

## Andreas Wächter

Industrial Engineering and Management Sciences  
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### Appointment

Northwestern University  
– Associate Professor, Industrial Engineering and Management Sciences (Fall 2011 – present)

### Education

Carnegie Mellon University, Pittsburgh PA (1997 – 2002)  
– PhD in Chemical Engineering

University of Cologne, Germany (1992 – 1997)  
– Diplom-Mathematiker (German Master’s degree equivalent in Mathematics)

### Professional Experience

IBM Thomas J. Watson Research Center, Yorktown Heights, NY, USA (2002 – 2011):  
– Research Staff Member, Department of Mathematical Sciences (Oct 2002 – 2011)  
– Postdoctoral Associate, Department of Mathematical Sciences (Feb 2002 – Oct 2002)  
*Description: Conduct basic research in Numerical Analysis and Operations Research, including publication in scientific journals and participation in international conferences; participate in and lead projects for external and internal IBM customers; write efficient state-of-the-art optimization software*

### Awards

- Charles Broyden Prize for best paper in Optimization Methods and Software 2016 (with N. Keskar, J. Nocedal, and F. Öztoprak) for “*A second-order method for convex  $l_1$ -regularized optimization with active-set prediction*”
- J. H. Wilkinson Prize for Numerical Software 2011 (with C.D. Laird) for *Ipopt*
- INFORMS Computing Society Award 2009 (with L.T. Biegler) for “*On the implementation of a primal-dual interior point filter line search algorithm for large-scale nonlinear programming*”
- Student Paper Prize 2002 of the Society for Industrial and Applied Mathematics (SIAM) for “*Global and Local Convergence of Line Search Filter Methods for Nonlinear Programming*”
- Honorary mention at the International Conference on Continuous Optimization (ICCOPT-I) “Young Researcher Competition” (Troy, NY, Aug 2004) for “*On the Implementation of an Interior-Point Filter Line-Search Algorithm for Large-Scale Nonlinear Programming*”
- IBM Awards: Technical Group Award (2003), Research Division Awards (2006 and 2007), Technical Accomplishment Award (2009)

### Publishing Activities

#### Journal Publications

1. A. Maggiar, A. Wächter, I. S. Dolinskaya, and J. Staum. A derivative-free trust-region algorithm for the optimization of functions smoothed via Gaussian convolution using adaptive multiple importance sampling. *SIAM Journal on Optimization*, 28(2): 1478-1507, 2018

