

UCSD Mathematics Department
9500 Gilman Drive, La Jolla, CA 92093
<http://www.math.ucsd.edu/~njw>

Tel: (858)534-6015
Fax: (858)534-5273
njw@math.ucsd.edu

Curriculum Vitae

Jiawang Nie

Research Area

- Mathematical Programming
- Multivariate Polynomial Optimization
- Convex Optimization and Semidefinite Programming
- Numerical Analysis and Optimization

Education

Ph.D. University of California at Berkeley, 2006
M.S. Chinese Academy of Sciences, 2000
B.S. Xi'an Jiao Tong University, 1997

Working Experience

2011– present, Associate Professor, Department of Mathematics, University of California, San Diego
2007– 2011, Assistant Professor, Department of Mathematics, University of California, San Diego
2006-2007, Postdoctoral Research Fellow, Institute for Mathematics and its Applications (IMA),
University of Minnesota

Awards

- *Tucker Prize Finalist*, Mathematical Programming Society, 2009
- *CAREER Award*, National Science Foundation, 2009
- *Hellman Foundation Fellowship*, UCSD, 2009
- *President's Excellent Scholarship*, Chinese Academy of Sciences, 2000
- *Wei Hua Science & Technology Scholarship*, Chinese Academy of Sciences, 1999

Preprints

1. J. Nie. An Exact Jacobian SDP relaxation for polynomial optimization. *Preprint*, 2010.
2. J. Nie. Discriminants and nonnegative polynomials. *Preprint*, 2010.
3. J. Nie. Regularization Methods for Sum of Squares Relaxations in Large Scale Polynomial Optimization. *Preprint*, 2009.
4. J. Nie. An Approximation Bound Analysis for Lasserre's Relaxation in Multivariate Polynomial Optimization. *Preprint*, 2009.

Publications

1. J. Nie. First Order Conditions for Semidefinite Representations of Convex Sets Defined by Rational or Singular Polynomials. *Mathematical Programming*, to appear.

2. L. Fialkow and J. Nie. Positivity of Riesz Functionals and Solutions of Quadratic and Quartic Moment Problems. *Journal of Functional Analysis*, 258 (2010), no. 1, 328–356.
3. J. Nie, K. Ranestad and B. Sturmfels. Algebraic Degree of Semidefinite Programming. *Mathematical Programming*, Series A, Vol. 122, No.2, pp. 379-405, 2010.
4. C. Ling, J. Nie, L. Qi, and Y. Ye. Bi-Quadratic Optimization over Unit Spheres and Semidefinite Programming Relaxations. *SIAM Journal on Optimization*, Vol. 20, No. 3, pp.1286-1310, 2009.
5. J.W. Helton and J. Nie. Semidefinite representation of convex sets. *Mathematical Programming, Series A*, Vol. 122, No.1, pp.21–64, 2010.
6. J. Nie and B. Sturmfels. Matrix cubes parametrized by eigenvalues. *SIAM Journal on Matrix Analysis and Applications*, Vol. 31, No. 2, pp. 755-766, 2009.
7. J.W. Helton and J. Nie. Sufficient and Necessary Conditions for Semidefinite Representability of Convex Hulls and Sets. *SIAM Journal on Optimization*, Vol. 20, No.2, pp. 759-791, 2009.
8. J. Nie. Sum of Squares Method for Sensor Network Localization. *Computational Optimization and Applications*, Vol.43, No. 2 (2009), pp. 151-179.
9. J. Nie and K. Ranestad. Algebraic Degree of Polynomial Optimization. *SIAM Journal on Optimization*, Vol. 20, No. 1, pp. 485-502, 2009.
10. J. William Helton and J. Nie. Structured Semidefinite Representation of Some Convex Sets. *Proceeding of 47th IEEE Conference on Decision and Control*, pp. 4797 - 4800, Cancun, Mexico, Dec. 9-11, 2008.
11. B. Li, J. Nie, and L. Zhi. Approximate GCDs of polynomials and sparse SOS relaxations. *Theoretical Computer Science*, 409(2) pp.200-210, 2008.
12. J. Nie and J. Demmel. Sparse SOS relaxations for minimizing functions that are summation of small polynomials. *SIAM Journal on Optimization*, Vol. 19, No. 4, pp. 1534-1558 (2008).
13. S. He, Z. Luo, J. Nie and S. Zhang. Semidefinite Relaxation Bounds for Indefinite Homogeneous Quadratic Optimization. *SIAM Journal on Optimization*, Vol. 19, No.2, pp. 503-523, 2008.
14. M. Mevissen, M. Kojima, J. Nie and N. Takayama. Solving partial differential equations via sparse SDP relaxations. *Pacific Journal of Optimization*, Vol. 4 (2) 213 - 241 (2008).
15. J. Nie, P. Parrilo and B. Sturmfels Semidefinite representation of k -ellipse. *IMA Volume 146: Algorithms in Algebraic Geometry* (Eds. A. Dickenstein, F.-O. Schreyer, and A. Sommese), pp. 117-132, Springer, New York, 2008.
16. J. Nie, J. Demmel and M. Gu. Global minimization of rational functions and the nearest GCDs. *Journal of Global Optimization*, Vol. 40 (2008), no.4, 697-718.
17. C. Hillar and J. Nie. An elementary and constructive proof of Hilbert’s 17th Problem for matrices. *Proceedings of the American Mathematical Society*, 136 (2008), 73-76.
18. J. Nie and M. Schweighofer. On the complexity of Putinar’s positivstellensatz. *Journal of Complexity* 23(2007) 135-150.
19. J. Demmel, J. Nie and V. Powers Representations of positive polynomials on non-compact semialgebraic sets via KKT ideals. *Journal of Pure and Applied Algebra*, Vol. 209, No. 1, pp. 189-200, 2007.
20. J. Nie, J. Demmel and B. Sturmfels. Minimizing polynomials via sum of squares over the gradient ideal. *Mathematical Programming*, Series A, Vol. 106 (2006), No. 3, 587-606.
21. J. Nie and J. Demmel. Minimum ellipsoid bounds for solutions of polynomial systems via sum of squares. *Journal of Global Optimization* (2005) 33: 511-525.
22. J. Nie and J. Demmel. Shape optimization of transfer functions. *Multilevel optimization methods and applications* (eds. W. Hager, P. Pardalos, S. Huang etc.), pp. 313-326, Springer series on nonconvex optimization and its applications, 2005.
23. J. Nie and Y. Yuan. A predictor-corrector algorithm for QSDP combining Dikin-type and Newton centering steps. *Annals of Operations Research*, 103(2001) 115-133.

