

# RAVINDRA K. AHUJA

## President & CEO, Innovative Scheduling, Inc.

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## Professor, Industrial & Systems Engineering

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Dr. Ahuja is a Professor in Industrial and Systems Engineering at the University of Florida, Gainesville, and also the founding President & CEO on Innovative Scheduling, Inc. He obtained his BS (1977) in Mechanical Engineering, MS (1979) and PhD (1982) in Industrial and Management Engineering from Indian Institute of Technology (IIT), Kanpur. After completing his Ph.D., he joined the faculty of IIT Kanpur. He visited Sloan School of Management, MIT from 1986 to 1988 to do research on developing faster algorithms for network flow problems. This collaboration produced the fastest available algorithms for most of the fundamental network flow problems and also stimulated the development of the book "*Network Flows: Theory, Algorithms and Applications*," which he coauthored with T.L. Magnanti (MIT) and J.B. Orlin (MIT). This book is now the leading text and reference book in the field of network optimization and also won the prestigious *Lanchester Prize* in 1993 given annually to the best publication in Operations Research. Dr. Ahuja has visited MIT numerous times, and taught at Rutgers University for one year. He has been on the faculty of the University of Florida since 1998.

Professor Ahuja has contributed significantly to the practice of Operations Research. He with his collaborators has developed innovative models and algorithms for radiation therapy treatment planning, air defense, airline scheduling, railroad scheduling, and logistics problems that were previously considered intractable. His applications-oriented research has also been recognized. One of his coauthored paper in this area, "*A Column Generation Approach to Radiation Therapy Treatment Planning using Aperture Modulation*," won the 2003 *Pierskalla Award* given by INFORMS to the best paper of Operations Research in Health Applications; his coauthored paper, "*Solving Real-Life Railroad Blocking Problems*," won the 2006 *Daniel H. Wagner Prize* given by INFORMS for Excellence in Operations Research Practice; and his coauthored paper, "*Exact and Heuristic Algorithms for the Weapon-Target Assignment Problem*," won 2007 *Koopman Prize* given by INFORMS for the outstanding contribution to Military Operations Research; and his coauthored paper, "The Locomotive Routing Problem," received the Honorable Mention in the Best Paper Competition from the Transportation and Logistics Section of INFORMS. Professor Ahuja became a *Fellow* of INFORMS in 2008.

Professor Ahuja founded the company, Innovative Scheduling, Inc., in 2000 to bring cutting-edge operations research and optimization techniques to the field of logistics, transportation and scheduling. This company is developing models for very large-scale decision problems in logistics and transportation and packaging them into interactive web-enabled decision support systems. The company also provides technology-enabled consulting services and uses its software products to provide answers to strategic and planning problems faced by companies.

Professor Ahuja publishes widely and is a coauthor of over 100 research papers and book chapters in industrial engineering, operations research and computer science, and four books. His research papers have appeared in *Operations Research*, *Management Science*, *Transportation Science*, *Mathematical Programming*, *Networks*, *Mathematics of Operations Research*, *Journal of ACM*, *SIAM Journal on Computing*, *SIAM Survey*, *INFORMS Journal on Computing*, and several other journals. He is also an Associate Editor of three prestigious journals: *Operations Research*, *Transportation Science*, and *Networks*.

Professor Ahuja also engages in consulting activities for clients to identify opportunities for improvement, identifying methodologies to improve performance, determining recommendations, and getting the recommendations implemented. He has performed consulting for several small to large corporations including CSX Transportation, BNSF Railway, Norfolk Southern, Union Pacific, Toyota Motors, Towne Air freight, and R+L Carriers.