2. M. Feng, J. E. Mitchell, J.-S. Pang, X. Shen, A. Wächter. Complementarity formulations of  $l_0$ -norm optimization problems. *Pacific Journal on Optimization*, 14(2): 273-305, 2018.
3. F. Jara-Moroni, J.-S. Pang, and A. Wächter. A Study of the Difference-of-Convex Approach for Solving Linear Programs with Complementarity Constraints. *Mathematical Programming*, 169(1):221–5254, 2018.
4. F. E. Curtis, A. Wächter, and V. Zavala. A sequential algorithm for solving nonlinear optimization problems with chance constraints. *SIAM Journal on Optimization*, 28(1): 930-958, 2018
5. N. Keskar and A. Wächter. A limited-memory quasi-Newton algorithm for bound-constrained non-smooth optimization. To appear in *Optimization Methods and Software* (DOI:10.1080/10556788.2017.1378652)
6. H. Gao, A. Wächter, I. A. Konstantinov, S. G. Arturo, L. J. Broadbelt. Application and comparison of derivative-free optimization algorithms to control and optimize free radical polymerization simulated using the kinetic Monte Carlo method. *Computers and Chemical Engineering*, 108, 268-275, 2018
7. J. L. Greene, A. Wächter, K. E. J. Tyo, L. J. Broadbelt. Acceleration Strategies to Enhance Metabolic Ensemble Modeling Performance. *Biophysical Journal* 113 (5), 1150-1162, 2017
8. D. Janka, C. Kirches, S. Sager, A. Wächter. An SR1/BFGS SQP algorithm for nonconvex nonlinear programming with block-diagonal Hessian matrix. *Mathematical Programming Computation*, 8(4): 435-459, 2016
9. N. S. Keskar, J. Nocedal, F. Oztoprak, and A. Wächter. A second-order method for convex  $l_1$ -regularized optimization with active-set prediction. *Optimization Methods and Software*, 31(3): 605-621, 2016
10. T. C. Johnson, C. Kirches, A. Wächter. An Active-Set Quadratic Programming Method Based On Sequential Hot-Starts, *SIAM Journal on Optimization*, 25(2): 967-994, 2015.
11. M. Feng, A. Wächter, J. Staum. Practical Algorithms for Value-at-Risk Portfolio Optimization Problems, *Quantitative Finance Letters*, 3(1): 1-9, 2015.
12. F. E. Curtis, T. C. Johnson, D. P. Robinson, and A. Wächter. An Inexact Sequential Quadratic Optimization Algorithm for Nonlinear Optimization, *SIAM Journal on Optimization*, 24(3):1041–1074, 2014.
13. P. Bonami, J. Lee, S. Leyffer, and A. Wächter. On Branching Rules for Convex Mixed-Integer Nonlinear Optimization, *ACM Journal on Experimental Algorithmics*, 18(2): Article 6, 2013
14. F. E. Curtis, J. Huber, O. Schenk, and A. Wächter. A Note on the Implementation of an Interior-Point Algorithm for Nonlinear Optimization with Inexact Step Computations, *Mathematical Programming*, 136(1):209–227, 2012.
15. D. O. S. Melville, A. E. Rosenbluth, A. Wächter, M. Millstone, J. Tirapu-Azpiroz, K. Tian, K. Lai, T. Inoue, M. Sakamoto, K. Adam, A. Trichkov. Computational lithography: Exhausting the resolution limits of 193-nm projection lithography systems, *Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures*, 29(6):06FH04, 2011.
16. F. E. Curtis, O. Schenk, and A. Wächter. An interior-point algorithm for large-scale nonlinear optimization with inexact step computations, *SIAM Journal on Scientific Computing*, 32(6): 3447-3475, 2010.
17. P. Belotti, J. Lee, L. Liberti, F. Margot, and A. Wächter, Branching and bounds tightening techniques for non-convex MINLP. *Optimization Methods and Software*, 24(4-5): 597-634, 2009.
18. F. E. Curtis, J. Nocedal, and A. Wächter, A matrix-free algorithm for equality constrained optimization problems with rank-deficient Jacobians. *SIAM Journal on Optimization*, 20(3): 1224-1249, 2009.
19. J. Nocedal, A. Wächter, and R. A. Waltz. Adaptive barrier strategies for nonlinear interior methods. *SIAM Journal on Optimization*, 19(4): 1674-1693, 2009.
20. O. Schenk, A. Wächter, and M. Weiser. Inertia revealing preconditioning for large-scale nonconvex constrained optimization. *SIAM Journal on Scientific Computing*, 31(2):939-960, 2008.
21. P. Bonami, L. T. Biegler, A. R. Conn, G. Cornuéjols, I. E. Grossmann, C. D. Laird, J. Lee, A. Lodi, F. Margot, N. Sawaya, and A. Wächter. An algorithmic framework for convex mixed integer nonlinear programs. *Discrete Optimization*, 5(2):186-204, 2008.
22. O. Schenk, A. Wächter, and M. Hagemann. Matching-based preprocessing algorithms to the solution of saddle-point problems in large-scale nonconvex interior-point optimization. *Journal of Computational Optimization and Applications*, 36(2-3):321–341, 2007.
23. A. Wächter and L. T. Biegler. On the implementation of a primal-dual interior point filter line search algorithm for large-scale nonlinear programming. *Mathematical Programming*, 106(1):25–57, 2006.
24. A. Wächter and L. T. Biegler. Line search filter methods for nonlinear programming: Motivation and global convergence. *SIAM Journal on Optimization*, 16(1):1–31, 2005.

25. A. Wächter and L. T. Biegler. Line search filter methods for nonlinear programming: Local convergence. *SIAM Journal on Optimization*, 16(1):32–48, 2005.
26. A. Wächter, C. Visweswariah, and A. R. Conn. Large-scale nonlinear optimization in circuit tuning. *Future Generation Computer Systems*, 21(8):1251–1262, 2005.
27. A. L. Tits, A. Wächter, S. Bakhtiari, T. J. Urban, and C. T. Lawrence. A primal-dual interior-point method for nonlinear programming with strong global and local convergence properties. *SIAM Journal on Optimization*, 14(1):173–199, 2003.
28. T. Jockenhövel, L. T. Biegler, and A. Wächter. Dynamic optimization of the Tennessee Eastman process using the OptControlCentre. *Computers and Chemical Engineering*, 27(11):1513–1531, 2003.
29. R. Fletcher, N. I. M. Gould, S. Leyffer, Ph. L. Toint, and A. Wächter. Global convergence of a trust-region SQP-filter algorithm for general nonlinear programming. *SIAM Journal on Optimization*, 13(3):635–659, 2002.
30. L. T. Biegler, A. M. Cervantes, and A. Wächter. Advances in simultaneous strategies for dynamic process optimization. *Chemical Engineering Science*, 57(4):575–593, 2002.
31. A. Wächter and L. T. Biegler. Failure of global convergence for a class of interior point methods for nonlinear programming. *Mathematical Programming*, 88(2):565–574, 2000.
32. A. M. Cervantes, A. Wächter, R. H. Tütüncü, and L. T. Biegler. A reduced space interior point strategy for optimization of differential algebraic systems. *Computers and Chemical Engineering*, 24(1):39–51, 2000.

