian Product Graphs*, Electronic Journal of Combinatorics, 20(3), 2013.

7. S. Margulies, J. Ma, I.V. Hicks, *The Cunningham-Geelen Method in Practice: Branch-decompositions and Integer Programming*, INFORMS Journal of Computing, 25(4), 599–610, 2013.

8. J. Ma, S. Margulies, I.V. Hicks, E. Goins, *Branch Decomposition Heuristics for Linear Matroids*, Discrete Optimization 10(2): 102–119, 2013.

9. S. Margulies, I.V. Hicks, *An Algebraic Exploration of Dominating Sets and Vizing's Conjecture*, Electronic Journal of Combinatorics, 19 (2), April 2012.

10. J.A. De Loera, J. Lee, P.N. Malkin, S. Margulies, *Computing Infeasibility Certificates for Combinatorial Problems through Hilbert's Nullstellensatz*, Journal of Symbolic Computation, 46(11), 1260–1283, 2011.

11. J. Gunnels, J. Lee, S. Margulies, *Efficient High-precision Dense Matrix Algebra on Parallel Architectures for Nonlinear Discrete Optimization*, Mathematical Programming Computation, 2(2), 103–124, 2010.

12. J.A. De Loera, J. Lee, P.N. Malkin, S. Margulies, *Hilbert's Nullstellensatz and an Algorithm for Proving Combinatorial Infeasibility*, Interntl. Symposium on Symbolic and Algebraic Computation (ISSAC 2009).

13. J.A. De Loera, J. Lee, S. Margulies, S. Onn, *Expressing Combinatorial Optimization Problems by Polynomial Equations*, Journal of Combinatorics, Probability and Computing, 18, 551–582, 2009.

TEACHING EXPERIENCE

Assistant Professor *United States Naval Academy*, 2013 - present
Math SM223: Calculus III (Fall 2013, Fall 2014)
Math SM221X: Calculus III with Infinite Series (Spring 2014)
Math SM219: Introductory Statistics (Spring 2014)
Math SM233: Introduction to Applied Math (Spring 2015)
Math SM450: Cryptology and Information Security (Spring 2015)

Instructor *Rice University*, 2008 - 2010
CAAM 470: Graph Theory (Spring 2010)
CAAM 210: Introduction to Scientific Programming with Matlab (Spring 2009, Fall 2009, Fall 2010)
CAAM 499: VIGRE Seminar, Investigating the Dominating Set Problem (Fall 2010)
CAAM 499: VIGRE Seminar, Investigating the Weighted Stable Set Problem (Spring 2010)
CAAM 499: VIGRE Seminar, Clutters and Min-Max Theorems (Fall 2009)
CAAM 499: VIGRE Seminar, Grobner Bases and Applications (Spring 2009)

Instructor *UC Davis*, 2008
ECS 122A: Analysis of Algorithms (Spring 2008)

Teaching Assistant *UC Davis*, 2003 - 2008
Math 165: Mathematics and Computers (Spring 2006)
ECS 124: Theory and Practice of Bioinformatics (Spring 2005),
ECS 222A: Design and Analysis of Algorithms (Winter 2005, Winter 2006),
ECS 122A: Analysis of Algorithms (Fall 2003 - Fall 2004)

MENTORING EXPERIENCE

1. Midshipmen David Frick, *Ring Signatures*, United States Naval Academy, Spring 2015

2. Keerti Choudhary, *Dominating sets*, Rice University, Houston, TX, Summer 2011.

3. Joel Mancaluso, *Branch-decompositions and Ramsey Numbers*, Rice University, Houston, TX, Spring 2011.

4. Jing Ma, *Heuristics for Branch-decompositions of Matroids*, Rice University, Houston, TX, Fall 2008 - Spring 2009.

TALKS

1. *National Institute of Standards and Technology*, Gaithersburg, MD, April 2015.

2. *Oberlin College*, Oberlin, OH, September 2014.

3. *Computational Nonlinear algebra*, ICERM, Brown University, Providence, RI, June 2014.

4. *Howard University*, Washington DC, January 2014.

5. *UC Davis Combinatorial Optimization Seminar*, Davis, California, September 2013.

6. *George Mason University Colloquium*, Fairfax, Virginia, September 2013.

7. *Young Women in Discrete Mathematics*, Bonn, Germany, May 2013.

8. *Johns Hopkins University, Applied Math Seminar*, Baltimore, MD., March 2013.

9. *Temple University, Applied Math and Scientific Computing Seminar*, Philadelphia, PA., March 2013.

10. *Tensor networks and algebraic geometry*, ISI Foundation, Torino, Italy, November 2012.

11. *University of Oregon, Computer Science, Colloquium*, Portland, Oregon October 2012.

