Andreas Wächter

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Appointment

Northwestern University
− Professor, Industrial Engineering and Management Sciences (2019 – present)
− Associate Professor, Industrial Engineering and Management Sciences (2011 – 2019)

Los Alamos National Laboratory
− Ulam Scholar, Center for Nonlinear Studies (2019 – 2020)

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

− 2nd place in ARPA-E's Grid Optimization Competition ($400,000), 2020
− Stanislaw M. Ulam Distinguished Scholar, Center for Nonlinear Studies, Los Alamos National Laboratories, (2019-2020)
− 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 l1-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. Sh. Tu, A. Wächter and E. Wei. A Two-Stage Decomposition Approach for AC Optimal Power Flow. *arXiv 2002.08003*, to appear in *IEEE Transactions on Power Systems*, 2020.

2. A. Peña-Ordieres, D.K. Molzahn, L.A. Roald, and A. Wächter. DC optimal power flow with joint chance constraints. *arXiv 1911.12439*, to appear in *IEEE Transactions on Power Systems*, 2020

3. A. Peña-Ordieres, J.R. Luedtke, and A. Wächter. Solving chance-constrained problems via a smooth sample-based nonlinear approximation, *arXiv 1905.07377*, to appear in *SIAM Journal on Optimization*, 2020.

4. F. Jara-Moroni, J.E. Mitchell, J.-S. Pang, and A. Wächter. An enhanced logical Benders approach for linear programs with complementarity constraints, *Journal of Global Optimization* 77: 687-714, 2020.

5. N. Keskar and A. Wächter. A limited-memory quasi-Newton algorithm for bound-constrained non-smooth optimization. *Optimization Methods and Software* 34(1): 150-171, 2019

6. 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

7. 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.

8. 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):221–254, 2018.

9. 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

10. 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

11. 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

12. 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

13. N. S. Keskar, J. Nocedal, F. Otzoprak, 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

14. 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.

15. M. Feng, A. Wächter, J. Staum. Practical Algorithms for Value-at-Risk Portfolio Optimization Problems, *Quantitative Finance Letters*, 3(1): 1-9, 2015.

16. 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.

17. 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

18. 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.

19. 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.

20. 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.

21. 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.

22. 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.

23. J. Nocedal, A. Wächter, and R. A. Waltz. Adaptive barrier strategies for nonlinear interior methods. *SIAM Journal on Optimization*, 19(4): 1674-1693, 2009.

24. 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.

25. 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.

26. 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.

27. 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.

28. 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.

29. A. Wächter and L. T. Biegler. Line search filter methods for nonlinear programming: Local convergence. *SIAM Journal on Optimization*, 16(1):32–48, 2005.

30. A. Wächter, C. Visweswariah, and A. R. Conn. Large-scale nonlinear optimization in circuit tuning. *Future Generation Computer Systems*, 21(8):1251–1262, 2005.

31. 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.

32. 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.

33. 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.

34. 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.

35. 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.

36. 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. Feng, A. Maggiar, J. Staum, A. Wächter. Uniform convergence of sample average approximation with adaptive multiple importance sampling. *2018 Winter Simulation Conference (WSC),* p.1646-1657, 2018.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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. Tritchkov, 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.

8. 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.

9. 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.

10. 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. Tritchkov, and Y. Granik. Intensive optimization of masks and sources for 22nm lithography. *SPIE Conference Series*, Vol 7274, 727409, 2009.

11. 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 Annucal Conference*, SPE Paper 99996, 2006.

12. 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.

13. 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. B. Tasseff, C. Coffrin, A. Wächter and C. Laird. Exploring benefits of linear solver parallelism on modern nonlinear optimization applications, *arXiv 1909.08104*, 2019.