### Book Chapter

1. A. Wächter. Nonlinear Optimization Algorithms. In *Advances and Trends in Optimization with Engineering Applications*, p. 221-235, 2017.

### Conference Proceedings

1. M. Semelhago, B. L. Nelson, A. Wächter, E. Song. Computational methods for optimization via simulation using Gaussian Markov random fields. *2017 Winter Simulation Conference (WSC)*, p.2080-2091, 2017.
2. C. D'Ambrosio, J. Lee, A. Wächter. An algorithmic framework for MINLP with separable non-convexity. In J. Lee and S. Leyffer (eds.), *Mixed-Integer Nonlinear Optimization: Algorithmic Advances and Applications*, The IMA Volumes in Mathematics and its Applications, Volume 154, p.315-347, Springer, 2012.
3. J. Huber, O. Schenk, U. Naumann, E. Varnik, A. Wächter. Algorithmic Differentiation and Nonlinear Optimization for an Inverse Medium Problem. In Naumann and Schenk (eds.), *Combinatorial Scientific Computing*, Computational Science Series, CRC Press, 203-231, 2012.
4. K. Lai, M. Gabrani, D. Demaris, N. Casati, A. Torres, S. Sarkar, P. Strenski, S. Bagheri, D. Scarpazza, A. E. Rosenbluth, D. O. Melville, A. Wächter, J. Lee, V. Austel, M. Szeto-Millstone, K. Tian, F. Barahona, T. Inoue, M. Sakamoto. Design Specific Joint Optimization of Masks and Sources on a Very Large Scale. *SPIE Conference Series*, Vol. 7973, 797308, 2011.
5. G. Nannicini, P. Belotti, J. Lee, J. Linderoth, F. Margot, and A. Wächter. A Probing Algorithm for MINLP with Failure Prediction by SVM. In Achterberg and Beck (eds.), *Integration of AI and OR Techniques in Constraint Programming for Optimization Problems*, Lecture Notes in Computer Sciences, Volume 6697, Springer Verlag, Berlin, 154-169, 2011.
6. D. O. Melville, A. E. Rosenbluth, K. Tian, K. Lai, S. Bagheri, J. Tirapu-Azpiroz, J. Meiring, S. Halle, G. McIntyre, T. Faure, D. Corliss, A. Krasnoperova, L. Zhuang, P. Strenski, A. Wächter, L. Ladanyi, F. Barahona, D. Scarpazza, J. Lee, T. Inoue, M. Sakamoto, H. Muta, A. Wagner, G. Burr, Y. Kim, E. Gallagher, M. Hibbs, A. Trichtkov, Y. Granik, M. Fakhry, K. Adam, G. Berger, M. Lam, A. Dave, N. Cobb. Demonstrating the Benefits of Source-Mask Optimization and Enabling Technologies through Experiment and Simulations. *SPIE Conference Series*, Vol. 7640, 764006, 2010.
7. C. D'Ambrosio, J. Lee, and A. Wächter. A global-optimization algorithm for mixed-integer nonlinear programs having separable non-convexity. In *Proceedings of ESA 2009*, F. Amos, P. Sanders (Eds.), *Lecture Notes in Computer Sciences (5757)*:107-118, Springer Berlin, 2009.

8. A. Wächter. Short tutorial: Getting Started with IPOPT in 90 minutes. In U. Naumann, O. Schenk, H. D. Simon, and S. Toledo, editors, *Combinatorial Scientific Computing*, Dagstuhl Seminar Proceedings 09061, 2009.
9. A. E. Rosenbluth, D. O. Melville, K. Tian, S. Bagheri, J. Tirapu-Azpiroz, A. Wächter, T. Inoue, L. Ladanyi, F. Barahona, K. Scheinberg, M. Sakamoto, H. Muta, E. Gallagher, T. Faure, M. Hibbs, A. Trichtkov, and Y. Granik. Intensive optimization of masks and sources for 22nm lithography. *SPIE Conference Series*, Vol 7274, 727409, 2009.
10. J. R. P. Rodrigues, A. Wächter, A. Conn, R. J. de Moraes, F. P. T. da Silva. Combining Adjoint Calculations and Quasi-Newton Methods for Automatic History Matching, *Society of Petroleum Engineers Europec/EAGE Annual Conference*, SPE Paper 99996, 2006.
11. L. T. Biegler and A. Wächter. SQP SAND strategies that link to existing modeling systems. In Ghattas, Heinkenschloss, Keyes, Biegler, and van Bloemen Waanders, editors, *First CSRI Workshop on PDE-based Optimization*, Lecture Notes in Computational Sciences and Engineering. Springer Verlag, Berlin, 2003.
12. R. A. Bartlett, A. Wächter, and L. T. Biegler. Active set vs. interior point methods for nonlinear model predictive control. In *Proceedings of American Control Conference*, page 3505, Chicago, IL, USA, 2000.

