

## Curriculum Vitae: Mohit Tawarmalani

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### Education

- B.Tech. Mechanical Engineering, Indian Institute of Technology, May 1993  
Thesis: Feature Extraction in Turned Components
- M.S. Industrial Engineering, University of Illinois at Urbana-Champaign, May 1997  
Thesis: Multistage Network Optimization and Decomposition Algorithms
- Ph.D. Industrial Engineering, University of Illinois at Urbana-Champaign, August 2001  
Thesis: Mixed Integer Nonlinear Programs: Theory, Algorithms and Applications

### Academic/Professional Appointments

- Associate Professor, Purdue University, August 2006 - Present
- Assistant Professor, Purdue University, August 2001 - August 2006
- Software Engineer, ComputerVision, India, January 1995 - July 1995
- Graduate Engineer, TELCO (Tata Engineering and Locomotive Company), India, July 1993 - December 1994

### Research Interests

Mathematical Programming, Complexity and Approximation, Symbolic Computing. Research emphasis is on global optimization theory, algorithms and software. Applications and models in business, economics, systems, engineering design, and molecular design, are of particular interest.

### Teaching Interests

Deterministic and Stochastic Operations Research, Mathematical Programming, Global Optimization, Applied Probability and Statistics, Quantitative Analysis, Spreadsheet Modeling and Decision Analysis.

### Book

Tawarmalani, M. and N. V. Sahinidis, Convexification and Global Optimization in Continuous and Mixed-Integer Nonlinear Programming: Theory, Algorithms, Software and Applications, 504 pages, Kluwer Academic Publishers, 2002.

## Journal Publications

- [1] Sahinidis, N. V. and M. Tawarmalani, Accelerating branch-and-bound through a language specific construct for relaxation-specific constraints, *Journal of Global Optimization*, 32, 259–280, 2005.
- [2] Tawarmalani, M. and N. V. Sahinidis, A Polyhedral Branch-and-Cut Approach to Global Optimization, *Mathematical Programming*, 103, 229–249, 2005.
- [3] Ahmed, S., M. Tawarmalani and N. V. Sahinidis, A Finite Branch and Bound Algorithm for Two-Stage Stochastic Integer Programs, *Mathematical Programming*, 100, 355–377, 2004.
- [4] Tawarmalani, M. and N. V. Sahinidis, Global Optimization of Mixed Integer Nonlinear Programs: A Theoretical and Computational Study, *Mathematical Programming*, 99, 563–591, 2004.
- [5] Sahinidis, N. V., M. Tawarmalani and M. Yu, Design of Alternative Refrigerants via Global Optimization, *American Institute of Chemical Engineers (AIChE) Journal*, 49(7) 1761–1775, 2003.
- [6] Tawarmalani, M. and N. V. Sahinidis, Convex Extensions and Envelopes of Lower Semi-continuous Functions, *Mathematical Programming*, 93, 247-263, 2002.
- [7] Tawarmalani, M., S. Ahmed and N. V. Sahinidis, Product Disaggregation and Relaxations of Mixed-Integer Rational Programs, *Optimization and Engineering*, 3, 281-303, 2002.
- [8] Tawarmalani, M. and N. V. Sahinidis, Exact Algorithms for Mixed Integer Nonlinear Programming, *Handbook of Global Optimization*, Volume 2, P. M. Pardalos and H. E. Romeijn (eds.), Kluwer Academic Publishers, 2002.
- [9] Tawarmalani, M, S. Ahmed and N. V. Sahinidis, Global Optimization of 0-1 Hyperbolic Programs, *Journal of Global Optimization*, 24, 385-417, 2002.
- [10] Tawarmalani, M. and N. V. Sahinidis, Semidefinite Relaxations of Fractional Programs via Novel Convexification Techniques, with N. V. Sahinidis, *Journal of Global Optimization*, 20, 137-158, 2001.
- [11] Tawarmalani, M. and N. V. Sahinidis, The Time Dependent Traveling Salesman Problem, *Encyclopedia of Optimization*, C. A. Floudas and P. M. Pardalos (eds.) Kluwer Academic Publishers, Vol 5, 445-450, 2001.
- [12] Sahinidis, N. V. and M. Tawarmalani, Applications of Global Optimization to Process and Molecular Design, *Computers & Chemical Engineering*, 24, 2157-2169, 2000.
- [13] Adhya, N., M. Tawarmalani and N. V. Sahinidis, A Lagrangian Approach to the Pooling Problem, *Industrial & Engineering Chemistry Research*, 38(5), 1956-1972, 1999.