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

– "Hybrid Interior-Point/Active-Set SCOPF Algorithms Exploiting Power Systems Characteristics," ARPA-E, U.S. Department of Energy, effective Nov 2018 until Nov 2019. Multiple PIs; joint with Frank E. Curtis, Lehigh University, Dan Molzahn, Georgia Tech, Ermin Wei, Northwestern, Elizabeth Wong, University of California San Diego.
– "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, 2019. 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 *AIChE 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. "Solving Chance-Constrained Problems via a Smooth Sample-Based Nonlinear Approximation", Institute for Computational and Experimental Research in Mathematics, Providence, RI, Jun 2019 (invited)
2. "Nonlinear Programming Formulations of Chance Constraints with Application to Optimal Power Flow", *2019 Grid Science Winter School & Conference*, Santa Fee, Jan 2019 (invited)
3. "Nonlinear Programming Formulations of Chance-Constraints (Part 1)", *23rd International Symposium on Mathematical Programming*, Bordeaux, France, Jul 2018 (invited)
4. "Nonlinear Programming Formulation of Chance-Constraints", *US-Mexico Workshop on Optimization and its Applications,* Huatulco, Mexico, Jan 2018 (invited)
5. "Solving Chance-Constrained Optimization Problems Using a Kernel-VaR Estimator", *Foundations of Computational Mathematics Optimization Workshop*, Barcelona, Spain, Jul 2017 (invited)
6. "Solving Chance-Constrained Optimization Problems Using a Kernel-VaR Estimator", *Workshop on Modern Convex Optimization and Applications,* Fields Institute, Toronto, Canada, Jul 2017 (invited)
7. "Solving Chance-Constrained Problems Using a Kernel-VaR Estimator," *Society for Industrial and Applied Mathematics Conference on Optimization,* Vancouver, Canada, May 2017 (invited)
8. "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)
9. "A Sequential Algorithm for Nonconvex Nonlinear with Chance-Constrained Optimization", *International Conference on Continuous Optimization*, Tokyo, Japan, Aug 2016 (invited)
10. "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)
11. "A Trust-Region Method for Nonconvex Nonlinear with Chance-Constrained Optimization", *US-Mexico Workshop on Optimization and its Applications,* Merida, Mexico, Jan 2016 (invited)
12. "A Derivative-Free Method for Minimizing Nonlinear Functions with Deterministic Noise," *22th International Symposium on Mathematical Programming*, Pittsburgh, PA, Jul 2015 (invited)
13. "A Derivative-Free Method for Minimizing Nonlinear Functions with Deterministic Noise," *Argonne-Chicago-Northwestern-Wisconsin Workshop 2015,* Chicago, IL, Jun 2015 (invited)
14. **(invited plenary)** "Inexact Methods for Nonlinear Optimization," *MOPTA (Modeling and Optimization: Theory and Applications) 2014*, Lehigh, PA, Aug 2014
15. "Hot-Starting NLP Solvers," *2014 Mixed-Integer Programming Workshop*, Columbus, OH, Jul 2014 (invited)
16. "An Active-Set Quadratic Programming Method Based On Sequential Hot-Starts," *Computational Contacts Mechanics: Advances and Frontiers in Modeling Contact*, Bannf International Research Station, Banff, Canada, Feb 2014 (invited)
17. "Complementarity Formulations for l0-Norm Optimization Problems," *International Conference on Continuous Optimization*, Lisbon, Portugal, Jul 2013 (invited)
18. **(invited plenary)** "Active Set SQP Algorithms with Inexact Subproblem Solutions for Nonlinear Nonconvex Optimization," *3rd European Conference on Computational Optimization*, Chemnitz, Germany Jul 2013