### Technical Reports

1. M. Feng, A. Maggiar, J. Staum, and A. Wächter. Uniform convergence of sample average approximation with adaptive multiple importance sampling. To appear in *2018 Winter Simulation Conference (WSC)*.
2. A. Wächter and L. T. Biegler. Global and local convergence of a reduced space quasi-Newton barrier algorithm for large-scale nonlinear programming. Technical Report B-00-06, Department of Chemical Engineering, Carnegie Mellon University, Pittsburgh, PA, USA, 2000.

### Community Newsletters

1. P. Bonami, J. J. Forrest, J. Lee, and A. Wächter. Rapid development of an open-source MINLP solver with COIN-OR. *Optima Newsletter* 75, 2007.
2. L. T. Biegler and A. Wächter. DAE constrained optimization. *SIAG/OPT Views-and-News*, 14(1):10–15, 2003.

### Patents

1. M. Sakamoto, A. E. Rosenbluth, M. A. Szeto-Millstone, T. Inoue, K. Tian, A. Waechter, J. Lee, D. O. Melville; David Osmond, “Optimizing lithographic mask for manufacturability in efficient manner”, U.S. Patent 8719735B2, filed July 14, 2011 and issued May 5, 2014.
2. S. Bagheri, F. Barahona, L. Ladanyi, J. Lee, D. O. Melville, A. E. Rosenbluth, D. P. Scarpazza, M. A. Szeto-Millstone, K. Tian, A. Waechter, “Dynamic provisional decomposition of lithographic patterns having different interaction ranges”, U.S. Patent 8266554B2, filed August 8, 2015 and issued September 11, 2012.

### Funding Activities

#### Funded Research Proposals

- “Algorithms for Nonlinear Nonconvex Optimization under Uncertainty,” Computational Mathematics Program, Division of Mathematical Sciences, National Science Foundation, effective from Sep 15, 2015 until Sep 14, 2018. Single PI.
- “Collaborative Research: Binary Constrained Convex Quadratic Programs with Complementarity Constraints and Extensions,” Operations Research Program, Division of Civil, Mechanical, and Manufacturing Innovation, National Science Foundation, effective from Aug 15, 2013 until Aug 14, 2016.

Multiple PIs; joint with Jong-Shi Pang, University of Illinois at Urbana-Champaign, and John E. Mitchell, Rensselaer Polytechnic Institute.

- “Novel Algorithms for Nonlinear Optimization,” Computational Mathematics Program, Division of Mathematical Sciences, National Science Foundation, effective from Aug 1, 2012 until July 31, 2015. Single PI.

## Service

- Chair of the INFORMS Computing Society Prize Committee 2018
- Vice Chair for SIAM Activity Group on Optimization, 2017-2019
- Associate Editor for *SIAM Journal on Optimization*
- Area Editor for *Mathematical Programming Computation*
- Chair of the INFORMS Computing Society Prize Committee 2010
- Review panels for the National Science Foundation and the US Department of Energy
- Vice Chair for Nonlinear Programming, INFORMS Optimization Society (Fall 2012 – 2015)
- Conference Co-organizer: U.S.-Mexico Workshop on Optimization and its Application, Merida, Mexico, 2016
- Area Coordinator for at the Optimization-Online technical reports repository (“Applications – Science and Engineering” and “Nonlinear Optimization”)
- Referee for *AICChE Journal*, *Central European Journal of Operations Research*, *Computational Optimization and Applications*, *Computers and Chemical Engineering*, *IMA Journal of Numerical Analysis*, *Industrial and Engineering Chemistry Research*, *INFORMS Journal on Computing*, *Journal of Global Optimization*, *Mathematical Programming A*, *Mathematical Programming B*, *Mathematical Programming Computation*, *Mathematics of Operations Research*, *Numerical Algorithms*, *Numerical Functional Analysis and Optimization*, *Operations Research*, *Optimization and Engineering*, *Optimization Methods and Software*, *Optimization Letters*, *SIAM Journal on Matrix Analysis and Applications*, *SIAM Journal on Optimization*, *Transactions on Mathematical Software*, *Transportation Science*