## Refereed Conference Proceedings

- [1] Tawarmalani, M., K. Kannan and P. De, A Mechanism for Allocating Objects in a Network of Symmetric Caches, Proceedings of the Fifteenth Workshop on Information Technologies and Systems, Las Vegas, 249–254, 2005.

## Presentations

- [1] Chung, Kwanghun, M. Tawarmalani, and J.-P. Richard, Strong Valid Inequalities for Bilinear Integer Knapsack Sets, INFORMS Annual Meeting, Seattle, November 2007.
- [2] Tawarmalani, M., J.-P. Richard, Extending mixed-integer programming lifting techniques to nonlinear programming, ICCOPT-MOPTA 2007, Hamilton, August 2007.
- [3] Tawarmalani, M., J.-P. Richard, Generating Strong Cuts for Nonlinear Programs by Lifting Inequalities, Workshop on Mixed Integer Programming, MIP 2007, Montreal, August 2007.
- [4] Rahman, Mohammad S., K. Kannan and M. Tawarmalani, The Countervailing Incentive of Restricted Patch Distribution: Economic and Policy Implications, Workshop on the Economics of Information Security, Pittsburgh, June 2007.
- [5] Tawarmalani, M., Convex Extensions, Inclusion Certificates and Disjunctive Programming, INFORMS Annual Meeting, Pittsburgh, 2006.
- [6] Tawarmalani, M. and J.-P. Richard, MIP Lifting Techniques for Nonlinear Programs, INFORMS Annual Meeting, Pittsburgh, INFORMS Annual Meeting, Pittsburgh, 2006.
- [7] Tawarmalani, M., K. Kannan and P. De, Allocating Objects in a Network of Caches: Centralized and Decentralized Analyses, INFORMS Annual Meeting, Pittsburgh, 2006.
- [8] Tawarmalani, M., Convex Extensions, Inclusion Certificates and Disjunctive Programming, XIX<sup>th</sup> Mathematical Programming Symposium, Rio De Janerio, 2006.
- [9] J.-P. Richard and M. Tawarmalani, MIP Lifting Techniques for Mixed-Integer Nonlinear Programs, MIP 2006, Coral Gables, 2006.
- [10] Tawarmalani, M., Inclusion Certificates and Disjunctive Programming, Carnegie Mellon University, Pittsburgh, 2006.
- [11] Tawarmalani, M., K. Kannan and P. De, A Mechanism for Allocating Objects in a Network of Symmetric Caches, Fifteenth Workshop on Information Technologies and Systems, Las Vegas, 2005.
- [12] Tawarmalani, M., Convex Extensions and Convexification of Nonlinear Sets, INFORMS Annual Meeting, San Francisco, November 2005.
- [13] J.-P. Richard and M. Tawarmalani, MIP Lifting Techniques for Mixed-Integer Nonlinear Programs, INFORMS Annual Meeting, San Francisco, November 2005.

- [14] J. Wei, M. Duran, K. Furman, N. V. Sahinidis and M. Tawarmalani, Global Optimization of Stochastic Nonconvex Mixed Integer Nonlinear Programming (MINLP) Problems, INFORMS Annual Meeting, San Francisco, November 2005.
- [15] M. Tawarmalani and Y. Li, Minimizing Flow Disruption due to Network Maintenance, INFORMS Annual Meeting, San Francisco, November 2005.
- [16] N. V. Sahinidis and M. Tawarmalani, Global Optimization with Branch-and-Reduce, INFORMS Annual Meeting, San Francisco, November 2005.
- [17] Tawarmalani, M., K. Kannan. P. De and C. Kumar, Allocating Objects in a Network of Caches: Social Welfare and Incentive Compatibility, First CDGO International Conference, Blacksburg, August 2005.
- [18] Tawarmalani, M. and N. V. Sahinidis, Solving Nonlinear Global Optimization Problems Using BARON, INFORMS ICS 9th Conference, Annapolis, 2005.
- [19] Tawarmalani, M., Convexification and Global Optimization of Nonlinear programs, Workshop on Integer Programming and Continuous Optimization, Chemnitz, November 2004.
- [20] Sahinidis N. V. and M. Tawarmalani, Strengthening Polyhedral Relaxations for Global Optimization Problems, AIChE Annual Meeting, Austin 2004.
- [21] Sahinidis N. V. and M. Tawarmalani, A Polyhedral Branch-and-Cut Algorithm for Global Optimization, INFORMS, Denver, October 2004.
- [22] Tawarmalani, M., Convex Extensions and Convexification of Nonlinear Functions, INFORMS Annual Meeting, Atlanta, October 2003.
- [23] Tawarmalani, M. and N. V. Sahinidis, A Two-Step Procedure for Convexification of Lower Semicontinuous Functions, INFORMS Annual Meeting, Atlanta, October 2003.
- [24] Sahinidis, N. V. and M. Tawarmalani, Global Optimization with GAMS/BARON, Atlanta, October 2003.
- [25] Tawarmalani, M., Convex extensions and polyhedral basis, 18th International Symposium of Mathematical Programming, Denmark, August 2003.
- [26] Sahinidis, N. V. and M. Tawarmalani, Global Optimization with BARON, INFORMS Annual Meeting, San Jose, November 2002.
- [27] Tawarmalani, M. Convex Extensions and Polyhedral Basis, INFORMS, San Jose, November 2002.
- [28] Tawarmalani, M. and N. V. Sahinidis, Finiteness and Convexification Issues in Mixed-Integer Nonlinear Programming, Integer Programming Conference in Honor of Egon Balas, Pittsburgh, PA, June 2002.

- [29] Tawarmalani, M. and N. V. Sahinidis, Global Optimization of Mixed Integer Nonlinear Programs, AICHE Annual Meeting, November 2001.
- [30] Sahinidis, N. V., M. Tawarmalani, M. Yu, and G. Nanda, A Novel MINLP Approach to Molecular Design, AICHE Annual Meeting, November 2001.
- [31] Tawarmalani, M. and N. V. Sahinidis, Convex Envelopes of Nonlinear Functions, INFORMS, Miami, November 2001.
- [32] Sahinidis, N. V. and M. Tawarmalani, Global Optimization of Mixed Integer Nonlinear Programs, INFORMS, Miami, November 2001.
- [33] Tawarmalani, M. and N. V. Sahinidis, Domain Reduction in Global Optimization and Mixed Integer Nonlinear Programs, INFORMS, Miami, November 2001.
- [34] Tawarmalani, M. and N. V. Sahinidis, Global Optimization of Mixed Integer Nonlinear Programs, 17<sup>th</sup> International Symposium of Mathematical Programming, Atlanta, August 2000. Programming, Atlanta, 2000.
- [35] Tawarmalani, M. and N. V. Sahinidis, Semidefinite Relaxations of Fractional Programs Via Novel Techniques for Constructing Convex Envelopes of Nonlinear Functions, 17<sup>th</sup> International Symposium of Mathematical Programming, Atlanta, August 2000.
- [36] Ahmed, S., M. Tawarmalani, and N. V. Sahinidis, Global Optimization of Two-stage Stochastic Integer Programs, 17<sup>th</sup> International Symposium of Mathematical Programming, Atlanta, August 2000.
- [37] Tawarmalani, M. and N. V. Sahinidis, Semidefinite Relaxations of Fractional Programs via Novel Techniques for Constructing Convex Envelopes of Nonlinear Functions, International Conference on Advances in Convex Analysis and Global Optimization Samos, Greece, June 2000.
- [38] Ahmed, S., M. Tawarmalani and N. V. Sahinidis, Global Optimization for Stochastic Integer Programming, International Conference on Advances in Convex Analysis and Global Optimization Samos, Greece, June 2000.
- [39] Tawarmalani, M. and N. V. Sahinidis, Convexification using Convex Extensions and Semidefinite Relaxations of Fractional Programs, INFORMS Annual Meeting, Salt Lake City, Utah, May 2000.
- [40] Ahmed, S., M. Tawarmalani, and N. V. Sahinidis, A Finite Branch and Bound Algorithm for Two-Stage Stochastic Integer Programs, INFORMS Annual Meeting, Salt Lake City, Utah, May 2000.
- [41] Tawarmalani, M., S. Ahmed, and N. V. Sahinidis, Convexification Tools in Integer Programming, INFORMS Annual Meeting, Philadelphia, PA, November 1999.
- [42] Ahmed, S., M. Tawarmalani and N. V. Sahinidis, Global Optimization of Two-Stage Stochastic Mixed-Integer Programs, INFORMS Annual Meeting, Philadelphia, PA, November 1999.

- [43] Sahinidis, N. V., M. Tawarmalani, and M. Yu, Novel Molecular Designs Via Global Optimization, AICHE Annual Meeting, Dallas, TX, October 1999.
- [44] Ahmed, S., M. Tawarmalani and N. V. Sahinidis, A Finite Branch and Bound Scheme for Two-Stage Stochastic Integer Programs, INFORMS Annual Meeting, Cincinnati, OH, May 1999.
- [45] Sahinidis, N. V., M. Tawarmalani, and S. Ahmed, New Results in 0–1 Optimization, AICHE Annual Meeting, Miami Beach, FL, November 1998.
- [46] Tawarmalani, M., S. Ahmed and N. V. Sahinidis, Convexification of 0-1 Fractional Programs, INFORMS Annual Meeting, Seattle, WA, October 1998.
- [47] Tawarmalani, M., N. Adhya and N. V. Sahinidis, Global Optimization of the pooling problem, INFORMS Annual Meeting, Seattle, WA, October 1998.
- [48] Tawarmalani, M., N. Adhya and N. V. Sahinidis, Global Optimization of the pooling problem, 2<sup>nd</sup> Engineering Design Automation Conference, Maui, HI, August 1998.
- [49] Tawarmalani, M. and N. V. Sahinidis, Decomposition method for the TDTSP and QAP, INFORMS Annual Meeting, Washington, DC, May 1996.

### **Working Papers**

- [1] Tawarmalani, M., K. Kannan, P. De, and C. Kumar, Allocating Objects in a Network of Caches: Social Welfare and Incentive Compatibility, *Management Science*, submitted.
- [2] Richard, J.-P., and M. Tawarmalani, Lifting Inequalities, A Framework for Generating Strong Cuts for Nonlinear Programs, *Mathematical Programming*, submitted.
- [3] Tawarmalani, M. and Y. Li, Minimizing Flow Disruption due to Network Maintenance, working paper.
- [4] Tawarmalani, M., Convex Extensions, Inclusion Certificates and links to Disjunctive Programming, working paper.

### **Software**

Co-authored BARON (Branch and Reduce Optimization Navigator) for global optimization of mixed-integer nonlinear programs

Implemented the Data Reduction subroutine (Merge) within CADDSS5 environment

### **Honors**

Krannert Faculty Fellow, 2006

2006 Beale-Orchard-Hays prize (with N. V. Sahinidis) for the paper “A polyhedral branch-and-cut approach to global optimization”

Best Paper Award (with K. Kannan and P. De) in the fifteenth Workshop on Information Technologies and Systems (2005) for the paper “A Mechanism for Allocating Objects in a Network of Symmetric Caches”

Honorable Mention in 2005 Junior Faculty Interest Group Competition (with Y. Li) for the paper “Minimizing Flow Disruption due to Network Maintenance”

Outstanding Core MBA Teaching Award, 2005, 2006

INFORMS Computing Society Prize (with N. V. Sahinidis), 2004 for research excellence in the interface between Computer Science and Operations Research

Jay N. Ross Young Faculty Scholar Award, 2002–2003, Purdue University

American Institute of Chemical Engineers (AIChE) Computers and Systems Technology (CAST) Director’s Award, 1999. Best Poster: Novel Molecular Designs Via Global Optimization

CSE Fellow, Computational Science & Engineering, University of Illinois, Jan 1999–May 1999

Teaching Fellow, Department of Mechanical and Industrial Engineering, University of Illinois, Aug 1998–May 1999

Tata Consultancy Services award for *best project* in the areas of CAD/CAM, Robotics & Automation, July 1993

### **Professional Memberships**

Member of Mathematical Programming Society since 2003

Member of Institute of Operations Research and Management Science since 1996

Web Administrator of Optimization Section of Institute for Operations Research and Management Science 1996-2001

### **Professional Activities**

Organized Session for Optimization Society Annual Meeting, Atlanta, 2008

Organized the Global Optimization Cluster for ICCOPT-MOPTA, Hamilton, 2007

Organized the Global Optimization Cluster for INFORMS, Pittsburgh, 2006

Organized the Global Optimization Cluster for INFORMS, San Francisco, 2005

Vice Chair of Global Optimization, INFORMS Optimization Society, October 2004 to November 2006

Refereed papers for *Computers and Chemical Engineering*, *Discrete Optimization*, *European Journal of Operational Research*, *International Journal of Systems Science*, *International Journal of Operations and Quantitative Management*, *Journal of Global Optimization*, *Journal of*

*Industrial and Management Optimization, Journal of Optimization Theory and Applications, Management Science, Mathematical Programming, Operations Research, Operations Research Letters, Optimization and Engineering, and SIAM Journal on Optimization.*

Developed and Maintained Web Interface for BARON, October 1999–May 2001

Organized Paper Sessions in INFORMS, Miami, 2001 and INFORMS, San Jose, 2002

Member of Advisory Board, Journal of Insurance and Risk Management