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19. "Towards Hot-Started NLP Solvers: Algorithms," *Institute for Operations Research and the Management Sciences Annual Meeting*, Phoenix, AZ, Oct 2012 (invited)
20. "Towards Hot-Started NLP Solvers," *21th International Symposium on Mathematical Programming*, Berlin, Germany, Aug 2012 (invited)
21. "Large-Scale Nonlinear Optimization with Inexact Step Computations," *Society for Industrial and Applied Mathematics Conference on Optimization,* Darmstadt, Germany, May 2011 (invited)
22. "Large-Scale Nonlinear Optimization with Inexact Step Computations," *9th US-Mexico Workshop on Optimization and its Applications,* Oaxaca, Mexico, January 2011 (invited)
23. "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)
24. **(invited plenary)** "Large-Scale Nonlinear Optimization with Inexact Step Computations," *Parametric Optimization and Related Topics X,* Karlsruhe, Germany, Sep 2010
25. "An NLP Algorithm Using Iterative Linear Solvers," *European Workshop on Mixed Integer Nonlinear Programming*, Marseille, France, Apr 2010 (invited)
26. "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)
27. "Solving Nonlinear Optimization Problems on Large-Scale Parallel Computers," *20th International Symposium on Mathematical Programming*, Chicago, IL, Aug 2009 (invited)
28. "Solving Large-Scale Continuous Optimization Problems with Ipopt," *Optimization Days 2009*, Montréal, Canada, May 2009 (invited)
29. "Tutorial for the NLP solver Ipopt," *Workshop on Combinatorial Scientific Computing,* Dagstuhl, Germany, Feb 2009 (invited)
30. **(invited plenary)** "Some Recent Advances in Mixed-Integer Nonlinear Programming," *Society for Industrial and Applied Mathematics Conference on Optimization,* Boston, MA, May 2008
31. "Some Recent Advances in Mixed-Integer Nonlinear Programming," *Special Interest Group on Optimization (SIGOPT) – International Conference on Optimization 2008*, Lambrecht, Germany, Feb 2008 (invited)
32. **(invited plenary)** "Recent Advances in Mixed-Integer Nonlinear Programming," *13th Czech-French-German Conference on Optimization*, Heidelberg, Germany, Sep 2007
33. "A New Open Source Solver for MINLP," *8th US-Mexico Workshop on Optimization and its Applications*, Huatulco, Mexico, Jan 2007 (invited)
34. "Circuit Tuning with Ipopt," *Institute for Operations Research and the Management Sciences Annual Meeting*, Pittsburgh, PA, Nov 2006
35. "Smoothing Noisy Black-Box Functions For Nonlinear Optimization," *19th International Symposium on Mathematical Programming*, Rio de Janeiro, Brazil, Aug 2006 (invited)
36. "Ipopt Tutorial," *DIMACS Workshop on COIN-OR*, Rutgers University, New Brunswick, NJ, Jul 2005
37. "Adaptive Barrier Parameter Strategies For Nonlinear Programming," *Foundations of Computational Mathematics Optimization Workshop*, Santander, Spain, Jul 2005 (invited)
38. "Adaptive Barrier Parameter Strategies For Nonlinear Programming," *Society for Industrial and Applied Mathematics Conference on Optimization*, Stockholm, Sweden, May 2005 (invited)
39. "Adaptive Barrier Parameter Strategies For Nonlinear Programming," *1st International Conference on Continuous Optimization*, Troy, NY, Aug 2004 (invited)
40. "Large-Scale Nonlinear Optimization in Circuit Tuning," *Numerical Aspects of Circuit and Design Modeling Workshop*, Santa Fe, NM, Jun 2004 (invited)
41. "Large-Scale Nonlinear Optimization in Circuit Tuning," *Optimization Days 2004*, Univeristé de Montréal, Montréal, Canada, May 2004 (invited)
42. "On the Implementation of an Interior Point Method for Large-Scale Nonlinear Optimization," *European Conference on Computational Optimization*, Dresden, Germany, Mar 2004 (invited)
43. "An Interior Point Algorithm for Large-Scale Nonlinear Optimization With Applications In Circuit Tuning," *75th Annual Meeting of the International Association of Applied Mathematics and Mechanics (GAMM)*, Dresden, Germany, Mar 2004 (invited)

44. "An Interior-Point Filter Line-Search Method for Large-Scale Nonlinear Programming," *18th International Symposium on Mathematical Programming*, Copenhagen, Denmark, Aug 2003 (invited)

45. "Large-Scale Nonlinear Optimization with Applications in Circuit Tuning," *33rd Speedup Workshop*, Basel, Switzerland, Mar 2003 (invited)

46. "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)

47. "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)

48. "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)

49. "An Interior Point NLP Algorithm for Large-Scale Chemical Process Optimization," *7th US-Mexico Workshop in Numerical Analysis*, Merida, Mexico, Jan 2001 (invited)

50. "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

51. "Global Convergence of a Class of Interior-Point Methods for Nonconvex Nonlinear Programming: Failure and Some Remedies," *17th International Symposium on Mathematical Programming*, Atlanta, GA, Aug 2000 (invited)

52. "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

53. "A Quasi-Newton Interior Point Method for Large-Scale Nonlinear Programming with Modifications to Handle Constraint Inconsistencies," *1st 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, MIT Operations Research Center Seminar, MIT, Cambridge, MA, Feb 2019
2. "Nonlinear Programming Formulations of Chance-Constraints", Industrial and Systems Engineering Seminar, Lehigh University, Bethlehem, PA, Dec 2018
3. "Nonlinear Programming Formulations of Chance-Constraints", Advanced Network Science Initiative Seminar, Los Alamos National Laboratories, Los Alamos, NM, Oct 2018
4. "Nonlinear Programming Formulations of Chance-Constraints", Department of Information and Decision Sciences Seminar, University of Illinois at Chicago, Chicago, IL, Apr 2018
5. "Constrained Nonlinear Optimization", guest lecture in summer school on "Mathematical Optimization" at the Institute of Mathematics and its Applications, Minnesota, MN, Aug 2016
6. "A Sequential Algorithm for Nonlinear Optimization Problems with Chance Constraints", Industrial and Systems Engineering Colloquium, University of Wisconsin-Madison, Madison, WI, Sep 2016
7. "Constrained Nonlinear Optimization Algorithms" (invited short course, 2 lectures), Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN, Aug 2016
8. "A Derivative-Free Method for Solving Nonlinear Optimization Problems with Deterministic Noise," Institute for Mathematics, Paderborn University, Paderborn, Germany Sep 2015
9. "A Derivative-Free Method for Solving Nonlinear Optimization Problems with Deterministic Noise," Applied Math Colloquium, Northwestern University, Evanston, IL, Nov 2014
10. "Exploiting Inexact Subproblem Solutions in Nonlinear Optimization Algorithms," Department of Applied Mathematics and Statistics Seminar, Johns Hopkins University, Baltimore, MD, Apr 2014
11. "Towards Hot-Started NLP Solvers," ISE Graduate Seminar, University of Illinois at Urbana-Champaign, Urbana, IL, Sep 2012
12. "Large-Scale Nonlinear Optimization with Inexact Step Computations," Operations/Management Science Workshop, University of Chicago Booth School of Business, Chicago, IL, May 2012
13. "Large-Scale Nonlinear Optimization with Inexact Step Computations," Computational Science & Engineering Seminar, Purdue University, West Lafayette, IN, Feb 2012

14. "Large-Scale Nonlinear Optimization with Inexact Step Computations," LANS Seminar, Mathematics and Computer Science Division, Argonne National Laboratories, Argonne, IL, Dec 2011
15. "Large-Scale Nonlinear Optimization," Center for Computational Engineering Seminar Series, Massachusetts Institute of Technology, Boston, MA, Nov 2009
16. "An Interior-Point Algorithm For Large-Scale Nonlinear Optimization With Inexact Step Computations," Computer Science Department, University of Basel, Feb 2009
17. "Some Recent Advances in Mixed-Integer Nonlinear Programming," Institute of Applied Mathematics, University of Hanover, Germany, Feb 2008
18. "An Open Source Package for Mixed Integer Nonlinear Programming," Courant Institute of Mathematical Sciences, New York University, New York, NY, Apr 2007
19. "A Short Course In Nonlinear Optimization" (invited short course, 5 lectures), University of Bologna, Bologna, Italy, Mar 2007
20. "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
21. "An Algorithm for Large-Scale Nonlinear Optimization with Applications in Circuit Tuning," Industrial and Systems Engineering Department Seminar, Lehigh University, Bethlehem, PA, Feb 2006
22. "Eine Innere-Punkte-Methode für nichtline;are Optimierung mit Anwendungen aus der Optimierung integrierter Schaltkreise," Institute for Computer Science, University of Cologne, Cologne, Germany, Jan 2006
23. "Interior Point Algorithms for Large-Scale Nonlinear Programming: Theory and Algorithmic Development," Industrial Optimization Seminar, Fields Institute, Toronto, Canada, Mar 2005
24. "An Algorithm for Large-Scale Nonlinear Optimization with Applications in Circuit Tuning," Humboldt University, Berlin, Germany, Dec 2004
25. "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
26. "Large-Scale Nonlinear Optimization in Circuit Tuning," Applied Mathematics Colloquium, University of Maryland, Baltimore County, Baltimore, MD, Oct 2004
27. "Nonlinear Programming and Circuit Tuning (How can a nonlinear optimization method make computers faster?)," (invited short course) 11th Mathematical Programming Meeting , Han-sur-Lesse, Belgium, Feb 2004
28. "Nonlinear Optimization in Circuit Tuning," Optimization Technology Center, Northwestern University, Evanston, IL, Dec 2002
29. "Global and Local Convergence of Line Search Filter Methods for Nonlinear Programming," Facultés Universitaires Notre-Dame de la Paix, Namur, Belgium, Aug 2002
30. "An Interior Point Algorithm for Large-Scale Nonlinear Optimization: Some Theory and Applications," Institute Tecnologico Autonomo de Mexico (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

Curriculum Vitae: Andreas Wächter, Ph.D.

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
– Shima Dezfulian (expected graduation 2024)
– Xinyi Luo (expected graduation 2023)
– Ruby Tu (expected graduation 2021)
– Mark Semelhago (graduated 2020) – co-advised with Prof. Barry Nelson
– Alejandra Pena-Odieres (graduated 2020)
– Francisco Jara-Moroni (graduated 2018)
– Nitish Keskar (graduated 2017)
– Mingbin Feng (graduated 2016) – co-advised with Prof. Jeremy Staum
– Travis Johnson (graduated 2013)