## Membership in professional societies

- Full member of the Society for Industrial and Applied Mathematics (SIAM)
- Full member of the Mathematical Optimization Society (MOS, formerly MPS)
- Full member of the Institute for Operations Research and the Management Sciences (INFORMS)
- Full member of the Computational Infrastructure for Operations Research foundation (COIN-OR)

## List of Presentations

### Conference Presentations

1. “Nonlinear Programming Formulations of Chance-Constraints (Part 1)”, *23<sup>rd</sup> International Symposium on Mathematical Programming*, Bordeaux, France, Jul 2018 (invited)
2. “Nonlinear Programming Formulation of Chance-Constraints”, *US-Mexico Workshop on Optimization and its Applications*, Huatulco, Mexico, Jan 2018 (invited)
3. “Solving Chance-Constrained Optimization Problems Using a Kernel-VaR Estimator”, *Foundations of Computational Mathematics Optimization Workshop*, Barcelona, Spain, Jul 2017 (invited)
4. “Solving Chance-Constrained Optimization Problems Using a Kernel-VaR Estimator”, *Workshop on Modern Convex Optimization and Applications*, Fields Institute, Toronto, Canada, Jul 2017 (invited)
5. “Solving Chance-Constrained Problems Using a Kernel-VaR Estimator,” *Society for Industrial and Applied Mathematics Conference on Optimization*, Vancouver, Canada, May 2017 (invited)

6. “A Sequential Algorithm for Nonconvex Nonlinear with Chance-Constrained Optimization”, *AIChE (American Institute for Chemical Engineering) Annual Meeting 2016*, San Francisco, CA, Nov 2016 (invited)
7. “A Sequential Algorithm for Nonconvex Nonlinear with Chance-Constrained Optimization”, *International Conference on Continuous Optimization*, Tokyo, Japan, Aug 2016 (invited)
8. “A Sequential Algorithm for Nonconvex Nonlinear with Chance-Constrained Optimization”, *Workshop on Nonlinear Optimization Algorithms and Industrial Applications*, Fields Institute, Toronto, Canada, Jun 2016 (invited)
9. “A Trust-Region Method for Nonconvex Nonlinear with Chance-Constrained Optimization”, *US-Mexico Workshop on Optimization and its Applications*, Merida, Mexico, Jan 2016 (invited)
10. “A Derivative-Free Method for Minimizing Nonlinear Functions with Deterministic Noise,” 22<sup>th</sup> *International Symposium on Mathematical Programming*, Pittsburgh, PA, Jul 2015 (invited)
11. “A Derivative-Free Method for Minimizing Nonlinear Functions with Deterministic Noise,” *Argonne-Chicago-Northwestern-Wisconsin Workshop 2015*, Chicago, IL, Jun 2015 (invited)
12. **(invited plenary)** “Inexact Methods for Nonlinear Optimization,” *MOPTA (Modeling and Optimization: Theory and Applications) 2014*, Lehigh, PA, Aug 2014
13. “Not-Starting NLP Solvers,” *2014 Mixed-Integer Programming Workshop*, Columbus, OH, Jul 2014 (invited)
14. “An Active-Set Quadratic Programming Method Based On Sequential Hot-Starts,” *Computational Contacts Mechanics: Advances and Frontiers in Modeling Contact*, Banff International Research Station, Banff, Canada, Feb 2014 (invited)
15. “Complementarity Formulations for l0-Norm Optimization Problems,” *International Conference on Continuous Optimization*, Lisbon, Portugal, Jul 2013 (invited)
16. **(invited plenary)** “Active Set SQP Algorithms with Inexact Subproblem Solutions for Nonlinear Nonconvex Optimization,” 3<sup>rd</sup> *European Conference on Computational Optimization*, Chemnitz, Germany Jul 2013
17. “Towards Hot-Started NLP Solvers: Algorithms,” *Institute for Operations Research and the Management Sciences Annual Meeting*, Phoenix, AZ, Oct 2012 (invited)
18. “Towards Hot-Started NLP Solvers,” 21<sup>th</sup> *International Symposium on Mathematical Programming*, Berlin, Germany, Aug 2012 (invited)
19. “Large-Scale Nonlinear Optimization with Inexact Step Computations,” *Society for Industrial and Applied Mathematics Conference on Optimization*, Darmstadt, Germany, May 2011 (invited)
20. “Large-Scale Nonlinear Optimization with Inexact Step Computations,” 9<sup>th</sup> *US-Mexico Workshop on Optimization and its Applications*, Oaxaca, Mexico, January 2011 (invited)
21. “Large-Scale Nonlinear Optimization with Inexact Step Computations,” *Workshop on Numerical Methods for Continuous Optimization*, Institute for Pure and Applied Mathematics at UCLA, Los Angeles, CA, Oct 2010 (invited)
22. **(invited plenary)** “Large-Scale Nonlinear Optimization with Inexact Step Computations,” *Parametric Optimization and Related Topics X*, Karlsruhe, Germany, Sep 2010
23. “An NLP Algorithm Using Iterative Linear Solvers,” *European Workshop on Mixed Integer Nonlinear Programming*, Marseille, France, Apr 2010 (invited)
24. “An Interior-Point Filter Line-Search Algorithm for Large-Scale Nonlinear Programming,” *Institute for Operations Research and the Management Sciences Annual Meeting*, San Diego, CA, Oct 2009 (invited)
25. “Solving Nonlinear Optimization Problems on Large-Scale Parallel Computers,” 20<sup>th</sup> *International Symposium on Mathematical Programming*, Chicago, IL, Aug 2009 (invited)
26. “Solving Large-Scale Continuous Optimization Problems with Ipopt,” *Optimization Days 2009*, Montréal, Canada, May 2009 (invited)
27. “Tutorial for the NLP solver Ipopt,” *Workshop on Combinatorial Scientific Computing*, Dagstuhl, Germany, Feb 2009 (invited)
28. **(invited plenary)** “Some Recent Advances in Mixed-Integer Nonlinear Programming,” *Society for Industrial and Applied Mathematics Conference on Optimization*, Boston, MA, May 2008