## RAVINDRA K. AHUJA

### Education:

Ph.D. (July, 1982); M.S. (July, 1979)  
Dept. of Industrial and Management Engg.  
Indian Institute of Technology, Kanpur, INDIA

B.S. (May, 1977)  
Dept. of Mechanical Engg.  
Indian Institute of Technology, Kanpur, INDIA

### Citizenship:

Naturalized US Citizen

### Research Interests:

Network Flows, Combinatorial Optimization, and Heuristics;  
Supply-Chain Management;  
Modeling and Optimization of Large-Scale Logistics Problems;  
Railroad Scheduling; Truck Scheduling; Airline Scheduling;

### Associate Editorships:

*Networks* (1999-present)  
*Transportation Science* (1999-present)  
*Operations Research* (2003-2004; 2007-present)  
*Operations Research Letters* (1999-2003)

### Employment History:

8/1998 – Present: Professor (with tenure), Industrial & Systems Engineering, Univ. of Florida  
3/2000 – Present: President & CEO, Innovative Scheduling, Inc., Gainesville  
7/1997 – 8/1998: Visiting Professor, Sloan School of Management, MIT  
8/1996 – 6/1997: Visiting Professor, Faculty of Management, Rutgers University  
1989-1996 (Every summer): Visiting Professor, Sloan School of Management, MIT  
8/1986 – 12/1988: Visiting Assistant Professor, Sloan School of Management, MIT  
8/1982 – 5/1996: Faculty Member, Industrial and Management Engineering, IIT Kanpur

### Recent Synergistic Activities:

2011: Guest Co-Editor of the Focus Issue of the journal *Networks* on Optimization in Scheduled Transportation Network  
2008: Guest Co-Editor of the Focus Issue of the journal *Transportation Science* on Railroad Applications  
2006 – 2010: External Advisory Board Member of ARRIVAL Consortium (<http://arrival.cti.gr>)  
2006 – Present: Editorial Advisory Board Member of journal *Algorithmic Operations Research*  
2004 – Present: Co-Editor of the RAS Newsletter

## Sponsored Projects:

Worked on a variety of projects funded by the following corporations:

- ▶ Air Force Office of Scientific Research
- ▶ Office of Naval Research
- ▶ National Science Foundation
- ▶ Department of Transportation
- ▶ UPS Foundation
- ▶ United Airlines
- ▶ Toyota Motors
- ▶ CSX Transportation
- ▶ Pacer Stacktrain
- ▶ Burlington Northern Santa Fe Railway
- ▶ Norfolk Southern Corporation
- ▶ Union Pacific Railroads
- ▶ Swisslog Logistics
- ▶ R+L Carriers

## Recently Funded Research Projects:

1. "A Prototype Radiation Therapy Treatment Planning," funded by Georgia-Tech., Atlanta, GA.
2. "Innovations in Teaching Decision Support Systems," funded by National Science Foundation.
3. "Integrating Information Technology in the Industrial Engineering Curriculum," funded by National Science Foundation.
4. "Cyclic-Exchange Neighborhood Search and Other Very Large Scale Neighborhood Search Techniques," funded by National Science Foundation.
5. "Very Large Scale Neighborhood Search for Combinatorial Optimization Problems," funded by National Science Foundation.
6. "Solving Large-Scale Logistics Problems in Real Time – Models, Algorithms, and Information Systems," funded by National Science Foundation.
7. "The Combined Fleet-Through Assignment Model," funded by United Airlines, Chicago.
8. "Improved Locomotive Scheduling Models and Algorithms," funded by CSX Transportation, Jacksonville.
9. "Solving Real-Life Railroad Blocking Problems," funded by CSX Transportation, BNSF Railway, Norfolk Southern Corporation, and National Science Foundation (SBIR Program).
10. "A Decision Support System for the Train Schedule Design Problem," funded by National Science Foundation (SBIR Program) and BNSF Railway.
11. "Dynamic Locomotive Assignment: Algorithms for Real-Time Decision Support," funded by National Science Foundation (SBIR Program).

12. “Developing a Network Planning Model,” funded by Pacer Stacktrain.