24. J. Nie and Y. Yuan. A potential reduction algorithm for a new SDP problem. *Science in China*, Vol.43, No.1, Jan. 2000.

Ph.D. Thesis

Title: Global Optimization of Polynomial Functions and Applications

Co-Chairs: James Demmel and Bernd Sturmfels

Invited Lectures

- *Convex Optimization and Algebraic Geometry*, IPAM, UCLA, September 28 - October 1, 2010.
- *Recent Advances in Optimization Methods and Applications*, SIAM Annual Meeting, Pittsburgh, PA, July 12-16, 2010.
- *Advances in the Theory of Integer Linear Optimization and its Extensions*, Western Section Meeting of the American Mathematical Society, San Francisco, CA, April 25 - 26, 2009.
- *The 33rd annual meeting of Southeast-Atlantic Section of the Society for the Industrial and Applied Mathematics (SIAM-SEAS)*, April 4-5, University of South Carolina, Columbia, SC, 2009.
- *The XIXth International Workshop on Operator Theory and its Applications*, Williamsburg, Virginia, July 22 - July 26, 2008.
- *Colloquium Talk*, Operations Research, Univ. of North Carolina, Chapel Hill, April 10-11, 2007.
- *Optimization and Engineering Applications*, Banff International Research Station, Canada, November 11-16, 2006.
- *Positive Polynomials and Optimization*, Banff International Research Station, Canada, October 7-12, 2006.
- *SIAM conference on Discrete Mathematics*, Victoria, Canada, June 25-28, 2006.

Journals Served As Referees

SIAM Journal on Optimization • *Mathematical Programming* • *Mathematics of Operations Research*
• *Discrete and Computational Geometry* • *Journal of Global Optimization* • *Computational Optimization and Applications* • *Optimization Methods and Software* • *Journal of Mathematical Analysis and its Applications* • *Journal of Control Science and Engineering* • *IEEE Journal of Selected Topics in Signal Processing* • *Science in China*

Professional Membership

- *American Mathematical Society (AMS)*
- *Society of Industry and Applied Mathematics (SIAM)*
- *Mathematical Programming Society (MPS)*