29. “Some Recent Advances in Mixed-Integer Nonlinear Programming,” *Special Interest Group on Optimization (SIGOPT) – International Conference on Optimization 2008*, Lambrecht, Germany, Feb 2008 (invited)
30. **(invited plenary)** “Recent Advances in Mixed-Integer Nonlinear Programming,” *13<sup>th</sup> Czech-French-German Conference on Optimization*, Heidelberg, Germany, Sep 2007
31. “A New Open Source Solver for MINLP,” *8<sup>th</sup> US-Mexico Workshop on Optimization and its Applications*, Huatulco, Mexico, Jan 2007 (invited)
32. “Circuit Tuning with Ipopt,” *Institute for Operations Research and the Management Sciences Annual Meeting*, Pittsburgh, PA, Nov 2006
33. “Smoothing Noisy Black-Box Functions For Nonlinear Optimization,” *19<sup>th</sup> International Symposium on Mathematical Programming*, Rio de Janeiro, Brazil, Aug 2006 (invited)
34. “Ipopt Tutorial,” *DIMACS Workshop on COIN-OR*, Rutgers University, New Brunswick, NJ, Jul 2005
35. “Adaptive Barrier Parameter Strategies For Nonlinear Programming,” *Foundations of Computational Mathematics Optimization Workshop*, Santander, Spain, Jul 2005 (invited)
36. “Adaptive Barrier Parameter Strategies For Nonlinear Programming,” *Society for Industrial and Applied Mathematics Conference on Optimization*, Stockholm, Sweden, May 2005 (invited)
37. “Adaptive Barrier Parameter Strategies For Nonlinear Programming,” *1<sup>st</sup> International Conference on Continuous Optimization*, Troy, NY, Aug 2004 (invited)
38. “Large-Scale Nonlinear Optimization in Circuit Tuning,” *Numerical Aspects of Circuit and Design Modeling Workshop*, Santa Fe, NM, Jun 2004 (invited)
39. “Large-Scale Nonlinear Optimization in Circuit Tuning,” *Optimization Days 2004*, Université de Montréal, Montréal, Canada, May 2004 (invited)
40. “On the Implementation of an Interior Point Method for Large-Scale Nonlinear Optimization,” *European Conference on Computational Optimization*, Dresden, Germany, Mar 2004 (invited)
41. “An Interior Point Algorithm for Large-Scale Nonlinear Optimization With Applications In Circuit Tuning,” *75<sup>th</sup> Annual Meeting of the International Association of Applied Mathematics and Mechanics (GAMM)*, Dresden, Germany, Mar 2004 (invited)
42. “An Interior-Point Filter Line-Search Method for Large-Scale Nonlinear Programming,” *18<sup>th</sup> International Symposium on Mathematical Programming*, Copenhagen, Denmark, Aug 2003 (invited)
43. “Large-Scale Nonlinear Optimization with Applications in Circuit Tuning,” *33<sup>rd</sup> Speedup Workshop*, Basel, Switzerland, Mar 2003 (invited)
44. “Global and Local Convergence of Line Search Filter Methods for Nonlinear Programming,” *Society for Industrial and Applied Mathematics Annual Meeting*, Philadelphia, PA, Jul 2002 (invited)
45. “An Interior Point Line Search Filter Method for Large-Scale Nonlinear Programming,” *Society for Industrial and Applied Mathematics Conference on Optimization*, Toronto, Canada, May 2002 (invited)
46. “Application of an Interior Point Method for Large-Scale Nonlinear Programming to Circuit Tuning,” *Institute for Mathematics and Its Applications Workshop on Optimization in Simulation-Based Models*, Minneapolis, MN, Jan 2002 (invited)
47. “An Interior Point NLP Algorithm for Large-Scale Chemical Process Optimization,” *7<sup>th</sup> US-Mexico Workshop in Numerical Analysis*, Merida, Mexico, Jan 2001 (invited)
48. “An Interior Point Algorithm for Large-Scale Nonlinear Optimization with Applications in Dynamic Optimization,” *American Institute of Chemical Engineers Annual Meeting*, Los Angeles, CA, Nov 2000
49. “Global Convergence of a Class of Interior-Point Methods for Nonconvex Nonlinear Programming: Failure and Some Remedies,” *17<sup>th</sup> International Symposium on Mathematical Programming*, Atlanta, GA, Aug 2000 (invited)
50. “An SQP-Based Interior Point Algorithm for Large-Scale Nonlinear Optimization,” *Institute for Operations Research and the Management Sciences Fall Meeting*, Philadelphia, PA, Nov 1999
51. “A Quasi-Newton Interior Point Method for Large-Scale Nonlinear Programming with Modifications to Handle Constraint Inconsistencies,” *1<sup>st</sup> Workshop on Nonlinear Optimization: Interior-Point and Filter Methods*, University of Coimbra, Oct 1999 (invited)