12. *INFORMS 2012*, Phoenix, AZ, October 2012.

13. *Rice University*, CAAM Colloquium, Houston, Texas, October 2012.

14. *Shippensburg University*, Math Department Seminar, Shippensburg, PA., September 2012.

15. *ISMP 2012*, Berlin, Germany, August 2012.

16. *MOPTA*, Lehigh University, July 2012.

17. *Pennsylvania State University*, Operations Research Colloquium, February 2012.

18. *INFORMS Annual Meeting 2011*, Charlotte, North Carolina, November 2011.

19. *Mixed Integer Programming (MIP) Workshop 2011*, University of Waterloo, Ontario, Canada, June 2011.

20. *Israeli Operations Research Society (ORSIS) Annual Conference 2011*, Acre, Israel, May 2011.

21. *SIAM Conference on Optimization 2011*, Darmstadt, Germany, May 2011.

22. *University of Arizona, Department of Mathematics, Colloquium*, February 2011.

23. *University of Washington, Department of Mathematics, Optimization Seminar*, January 2011.

24. *University of Kentucky, Department of Statistics, Seminar*, January 2011.

25. *NAMIAM 2010*, First North American Meeting on Industrial and Applied Mathematics, Universidad del Mar, Huatulco, Oaxaca, México, December 2010.

26. *Discrete Optimization Workshop*, Institute for Pure & Applied Mathematics, October 2010.

27. *ALIO-INFORMS 2010*, Buenos Aires, Argentina, June 2010.

28. *AMS Western Section Meeting*, Albuquerque, New Mexico, April 2010.

29. *Randomization, Relaxation, and Complexity*, Banff International Research Station, Canada, March 2010.

30. *INFORMS*, San Diego, California, October 2009.

31. *ISMP 2009*, International Symposium on Mathematical Programming, Chicago, Illinois, August 2009.

32. *Oberlin College*, Department of Mathematics and Computer Science, Seminar, Oberlin, Ohio, July 2009.

33. *8th Cologne-Twente Workshop on Graphs and Combinatorial Optimization*, Paris, France, June 2009.

34. *AMS Spring Western Section Meeting*, San Francisco, April 2009.

35. *Rice University, Department of Computational and Applied Math, Colloquium*, Rice University, Houston, Texas, September 2008.

36. *ISSAC 2008*, Linz, Austria, July 2008.

37. *CombinaTexas*, El Paso, Texas, April 2008.

38. *INFORMS*, Seattle, Washington, November 2007.

39. *INFORMS*, Miami, Florida, January 2007.

CONFERENCES AND WORKSHOPS **(attendance or poster only)**

1. *Solving Polynomial Equations*, Simons Institute for the Theory of Computing, Berkeley, CA, Oct., 2014.

2. *Algebraic and Geometric Methods in Applied Discrete Mathematics*, Mathematical Research Community, Snowbird, Utah, June, 2014.

3. *Mixed Integer Programming 2014*, Ohio State University, July 2014.

4. *Counting, Inference and Optimization on Graphs*, Princeton, NJ, November 2011.

5. *Solving Polynomial Equations*, Mittag-Leffler Institute, Stockholm, Sweden, February 2011.

6. *NSF CMMI Grantee Conference*, Atlanta, Georgia, January 2011.

7. *Mathematics of Klee & Grünbaum: 100 Years in Seattle*, University of Washington, July 2010.

8. *Geometric Complexity Theory Workshop*, Princeton, New Jersey, July 2010.

9. *Negotiating the Ideal Faculty Position*, Rice University, Houston, Texas, October 2009.

10. *Connections for Women: Algebraic Geometry and Related Fields*, MSRI, UC Berkeley, January 2009.

11. *Mixed-integer Nonlinear Optimization*, IMA, University of Minnesota, Minnesota, November 2008.

12. *Women in Theory (WIT 2008)*, Princeton, New Jersey, June 2008.

13. *Chancellor's Fall Conference*, Tahoe City, California, September 2007.

14. *Complexity, Coding, and Communications*, IMA, University of Minnesota, Minnesota, April 2007.

15. *Algorithms in Algebraic Geometry*, IMA, University of Minnesota, Minnesota, September 2006.

16. *Sphere Packings: Exceptional Geometric Structures and Connections to Other Fields*, Mathematisches Forschungsinstitut Oberwolfach, Germany, November 2005.

PROFESSIONAL SERVICE

- Mixed Integer Programming 2014, member of the organizing committee.
- Reviewer for *Discrete Mathematics*, *Journal of Symbolic Computation*, *Journal of Discrete Optimization*, *NSF*, *Journal of Combinatorial Optimization*, *Electronic Notes in Discrete Mathematics*, *INFORMS Journal of Computing*