

HANDE YURTTAN BENSON

Curriculum Vitae

Department of Decision Sciences
Bennett S. LeBow College of Business
Drexel University
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EDUCATION

Princeton University	Princeton, New Jersey
Ph.D. in Operations Research and Financial Engineering	May 2001
Dissertation Title: Interior-Point Methods for Nonlinear, Second-Order Cone and Semidefinite Programming	
M.A. in Operations Research and Financial Engineering	May 1999
Georgetown University	Washington, DC
B.S. in Mathematics and Computer Science	May 1997
Magna Cum Laude	

EMPLOYMENT HISTORY

Drexel University	Philadelphia, Pennsylvania
Department of Decision Sciences	
Assistant Professor	September 2003-Present
United States Naval Academy	Annapolis, Maryland
Mathematics Department	
Assistant Professor	August 2002-August 2003
Princeton University	Princeton, New Jersey
Operations Research and Financial Engineering	
Postdoctoral Research Associate	September 2001-June 2002
Princeton Environmental Institute	
Postdoctoral Fellow	September 2001-June 2002
Rutgers University	Piscataway, New Jersey
Management Science and Information Systems	
Part-Time Lecturer	September 2001-June 2002

AWARDS AND FELLOWSHIPS

Excellence In Research, LeBow College of Business, Drexel University	2005
Travel Grant, Princeton University	2000
Graduate Student Fellowship, DIMACS	1999
Excellence in Teaching Award, Princeton University	1998
Dean's Fellowship, Princeton University	1997-1998
Henry M. Leslie Award in Mathematics, Georgetown University	May 1997
Computer Science Award, Georgetown University	May 1997

RELATED EXPERIENCE

Lattice Financial LLC Optimization Software Developer	Princeton Junction, New Jersey June-August 2001
Princeton University Senior Thesis Writers' Group Mentor	Princeton, New Jersey September 1999-April 2001
IBM T.J. Watson Research Center Summer Intern	Yorktown, Heights New York July-September 1998

RESEARCH INTERESTS

My research is in the field of continuous optimization. I am primarily interested in interior-point methods—improving the performance of these algorithms for nonlinear programming and extending them to different classes of problems and application areas. Some of my recent work has been in primal-dual regularization techniques to improve convergence properties and enable warm-starting and infeasibility detection in interior-point methods. These results have been implemented in the code LOQO and applied to solve mathematical programs with equilibrium constraints and mixed-integer nonlinear programming problems.

My dissertation work included analyzing and implementing a filter-like steplength control in an interior-point method algorithm for smooth nonlinear programming, and an extension of this algorithm to second-order cone programming and semidefinite programming. I have also worked to build a large test suite of problems, consisting mostly of real-world applications, which is available online to the optimization community. I have recently added models arising in supply chain management and path coordination of multiple vehicles under communications constraints to this suite.

In the next several years, I plan to continue this line of research in both the theory and applications of optimization. I am interested in further improvements in the performance of interior-point methods for mixed-integer nonlinear programming and in working within a general problem framework that incorporates cone and equilibrium constraints. Preliminary work of two of my Ph.D. students in discrete bilevel programming problems arising in biofuel production and in game theoretical aspects of path coordination of fleets of vehicles have revealed rich sources of applied problems and will also be pursued further.

FEDERALLY FUNDED GRANTS

- National Science Foundation \$59,960 (October 2007-September 2008) *Efficient Interior-Point Methods for Mixed-Integer Nonlinear and Conic Programming*, principal investigator.
- Office of Naval Research \$90,000 (December 2003-September 2006) *Mixed Integer Nonlinear Programming with Applications in Sensor Optimization*, principal investigator
- Office of Naval Research \$25,000 (April-September 2003) *A New Approach to Mixed Integer Nonlinear Programming*, principal investigator

INTERNAL GRANTS

- Drexel University Summer Research Grant (July 2007-September 2007) *Multi-Vehicle Path Coordination under Communication Constraints*, principal investigator

SUBMITTED GRANT PROPOSALS

- National Science Foundation \$332,911 (July 2008-June 2010) Optimization Methods for Multi-Vehicle Path Coordination with Communication Constraints. *Currently under consideration.*

FUNDING AGENCY REVIEW PANELS

- Served on an NSF Panel to evaluate grant proposals to the Operations Research Program (May 2007)
- Served as Grant Reviewer for the MITACS-NCE program
- Served as Reviewer for the Department of Energy Applied Mathematics Program

REFEREED JOURNAL PUBLICATIONS

I. Griva, D.F. Shanno, R.J. Vanderbei, and H.Y. Benson. Global Convergence of a Primal-Dual Interior-Point Method for Nonlinear Programming. To appear in *Algorithmic Operations Research*.