### **Invited Seminar Presentation and Short Courses**

1. “Nonlinear Programming Formulations of Chance-Constraints”, Department of Information and Decision Sciences Seminar, University of Illinois at Chicago, Chicago, IL, Apr 2018
2. “Constrained Nonlinear Optimization”, guest lecture in summer school on “Mathematical Optimization” at the Institute of Mathematics and its Applications, Minnesota, MN, Aug 2016
3. “A Sequential Algorithm for Nonlinear Optimization Problems with Chance Constraints”, Industrial and Systems Engineering Colloquium, University of Wisconsin-Madison, Madison, WI, Sep 2016
4. “Constrained Nonlinear Optimization Algorithms” (invited short course, 2 lectures), Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN, Aug 2016
5. “A Derivative-Free Method for Solving Nonlinear Optimization Problems with Deterministic Noise,” Institute for Mathematics, Paderborn University, Paderborn, Germany Sep 2015
6. “A Derivative-Free Method for Solving Nonlinear Optimization Problems with Deterministic Noise,” Applied Math Colloquium, Northwestern University, Evanston, IL, Nov 2014
7. “Exploiting Inexact Subproblem Solutions in Nonlinear Optimization Algorithms,” Department of Applied Mathematics and Statistics Seminar, Johns Hopkins University, Baltimore, MD, Apr 2014
8. “Towards Hot-Started NLP Solvers,” ISE Graduate Seminar, University of Illinois at Urbana-Champaign, Urbana, IL, Sep 2012
9. “Large-Scale Nonlinear Optimization with Inexact Step Computations,” Operations/Management Science Workshop, University of Chicago Booth School of Business, Chicago, IL, May 2012
10. “Large-Scale Nonlinear Optimization with Inexact Step Computations,” Computational Science & Engineering Seminar, Purdue University, West Lafayette, IN, Feb 2012
11. “Large-Scale Nonlinear Optimization with Inexact Step Computations,” LANS Seminar, Mathematics and Computer Science Division, Argonne National Laboratories, Argonne, IL, Dec 2011
12. “Large-Scale Nonlinear Optimization,” Center for Computational Engineering Seminar Series, Massachusetts Institute of Technology, Boston, MA, Nov 2009
13. “An Interior-Point Algorithm For Large-Scale Nonlinear Optimization With Inexact Step Computations,” Computer Science Department, University of Basel, Feb 2009
14. “Some Recent Advances in Mixed-Integer Nonlinear Programming,” Institute of Applied Mathematics, University of Hanover, Germany, Feb 2008
15. “An Open Source Package for Mixed Integer Nonlinear Programming,” Courant Institute of Mathematical Sciences, New York University, New York, NY, Apr 2007
16. “A Short Course In Nonlinear Optimization” (invited short course, 5 lectures), University of Bologna, Bologna, Italy, Mar 2007
17. “Eine Innere-Punkte-Methode zur Optimierung grosser nichtlinearer Probleme mit Anwendungen in der Schaltkreisoptimierung,” Institute for Applied Mathematics, University of Hanover, Hanover, Germany, Mar 2007
18. “An Algorithm for Large-Scale Nonlinear Optimization with Applications in Circuit Tuning,” Industrial and Systems Engineering Department Seminar, Lehigh University, Bethlehem, PA, Feb 2006
19. “Eine Innere-Punkte-Methode für nichtlineare Optimierung mit Anwendungen aus der Optimierung integrierter Schaltkreise,” Institute for Computer Science, University of Cologne, Cologne, Germany, Jan 2006
20. “Interior Point Algorithms for Large-Scale Nonlinear Programming: Theory and Algorithmic Development,” Industrial Optimization Seminar, Fields Institute, Toronto, Canada, Mar 2005
21. “An Algorithm for Large-Scale Nonlinear Optimization with Applications in Circuit Tuning,” Humboldt University, Berlin, Germany, Dec 2004
22. “Interior Point Methods for Large-Scale Nonlinear Optimization with Applications in Circuit Tuning,” Courant Institute of Mathematical Sciences, New York University, New York, NY, Dec 2004
23. “Large-Scale Nonlinear Optimization in Circuit Tuning,” Applied Mathematics Colloquium, University of Maryland, Baltimore County, Baltimore, MD, Oct 2004
24. “Nonlinear Programming and Circuit Tuning (How can a nonlinear optimization method make computers faster?),” (invited short course) 11<sup>th</sup> Mathematical Programming Meeting , Han-sur-Lesse, Belgium, Feb 2004
25. “Nonlinear Optimization in Circuit Tuning,” Optimization Technology Center, Northwestern University, Evanston, IL, Dec 2002