## Books:

### **Network Flows: Theory, Algorithms and Applications,**

R. K. Ahuja, T. L. Magnanti (MIT), and J. B. Orlin (MIT), published by Prentice Hall, NJ, USA, 1993, 846 pages. This book provides an integrative view of the theory, algorithms and applications of network flow problems. It combines classical results with the state-of-art developments and is suited as a text book as well as a reference book in network optimization. This book has become a standard reference book in its area and is used world-wide. It has been (and is being) used as a textbook in numerous universities including MIT, Berkeley, Urbana-Champaign, Stanford, Harvard, Cornell, Purdue, Carnegie-Mellon, and Georgia-Tech. This book also won *Lanchester Prize* for the year 1993 given to the best English language publication of the year in the field of Operations Research and Management Science.

### **Developing Spreadsheet-Based Decision Support Systems**

M.M.H. Seref (UF), R.K. Ahuja, and W.L. Winston (Indiana Univ.), Dynamic Ideas, 2007 (900 pages). This book describes how to develop decision support systems using Excel and VBA for Excel, and illustrates this development process through numerous case studies. The book contains three parts: (i) Excel Basics; (ii) VBA for Excel; and (iii) Case Studies. We also describe the development of spreadsheet-based case studies involving Access databases. The book contains an extensive set of review and hands-on exercises, and provides a set of team projects that students can do to master the material learnt.

### **Developing Web-Enabled Decision Support Systems**

A.A. Pol and R.K. Ahuja, Dynamic Ideas, 2007 (700 pages). This book describes how to develop decision support systems involving databases, implement databases using Microsoft Access database management system, and add additional functionalities using Visual Basic (VB) .NET programming language. We also show how to make these decision support systems web-enabled using Active Server Pages (ASP) .NET programming language. We illustrate this development process through several case studies arising in science, engineering, and management application domains. The book contains five parts: (i) Database Design Principles; (ii) Microsoft Access; (iii) VB .NET; (iv) ASP .NET; and (v) Case Studies.

### **Robust and Online Large-Scale Optimization**

Edited by: R.K. Ahuja, R. Möhring, and C. Zaroliagis, Springer, 2009 (446 pages). Scheduled transportation networks give rise to very complex and large-scale network optimization problems requiring innovative solution techniques and ideas from mathematical optimization and theoretical computer science. Examples of scheduled transportation include airline, trucking, railroads, and shipping lines. In this book, we focus on two important facets of scheduled transportation planning: robust planning and online (real-time) planning. The book comprises of research papers by leading academicians and researchers and contains state-of-the-art surveys and original research contributions. It is addressed to meet the needs of students, researchers, and practitioners who are interested in robust and online optimization of large-scale systems.

## Awards:

- ▶ The book "**Network Flows: Theory, Algorithms and Applications**" won the Lanchester Prize for 1993, which is one of the most prestigious international awards in Operations Research and Management Science and is given annually by INFORMS to the best publication of the year. The prize citation included - "In the last ten years, there has been an explosion of activity in which most of the fundamental algorithms for minimum cost network flows and related problems have been reworked and improved ..... . The authors have been among the leaders in this work. Now they have refined and integrated the most interesting and useful of the new results into a textbook that is admirable for its clear and elegant exposition, its completeness, its wealth of examples, and its extensive collection of suggested applications. This book is a well to which both students and researchers will return for instruction and inspiration. ...."
- ▶ The paper, "**A Column Generation Approach to Radiation Therapy Treatment Planning using Aperture Modulation**," coauthored with H.E. Romeijn, J.F. Dempsey, and A. Kumar, won the 2003 *Pierskalla Award* given by INFORMS to the best paper in Health Applications presented at the INFORMS National Meeting.
- ▶ The paper, "**Solving Real-Life Railroad Blocking Problems**," coauthored with K.C. Jha, and J. Liu won the 2006 *Daniel H. Wagner Award* given by INFORMS for Excellence in Operations Research Practice. This highly competitive prize emphasizes the quality and coherence of the analysis used in practice and the winning paper must emphasize good writing, strong analytical content, and verifiable practice successes.
- ▶ The paper, "**Exact and Heuristic Algorithms for the Weapon-Target Assignment Problem**," coauthored with K.C. Jha, A. Kumar, and J.B. Orlin won the 2007 *Koopman Prize* given by INFORMS for outstanding contribution to the Military Operations Research.
- ▶ Dr. Ahuja received the *INFORMS Fellow* award in 2008. The award was given for his contributions: "*for algorithmic research in network optimization, for the development of innovative methods in transportation scheduling, and for his contributions to practice in the railroad industry.*"
- ▶ The paper, "**The Locomotive Routing Problem**," coauthored with B. Vaidyanathan, and J.B. Orlin received the Honorable Mention in the 2010 Best Paper Competition organized by the Transportation and Logistics Society of INFORMS.
- ▶ The efforts by Dr. Ahuja on integrating information technology tools with the Industrial Engineering and Operations Research curriculum was selected as a Finalist (among two others) for the "Innovations in Curriculum Award" given by the Institute of Industrial Engineers (IIE) in 2007. This award was established for the first time in 2007.

## Workshops Organized:

- ▶ "*Solving Complex Scheduling Problems through Decomposition and Network Optimization*," INFORMS Practice Meeting, Washington, DC; April, 2008.
- ▶ "*Developing Web-Enabled Decision Support Systems*," INFORMS National Meeting, San Francisco, CA; November 12, 2005.
- ▶ "*Operations Research in Railroads: Opportunities and Challenges*," Fort Worth, Dallas, TX, December 5-7, 2004.

- ▶ “*Developing Spreadsheet-Based Decision Support Systems*,” INFORMS Denver 2004, Denver, CO; October 23, 2004.
- ▶ “*Developing Web-Enabled Decision Support Systems*,” Amelia Island Plantation, Jacksonville, FL; August 1-4, 2004.
- ▶ “*Developing Spreadsheet-Based Decision Support Systems*,” Amelia Island Plantation, Jacksonville, FL; August 1-4, 2004.
- ▶ “*The First International Workshop on Optimization in Radiation Therapy*,” Fort Lauderdale, FL; January 11-18, 2003.

### Invited Tutorials and Workshop Talks:

- ▶ INFORMS Practice Conference, Chicago; April 2011 (Tutorial and Technology Workshop)
- ▶ INFORMS Practice Conference, Orlando; April 2010 (Tutorial and Technology Workshop)
- ▶ MOPTA Symposium, Bethlehem; August 2009 (Plenary Talk)
- ▶ INFORMS Practice Conference, Phoenix; April 2008 (Tutorial and Technology Workshop)
- ▶ INFORMS Practice Conference, Baltimore; April 2008 (Tutorial and Technology Workshop)
- ▶ ATMOS Workshop, Seville, Spain; November 2007 (Plenary Talk)
- ▶ ARRIVAL Workshop, Seville, Spain; November 2007
- ▶ INFORMS International Meeting, Puerto Rico; July 2007
- ▶ INFORMS Practice Meeting, Vancouver; April 2007
- ▶ ARRIVAL Workshop, Utrecht, Amsterdam; April 2007 (Plenary Talk)
- ▶ AlgOR 2007, Vancouver; January 2007 (Plenary Talk)
- ▶ ATMOS Workshop, Zurich, Switzerland; September 2006 (Tutorial)
- ▶ Combinatorial Optimization, Clemson, SC; October 2005 (Tutorial)
- ▶ INFORMS Practice Meeting, Palm Springs, CA; April 2005
- ▶ INFORMS International Meeting, Banff, Canada; May 2004 (Tutorial)
- ▶ INFORMS Practice Meeting, Cambridge; April 2004 (Tutorial)
- ▶ INFORMS National Meeting, Atlanta, GA; October 2003 (Tutorial)
- ▶ International Workshop on Optimization in Radiation Therapy, Fort Lauderdale, FL; January 2003 (Tutorial)
- ▶ INFORMS, San Jose, CA; November 2002 (Tutorial)
- ▶ NSF Workshop on Real-Time Transportation Logistics, Long Beach, CA; April 2002
- ▶ Annual Italian Oper. Res. Soc, Conf., Italy; September 2001 (Keynote Address)
- ▶ Optimization 2001, Aveiro, Portugal; July 2001 (Keynote Address)

### University and Industry Talks:

- ▶ University of Toronto, Toronto, Canada, March 2011

- ▶ BNSF Railway, Fort Worth, TX, April 2011
- ▶ Pacer International, Dublin, OH, March 2011
- ▶ Walmart, Opelika, AL, January 2011
- ▶ Pitt Ohio, Pittsburgh, PA, December 2010
- ▶ Con-Way Freight, Ann Arbor, MI, December 2010
- ▶ Town Air Freight, South Bend, IN, November 2010
- ▶ Waste Management, Houston, TX, October 2010
- ▶ Swisslog Logistics, , Newport News, August 2010
- ▶ R+L Carriers, Wilmington, OH, July 2010
- ▶ New England Motor Freight, Newark, NJ, June 2010
- ▶ Belt Railway of Chicago, Chicago, IL, May 2010
- ▶ Canadian Pacific Railroad, Canada; July 2009
- ▶ Disney World, Orlando, Florida; June 2009
- ▶ University of Auckland, New Zealand; May 2009
- ▶ MIT, Cambridge; September 2008
- ▶ Air Force Institute of Technology, Dayton; May 2008
- ▶ SNCF (French Railroad), Paris; March 2008
- ▶ University of Illinois, Urbana-Champaign; February 2008
- ▶ American Airlines, Dallas; November 2007
- ▶ University of Texas, Dallas; November 2007
- ▶ Indian Railways, New Delhi; October 2007
- ▶ University of Washington, Seattle; January 2007
- ▶ Volpe, Department of Transportation, Cambridge; November 2006
- ▶ Deutsche Bahn, Frankfurt, Germany; September 2006
- ▶ Mississippi State University, Starkville, MS; October 2005
- ▶ Dell, Austin, TX; April 2005
- ▶ GE, Melbourne, FL; March 2005
- ▶ IBM, Yorktown Heights, NY; February 2005
- ▶ UPS, Louisville, KY; October 2004
- ▶ University of Oklahoma, Norman; October 2003
- ▶ Norfolk Southern Corporation, Atlanta, GA; December 2002
- ▶ Syncata Corporation, Los Angeles, November 2002
- ▶ Burlington Northern Santa Fe Railway; October 2002
- ▶ CSX Transportation, August, 2002
- ▶ Air Force Office of Scientific Research (AFOSR), Washington, DC; June 2002
- ▶ Lehigh University, Bethlehem, PA; April 2002
- ▶ Los Alamos National Lab, Los Alamos, NM; April 2002
- ▶ Princeton University, Princeton, NJ; February 2002
- ▶ Eglin Air Force Base, Eglin, FL; December 2001

## Doctoral Students:

- ▶ Jian Liu, Dissertation Title: "*Solving Real-Life Transportation Scheduling Problems*," August 2002. First Prize Winner of the INFORMS 2002 Student Paper Competition for best application of Management Science in railroads. Also received Honorable Mention in 2003.
- ▶ Krishna C. Jha, Dissertation Title: "*Very Large-Scale Neighborhood Search Algorithms for Combinatorial Optimization Problems*," April 2004. First Prize Winner of the INFORMS 2003 Student Paper Competition for best application of Management Science in railroads.
- ▶ Arvind Kumar, Dissertation Title: "*Linear Programming Approaches for Radiation Therapy Treatment Planning Problems*," July 2005. Co-winner of the 2003 Pierkella Award.
- ▶ Guvenc Sahin, Dissertation Title: "*Combinatorial Problems in Railroad Planning*", August 2006. Second Prize Winner of the INFORMS 2004 Student Paper Competition for best application of Management Science in railroads.
- ▶ Balachandran Vaidyanathan, Dissertation Title: "*Next Generation Locomotive Planning and Crew Scheduling Algorithms*". Received Honorable Mention in the INFORMS 2004 and 2006 Student Paper Competition for best application of Management Science in railroads. Winner of the best student paper award by Transportation Research Board for 2007.
- ▶ Ashish Nemani, Dissertation Title: "*Combinatorial Approaches for Solving Scheduling Problems*."
- ▶ Suat Bog, Dissertation Title: "*Algorithms for Solving Large-Scale Routing and Scheduling Problems*."
- ▶ Jose Walteros, Tentative Dissertation Title: "*Algorithms for Less-Than-Truckload Planning and Scheduling*."

## Academic Responsibilities:

- ▶ Department Representative for the College of Engineering Tenure & Promotion Committee; 2005-2011
- ▶ Chairman of the Faculty Recruitment Committee; 2000-2004.
- ▶ Member of the Department Graduate Committee; 1998-2005.
- ▶ Panel member for new engineering faculty orientation on "Managing Research"; 2001-2004.
- ▶ Chairman of the Computer Courses Curriculum Revision Subcommittee; 2002-2003.
- ▶ Chairman of the UG Curriculum Revision Committee for Design Courses; 2003.

## Recent Academic and Professional Service:

- ▶ Guest Co-Editor of the Special Issue of *Networks* on Scheduled Transportation Networks (January 2011)
- ▶ Guest Co-Editor of the Focus Issue of *Transportation Science* of Railroad Applications (October, 2008)
- ▶ Co-Chair of the Program Committee of the *ATMOS 2007 Workshop* in Seville, Spain
- ▶ Member of the Program Committee of the *ATMOS 2006 Workshop* in Zurich, Switzerland
- ▶ Panel member of the NSF Panel to review SBIR Phase II Technical Merit proposals the Division of Manufacturing and Industrial Innovations (April, 2004).
- ▶ Panel member of the NSF Panel to review SBIR Phase II Commercialization proposals the Division of Manufacturing and Industrial Innovations (May, 2004).
- ▶ Panel member of NSF Panel to review solicited proposals in the Division of Manufacturing and Industrial Innovations (December 2000, 2001, and 2003).

- ▶ Member of the International Program Committee of *International Network Optimization Conference*, Paris, France; October 2003
- ▶ Member of the International Program Committee of the *Asia-Pacific Conference on Operations Research*, New Delhi, India; December 2003
- ▶ Member of in the Collaborative Working Group (CWG) in radiation therapy sponsored by the National Cancer Institute (NCI) and the National Science Foundation (NSF); 2002-2003

## Reviewer of Journals:

*Operations Research, Mathematical Programming, Transportation Science, Mathematics of Operations Research, SIAM Journal of Computing, European Journal of Operational Research, Naval Research Logistics, Operations Research Letters, Information Processing Letters, Networks, Discrete Mathematics, Discrete Applied Mathematics, INFOR, Journal of Global Optimization, International Transactions in Operations Research, Annals of Operations Research, Interfaces, and Opsearch.*

## Refereed Journal Papers and Book Chapters:

S. Bog, A.K. Nemani, R.K. Ahuja. 2011. Iterative algorithms for the curfew planning problem. *Journal of the Operational Research Society* 62, 593-607.

A.K. Nemani, S. Bog, R.K. Ahuja. 2010. Solving the curfew planning problem. *Transportation Science* 44, 506-523.

B. Vaidyanathan, and R.K. Ahuja. 2010. Fast algorithms for specially structured minimum cost flow problems with applications. *Operations Research* 58, 1681-1696.

A.K. Nemani, K.C. Jha, and R.K. Ahuja. 2010. The load planning problem at an intermodal railway terminal. