

CURRICULUM VITAE

J. COLE SMITH

Assistant Professor

Department of Systems and Industrial Engineering, University of Arizona

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EDUCATION

B.S., Mathematical Sciences (emphasis in Computer Science), Clemson University, Clemson, S.C., 1996.

Ph.D., Industrial and Systems Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA, 2000. Dissertation: "Tight Discrete Formulations to Enhance Solvability with Applications to Production, Telecommunication, and Air Transportation Problems."

MAJOR FIELDS

Theoretical fields primarily involve integer programming and combinatorial optimization, specifically the study of polyhedral techniques in solving difficult discrete optimization problems. Other theoretical interests include network flow, scheduling, linear, and nonlinear programming problems. My main application focus lies in telecommunication network design, mathematical models for predicting and prescribing human decision-making, and transportation optimization, with additional forays into optimizing aspects of robotics, military, and biomedical systems.

EMPLOYMENT

2000 – present: *Assistant Professor*, Systems and Industrial Engineering, University of Arizona.

PROFESSIONAL SOCIETIES

The Institute for Operations Research and Management Science (INFORMS)

The Institute of Industrial Engineers (IIE)

Mathematical Programming Society (MPS)

HONORS AND AWARDS

Honorable Mention, 2003 Junior Faculty INFORMS Group (JFIG) Best Paper Award.

Recipient of a Young Investigator Award by the Office of Naval Research, 2002.

SIE Faculty/Student Interface Excellence Award, 2002, 2003, 2004.

First place, 2001 Pritsker Doctoral Dissertation Award, awarded by the Institute of Industrial Engineers.

First place, Paul Torgersen Graduate Research Award for Most Outstanding Engineering Dissertation at Virginia Tech.

Cunningham Fellow at Virginia Tech, 1997-2000.

1996 Samuel Maner Martin Award for Outstanding Senior in Mathematics at Clemson.

1995 Sue King Dunkle Award for Outstanding Junior in Mathematics at Clemson.

SERVICE

Intramural

SIE Graduate Committee, 2000-present

Co-Chair: 2003-2004

Chair: 2004-present

Advised a Senior Design team for ENGR 498a, involving weekly meetings and trips to Lockheed-Martin in Phoenix

SIE Faculty Scribe, 2002-2003 (one academic year)

Participant in the 2002 Wildcat Welcome

SIE Ad Hoc Committee on Operations Research Curriculum, 2001-present

Extramural

2005 INFORMS National Meeting Tutorial Chair.

2004 INFORMS National Meeting Future Academician Colloquium Chair (formerly the Doctoral Colloquium).

Program Committee Member: IASTED Modeling, Simulation, and Optimization Conference, Kauai, HI, August 2004.

IIE Best Book and Best Paper Award Panelist, 2003

NSF Proposal Review Panelist, 2001, 2003.

Individual Proposal Review Panelist, NSF: 2004

Individual Proposal Review Panelist, AFOSR: 2004

Ad Hoc Committee Chair to Recommend Surplus Budget Expenditure, INFORMS Optimization Section, 2001-2003

Session Stream Chair, 2002 IFORS Conference, Edinburgh, Scotland.

Session Cluster Chair, 2001 Summer INFORMS Conference, Maui, HI.

Program Committee Member, 2003 Eighth INFORMS Computing Society Conference, Phoenix, AZ.

Session Chair for Summer 2001, Fall 2001 (twice), Fall 2002 (twice), and Fall 2004 INFORMS conferences, for the 2002 IFORS Conference, and for the 2004 (twice) and 2005 IIE annual conferences.

Refereed papers for the following journals: *Operations Research*, *IIE Transactions*, *INFORMS Journal on Computing*, *Mathematical Programming*, *Transportation Science*, *Annals of OR*, *Computational Optimization and Applications*, *Networks*, *AIAA Journal*, *The Computer Journal*, *International Journal of Industrial Engineering*, *Geographical Analysis*, *IEEE Transactions on Systems, Man, and Cybernetics, Part A*.

Refereed papers for the following conferences: The Intelligence and Security Informatics Conference, IASTED Modeling, Simulation, and Optimization Conference, and conferences hosted by the INFORMS Computing Society, and by the Society of Mining Engineering.

GRANTS AND SPONSORED PROJECTS

- [1] Principal Investigator (100% responsibility): “Development of a Comprehensive Combinatorial Optimization Problem and Solution Library,” University of Arizona Faculty Small Grants, \$4,854, 2001.
- [2] Co-Principal Investigator (50% responsibility with S. Sen): “Modeling Network Design Problems,” Lockheed-Martin Corporation, \$9,500, 2001.
- [3] Principal Investigator (100% responsibility): “ITR/AP: Discrete Optimization Methods for Designing Survivable Networks,” Defense Advanced Research Projects Agency, \$301,184, 2001-2004.
- [4] Co-Principal Investigator (50% responsibility with S. Sen): “Equipment for Distributed and Parallel Computing,” State of Arizona Information Technology and Commerce Institute, \$80,000, 2002.
- [5] Principal Investigator (100% responsibility): “Optimization Methods for Routing Problems on Networks with Stochastic Failures,” Office of Naval Research (Young Investigator Program), \$300,000, 2003-2006.
- [6] Principal Investigator (20% responsibility, with R. Askin, T. Bahill, T. Connolly, J. Jin, A. Rapoport, S. Sen, Y. Son, F. Szidarovszky): “Predicting and Prescribing Human Decision Making Under Uncertain and Complex Scenarios,” Air Force Office of Scientific Research, \$3,987,238, 2003-2008.

PUBLICATIONS

Chapters in Scholarly Books

- [1] Contributor for *CRC Standard Mathematical Tables and Formulae* (Discrete Mathematics Chapter).

Papers Accepted or in Print

- [2] Sherali, H.D., Smith, J.C., and Adams, W.P., "Reduced First-Level Representations Via the Reformulation-Linearization Technique: Results, Counter-Examples, and Computations," *Discrete Applied Mathematics*, 101 (1), 247-267, 2000.
- [3] Sherali, H.D., Smith, J.C., and Lee, Y., "A Branch-and-Cut Algorithm for Solving an Intra-Ring Synchronous Optical Network Design Problem Allowing Demand Splitting," *INFORMS Journal on Computing*, 12 (4), 284-298, 2000.
- [4] Sherali, H.D., Smith, J.C., Trani, A.A., and Sale, S., "National Airspace Sector Occupancy and Conflict Analysis Models for Evaluating Scenarios Under the Free-Flight Paradigm," *Transportation Science*, 34, 321-336, 2000.
- [5] Sherali, H.D., Smith, J.C., and Selim, S.Z., "Convex Hull Representations of Models for Computing Collisions Between Multiple Bodies," *European Journal of Operational Research*, 135 (3), 514-526, 2001.
- [6] Sherali, H.D., Smith, J.C., "Improving Zero-One Model Representations Via Symmetry Considerations," *Management Science*, 47 (10), 1396-1407, 2001.
- [7] Sherali, H.D., Smith, J.C., and Trani, A.A., "An Airspace Planning Model for Selecting Flight-Plans Under Workload, Safety, and Equity Considerations," *Transportation Science*, 36 (4), 378-397, 2002.
- [8] Smith, J.C., "A Genetic Algorithm Approach to Solving a Multiple Inventory Loading Problem," *International Journal of Industrial Engineering* 10 (1), 7-16, 2003.
- [9] Baker, K. and Smith, J.C., "A Multiple-Criterion Model for Machine Scheduling," *Journal of Scheduling*, 6, 7-16, 2003.
- [10] Smith, J.C., "Algorithms for distributing telecommunication traffic on a multiple-ring SONET-based network," *European Journal of Operational Research*, 154 (3), 659-672, 2004.
- [11] Elshafei, M., Sherali, H.D., and Smith, J.C., "Radar pulse interleaving for multi-target tracking," *Naval Research Logistics*, 51 (1), 72-94, 2004.
- [12] Smith, J.C., Schaefer, A., and Yen, J., "A Stochastic Integer Programming Approach to Solving a Synchronous Optical Network Ring Design Problem," *Networks*, 44 (1), 12-26, 2004.
- [13] Smith, J.C. and Jacobson, S.J., "An Analysis of the Alias Method for Discrete Random-Variate Generation," to appear in *INFORMS Journal on Computing*.
- [14] Sherali, H.D. and Smith, J.C., "A Polyhedral Study of the Generalized Vertex Packing Problem," to appear in *Mathematical Programming, Series A*.
- [15] Lunday, B.J., Smith, J.C., and Goldberg, J.B., "Algorithms for Solving the Conditional Covering Problem on Paths," to appear in *Naval Research Logistics*.

- [16] Sherali, H.D. and Smith, J.C., “A Class of Web-Based Facets for the Generalized Vertex Packing Problem,” to appear in *Discrete Applied Mathematics*.

Papers Under Review

- [16] Armbruster, B., Smith, J.C., and Park, K., “The Optimization of Packet Filter Placements to Combat Distributed Denial of Service Attacks,” submitted to *European Journal of Operational Research*.
- [17] Horne, J.A. and Smith, J.C., “A Dynamic Programming Algorithm for the Conditional Covering Problem on Tree Graphs,” submitted to *Networks*.
- [18] Horne, J.A. and Smith, J.C., “Dynamic Programming Algorithms for the Conditional Covering Problem on Path and Extended Star Graphs,” submitted to *Networks*.
- [19] Sherali, H.D. and Smith, J.C., “Interleaving Two-Phased Jobs on a Single Machine with Application to Radar Pulse Interleaving,” submitted to *Discrete Optimization* (this is a new journal in the family of *Discrete Mathematics* and *Discrete Applied Mathematics*).

Refereed Conference Proceedings

- [21] Smith, J.C., Ortega, A., Gabel, C.M., Henderson, D., “Parameter Optimization for a Temperature Estimation Model,” International Electronic Packaging Technical Conference and Exhibition, 2003.
- [22] Mofya, E.C., Smith, J.C., “The Optimal Deployment of Filters to Limit Forged Address Attacks in Communication Networks,” 2nd Symposium on Intelligence and Security Informatics, 2004. Also, this is to appear in the *Lecture Notes on Computer Science* series.
- [23] Armbruster, B., Lachaine, M.E., Hamilton, R.J., Smith, J.C., “Mathematical Programming Formulations for Optimizing Radiation Treatment Strategies,” 2004 IERC Conference Proceedings.

Scholarly Presentations

Major Presentations

- [1] “Basics of System Optimization: When am I Ever Going to Use This?,” Three-hour seminar presented to SECME, Inc., July 2001.

- [2] “Contemporary Optimization Methods,” a 20-hour short course delivered at *Universidad Autonoma de Baja California*, Mexicali, Mexico, August 2002.

Other Presentations

- [3] “Models and Algorithms for a Synchronous Optical Network Design Problem,” INFORMS Fall Meeting, November 1999, Philadelphia, PA.
- [4] “Conflict Resolution Models for Airspace Management,” INFORMS Spring Meeting, May 2000, Salt Lake City, UT.
- [5] “Solution to a Synchronous Optical Network Design Problem,” Invited Lecture, Texas Tech University, May 2000, Lubbock, TX.
- [6] “Improving Zero-One Model Representations via Symmetry Considerations,” 17th International Symposium on Mathematical Programming, August 2000, Atlanta, GA.
- [7] “Radar Pulse Interleaving Algorithms for Multi-Target Tracking,” INFORMS Fall Meeting, November 2000, San Antonio, TX.
- [8] “Radar Pulse Interleaving Algorithms for Multi-Target Tracking,” Invited Seminar, Raytheon Lecture Series, January 2001, Tucson, AZ.
- [9] “Airspace Planning Models to Reduce Airspace Congestion,” Invited Lecture, Carnegie-Mellon University (Graduate School of Industrial Administration), February 2001, Pittsburgh, PA.
- [10] “The Optimal Design of a SONET Network with Uncertain Demands,” INFORMS International Conference, June 2001, Maui, HI.
- [11] “Fast Algorithms for Multi-Target Tracking,” INFORMS International Conference, June 2001, Maui, HI.
- [12] “The Design of Modern Survivable Networks,” Fault Tolerant Network Principal Investigator Meeting, August 2001, Colorado Springs, CO.
- [13] “Advanced Optical Network Design Methodology,” Invited Lecture (Mathematics), Clemson University, September 2001, Clemson, SC.
- [14] “Operations Research: Applications, Innovations, and Challenges,” First Symposium on Industrial Engineering, October 2001, Baja California, MX.
- [15] “Topics in Optical Network Design,” Invited Lecture, North Carolina State University (Computer Science), October 2001, Raleigh, NC.
- [16] “Convex Hull Representations of Models for Computing Collisions Between Multiple Bodies,” INFORMS Fall Meeting, November 2001, Miami, FL.
- [17] “Design of a Stochastic Synchronous Optical Network,” INFORMS Fall Meeting, November 2001, Miami, FL.
- [18] “Topics in Optical Network Design,” Invited Lecture, George Washington University (Computer Science), November 2001, Washington, DC.

- [19] “The Design of Modern Survivable Networks,” Fault Tolerant Network Principal Investigator Meeting, January 2002, San Diego, CA.
- [20] “A Stochastic Intra-Ring SONET Design Problem,” Invited Lecture, Arizona State University, February 2002, Tempe, AZ.
- [21] “A Stochastic Intra-Ring SONET Design Problem,” Invited Lecture, University of Texas, April 2002, Austin, TX.
- [22] “Valid Facetial Inequalities for a Generalized Vertex Packing Problem,” Invited Lecture, IFORS 2002 Conference, July 2002, Edinburgh, UK.
- [23] “The Design of Modern Survivable Networks,” Summer 2002 Fault Tolerant Network Principal Investigator Meeting, July 2002, Newport, RI.
- [24] “A Mixed-Integer Programming Approach to Improving Network Security,” Invited Lecture, INFORMS 2002 Conference, November 2002, San Jose, CA.
- [25] “An Integer Programming Approach to Single Machine Scheduling with Multi-phase Jobs,” Invited Lecture, INFORMS 2002 Conference, November 2002, San Jose, CA.
- [26] “A Class of SONET Optimization Problems,” Invited Lecture, Iowa State University (Computer Science), March 2003, Ames, IA.
- [27] “The Role of Algorithmic Theory in Contemporary Optimization Problems,” Invited Lecture, University of California at Los Angeles (Computer Science), April 2003, Los Angeles, CA.
- [28] “The Use of Baseline Scenarios in Solving Stochastic and Robust Programming Problems,” Invited Lecture, Naval Postgraduate School, September 2003, Monterey, CA.
- [29] “Integer Programming Approaches to Designing Nonsimultaneous Multicommodity Flow Networks,” Invited Lecture, INFORMS 2003 Conference, October 2003, Atlanta, GA.
- [30] “A Stochastic Intra-Ring SONET Design Problem,” Invited Lecture, INFORMS 2003 Conference, October 2003, Atlanta, GA. This talk was given as a requirement of the JFIG award competition.
- [31] “A Class of SONET Optimization Problems,” Invited Lecture, Purdue University, November 2003, West Lafayette, IN.
- [32] “Operations Research Modeling and Algorithms for Airspace Planning Problems,” Invited Lecture, Clemson University, February 2004, Clemson, SC.
- [33] “A Stochastic Edge-Partition Problem with Application to the Design of Nonsplit SONET Ring Networks,” Invited Lecture, The 7th INFORMS Telecommunications Conference, March 2004, Boca Raton, FL.

GRADUATE RESEARCH SUPERVISION

Ph.D. Dissertations

- [1] Jennifer Horne, Models and Algorithms for A Facility Location Problem Involving Complex Coverage Requirements, May 2004.

Ph.D. Dissertations (in progress)

- [2] Dale Henderson, Polynomial Mathematical Programming Problems Applied to Heat Transfer Models (expected completion: May 2005).
- [3] E. Chisonge Mofya, Exact and Heuristic Algorithms for Deploying Packet Filters in Communication Networks (expected completion: May 2005).
- [4] Manish Garg, Branch-and-Price-and-Cut Algorithms for Survivable Logistics Network Design (expected completion: May 2006).
- [5] April Andreas, Models and Algorithms for the Design of Robust Structures (expected completion: May 2006).

M.S. Theses/Reports

- [1] Ashwin Naik, Thesis: Development of a Flexible Metaheuristic Library with Application to Survivable Network Design, August 2002.
- [2] Manish Garg, Thesis: Design of Survivable Multicommodity Flow Networks, August 2003.
- [3] Sonal Joshi, Thesis: Optimizing Bioassembly Tool Operations, December 2003.
- [4] Omrum Aki, Thesis: Stochastic Facility Location Problems for Disaster Relief, May 2004.
- [5] Travis J. Lindberg (co-advised with Terry Bahill), Thesis: A Corps (and Below) Engineer Planning Resource, May 2004.
- [6] Sandeep Sastry, Report: Integer and Dynamic Programming Models for Survivable Shortest Path Problems with Random Arc Failures, May 2004.
- [7] Hitesh Jain, Report: A Column Generation Algorithm for Nonsimultaneous Multicommodity Flow Problems, May 2004.

M.S. Theses/Reports (in progress)

- [8] Josephat Zimba, Report: The Effect of Symmetry in Neighborhood-Based Heuristics (expected completion: December 2004).
- [9] Chad Reynolds, Report: Algorithms for Predicting Human Decision-Making by a Weighted Attribute Model (expected completion: December 2004).
- [10] Srikanth Sista, Report: Advanced Solution Approaches for Survivable Shortest Path Problems with Random Arc Failures (expected completion: December 2004).
- [11] Tingting Cui, Thesis: Algorithms for Solving a Class of Nonconvex Stochastic Optimization Problems (expected completion: December 2004).

[12] Francisca Sudargho, Thesis: Optimal Network Design Algorithms Under Varying Enemy Attack Strategies (expected completion: May 2005).

COURSES TAUGHT

SIE 340: Deterministic Models in Operations Research
Fall 2004: current (45 students enrolled)

SIE 495S: Undergraduate Seminar
Fall 2002: 4.8 Instructor Rating (51 students enrolled)

SIE 440/540: Topics in Optimization
Spring 2002: 4.7 Instructor Rating (37 students enrolled)
Spring 2003: 4.7 Instructor Rating (22 students enrolled)
Spring 2004: 4.5 Instructor Rating (22 students enrolled)

SIE 544: Linear Programming
Fall 2000: 4.6 Instructor Rating (24 students enrolled)
Fall 2001: 4.7 Instructor Rating (38 students enrolled)
Fall 2002: 4.9 Instructor Rating (33 students enrolled)
Spring 2004: 4.8 Instructor Rating (22 students enrolled)

SIE 545: Fundamentals of Optimization
Fall 2003: 4.7 Instructor Rating (28 students enrolled)

SIE 547: Computational Methods in Optimization (**new offering**)
Spring 2002: 4.9 Instructor Rating (11 students enrolled)

SIE 646: Integer Programming
Spring 2001: 4.9 Instructor Rating* (8 students enrolled)
Spring 2003: 4.7 Instructor Rating (20 students enrolled)

*This class was actually listed as 645, though the topic regarded integer programming and represents the same course material as 646.