26. “Global and Local Convergence of Line Search Filter Methods for Nonlinear Programming,” Facultés Universitaires Notre-Dame de la Paix, Namur, Belgium, Aug 2002
27. “An Interior Point Algorithm for Large-Scale Nonlinear Optimization: Some Theory and Applications,” Instituto Tecnológico Autónomo de México (ITAM), Mexico City, Mexico, Oct 2002

### Teaching and Advising Activities

#### Courses taught/teaching at Northwestern University, Industrial Engineering and Management Sciences

IEMS 395: Optimization Methods in Data Science	Spring	2018
IEMS 313: Foundations of Optimization	Winter	2018
IEMS 450-2: Mathematical Optimization II	Winter	2018
IEMS 395: Optimization Methods in Data Science	Spring	2017
IEMS 313: Deterministic Models and Optimization	Winter	2017
IEMS 450-2: Mathematical Programming II	Winter	2017
IEMS 313: Deterministic Models and Optimization	Spring	2016
IEMS 450-2: Mathematical Programming II	Winter	2016
IEMS 450-2: Mathematical Programming II	Spring	2015
IEMS 313: Deterministic Models and Optimization	Spring	2015
IEMS 457: Integer Programming	Winter	2015
IEMS 313: Deterministic Models and Optimization	Winter	2015
IEMS 450-2: Mathematical Programming II	Winter	2014
IEMS 313: Deterministic Models and Optimization	Winter	2014
IEMS 313: Deterministic Models and Optimization	Fall	2013
IEMS 313: Deterministic Models and Optimization	Spring	2013
IEMS 450-2: Mathematical Programming II	Winter	2012
IEMS 313: Deterministic Models and Optimization	Winter	2012
IEMS 313: Deterministic Models and Optimization	Spring	2012
IEMS 450-2: Mathematical Programming II	Winter	2011

#### Teaching Awards

- INFORMS Graduate Teaching Award for Outstanding Academic Instruction Among IEMS Graduate Faculty during the 2014-2015 academic year
- Included in the 2012-2013 Faculty Honor Roll of Northwestern’s Associate Student Government
- INFORMS Graduate Teaching Award for Outstanding Academic Instruction Among IEMS Graduate Faculty during the 2011-2012 academic year

#### Doctoral Student Advisees

- Ruby Tu (expected graduation 2020)
- Alejandra Pena-Odieres (expected graduation 2019)
- Francisco Jara-Moroni (graduated 2018)
- Nitish Keskar (graduated 2017)
- Mingbin Feng (graduated 2016) – co-advised with Prof. Jeremy Staum
- Travis Johnson (graduated 2013)