H.Y. Benson and D.F. Shanno. Interior-Point Methods for Nonconvex Nonlinear Programming: Regularization and Warmstarts. *Computational Optimization and Applications* 40(2), 143-189, June 2008.

H.Y. Benson and D.F. Shanno. An Exact Primal-Dual Penalty Method Approach to Warmstarting Interior-Point Methods for Linear Programming. *Computational Optimization and Applications* 38(3), 371-399, December 2007.

H.Y. Benson, A. Sen, D.F. Shanno, R.J. Vanderbei. Interior-Point Algorithms, Penalty Methods, and Equilibrium Problems. *Computational Optimization and Applications* 34(2), 155-182, June 2006.

H.Y. Benson, D.F. Shanno, R.J. Vanderbei. Interior-Point Methods for Nonconvex Nonlinear Programming: Jamming and Comparative Numerical Testing. *Mathematical Programming Series A* 99(1), 35-48, January 2004.

H.Y. Benson and R.J. Vanderbei. Solving Problems with Semidefinite and Related Constraints Using Interior-Point Methods for Nonlinear Programming. *Mathematical Programming Series B* 95(2), 279-302, February 2003.

H.Y. Benson, D.F. Shanno, R.J. Vanderbei. Interior-Point Methods for Nonconvex Nonlinear Programming: Filter Methods and Merit Functions. *Computational Optimization and Applications* 23(2): 257-272, November 2002.

CHAPTERS IN EDITED VOLUMES

H.Y. Benson, D.F. Shanno, R.J. Vanderbei. A Comparative Study of Large Scale Nonlinear Optimization Algorithms. In *High Performance Algorithms and Software for Nonlinear Optimization*, G. Di Pillo and A. Murli, editors, pages 94-126, Kluwer Academic Publishers, 2003.

PAPERS CURRENTLY UNDER REVIEW AT REFEREED JOURNALS

H.Y. Benson. Mixed-Integer Nonlinear Programming Using Interior-Point Methods. Submitted to *Optimization Methods and Software*, November 2007.

H.Y. Benson, A. Sen and D.F. Shanno. Convergence Analysis of an Interior-Point Method for Nonconvex Nonlinear Programming. Submitted to *Mathematics of Operations Research*, June 2007.

PUBLICATIONS IN REFEREED PROCEEDINGS

P. Abichandani, H.Y. Benson and M. Kam. Multi-Vehicle Path Coordination under Communication Constraints. *Proceedings of the American Control Conference*, 2008.

W. Hu, X. Liu, H.Y. Benson. Nonlinear Programming for Supply Chain Management: A Survey and Extensions. *Proceedings of the Northeast Decision Sciences Institute, Puerto Rico, USA 2006*.

H.Y. Benson. Optimal Pricing and Procurement Strategies in a Supply Chain with Multiple Capacitated Suppliers. *Proceedings of the Northeast Decision Sciences Institute, Philadelphia, USA 2005*.

H.Y. Benson and J.M. Ogden. Mathematical Programming Techniques for Designing Minimum Cost Pipeline Networks for CO₂ Sequestration. *Proceedings of the Sixth Greenhouse Gas Technologies Conference, Kyoto, Japan, 2002*.

TECHNICAL REPORTS

H.Y. Benson, D.F. Shanno, R.J. Vanderbei. Interior-Point Methods for Nonconvex Nonlinear Programming: Complementarity Constraints. Technical Report ORFE 02-02, Department of Operations Research and Financial Engineering, Princeton University, 2002.

R.J. Vanderbei and H.Y. Benson. On Formulating Semidefinite Programming Problems as Smooth Convex Nonlinear Optimization Problems. Technical Report ORFE 1999-01, Department of Operations Research and Financial Engineering, Princeton University, 1999.

R.J. Vanderbei and H. Yurttan. Using LOQO to Solve Second-Order Cone Programming Problems. Technical Report SOR-98-09, Statistics and Operations Research, Princeton University, 1998.

INVITED COLLOQUIA

State-of-the-Art in Large-Scale Nonlinear Optimization, School of Biomedical Engineering Seminar Series, Drexel University, April 2007.

Warmstarting Interior-Point Methods for Linear Programming, Department of Applied Mathematics Seminar Series, University of Maryland Baltimore County, September 2005.

Interior-Point Algorithms, Penalty Methods, and Equilibrium Problems, IOE Departmental Seminar Series, University of Michigan, Ann Arbor, March 2005.

INVITED CONFERENCE TALKS

Interior-Point Methods for Mixed-Integer Nonlinear Conic Programming, SIAM Conference on Optimization, May 2008.

LOQO, an Interior-Point Code for Nonconvex Nonlinear Programming, Seattle INFORMS, November 2007.

LOQO, an Interior-Point Code for Nonconvex Nonlinear Programming, ICCOPT-MOPTA, McMaster University, August 2007.

Interior-Point Methods for Nonconvex Nonlinear Programming: Regularization and Warmstarts, 8th Annual US-Mexico Workshop on Optimization, Huatulco, January 2007.

Warmstarting Interior-Point Methods for Nonlinear Programming, Pittsburgh INFORMS, November 2006.

Interior-Point Methods for Nonconvex Nonlinear Programming: Regularization and Warmstarts, CORS/Optimization Days Joint Conference, Montreal, May 2006.

Penalty Methods in Interior-Point Algorithms, Conference on Complementary, Duality, and Global Optimization, Virginia Tech, August 2005.

Interior-Point Algorithms, Penalty Methods, and Equilibrium Problems, 4th International Conference on Complementarity Problems, Stanford University, August 2005.

Recent Advances with LOQO, an Infeasible Interior-point Code for Nonlinear Programming, SIAM Conference on Optimization, Stockholm, May 2005.

Interior-Point Algorithms, Penalty Methods, and Equilibrium Problems, Denver INFORMS, October 2004.

Interior-Point Algorithms, Penalty Methods, and Equilibrium Problems, Banff CORS-INFORMS, May 2004.

Benchmarking of Nonlinear Programming Software, Atlanta INFORMS, October 2003.

LOQO, an Infeasible Interior-Point Method for Nonlinear Programming: Filter Methods and Nonlinear Programming Problems with Unbounded Multipliers, Atlanta INFORMS, October 2003.

Recent Advances in Nonlinear Programming with LOQO, International Symposium on Mathematical Programming, Copenhagen, August 2003.

Interior-Point Methods for Nonconvex Nonlinear Programming: Complementarity Constraints, San Jose INFORMS, November 2002.

Recent Advances in Solving Large Scale Nonlinear Programming Problems with LOQO, San Jose INFORMS, November 2002.

Short Course on Numerical Optimization: Algorithms and Software, SIAM Conference on Optimization, Toronto, May 2002.

A Comparative Study of Large Scale Nonlinear Optimization Algorithms, SIAM Conference on Optimization, Toronto, May 2002.

Solving Problems with Semidefinite and Related Constraints Using Interior-Point Methods for Nonlinear Programming, Miami INFORMS, November 2001

Filter Methods in Nonlinear Programming, Miami INFORMS, November 2001.

Solving Semidefinite Programming Problems Using Interior-Point Methods for Nonlinear Programming, San Antonio INFORMS, November 2000

Using LOQO to Solve Problems with Semidefinite and Related Constraints, Seventh DIMACS Implementation Challenge, November 2000

Solving Semidefinite Programming Problems Using Interior-Point Methods for Nonlinear Programming, International Symposium on Mathematical Programming, Atlanta, August 2000

Solving Second-Order Cone Programming Problems via Interior-Point Methods, Philadelphia INFORMS, November 1999

CONTRIBUTED TALKS

Nonlinear Programming for Supply Chain Management: A Survey and Extensions, Northeast Decision Sciences Institute, March 2006.

Optimal Pricing and Procurement Strategies in a Supply Chain with Multiple Capacitated Suppliers. Northeast Decision Sciences Institute, March 2005.

LOQO: An Infeasible Interior-Point Algorithm for Nonlinear Programming, Mathematical Programming Society International Conference on Continuous Optimization, Troy, NY, August 2004.

MEMBERSHIPS

Editorial Board, CONE World (GAMS Corporation)
Mathematical Programming Society
INFORMS

Society of Industrial and Applied Mathematics
Sigma Xi, Scientific Research Society
Association for Women in Mathematics

REVIEWER RESPONSIBILITIES

Served as ad hoc reviewer for the following journals: Mathematics of Operations Research, Mathematical Programming, SIAM Journal on Optimization, Computational Optimization and Applications, Optimization Methods and Software, Journal of Optimization Theory and Applications, European Journal of Operations Research, International Journal of Computer Mathematics, Central European Journal of Mathematics, Applied Numerical Mathematics

STUDENT SUPERVISION

- Virginia Miori, Ph.D. received June 2006
- Jiali Liao, Ph.D. received June 2006
- Pramod Abichandani, Ph.D. expected June 2009
- Xiangrong Liu, Ph.D. expected June 2009
- Vivek Mahanta, Ph.D. expected June 2010
- Committee member for Wan-ting Hu, Ph.D. approved May 2008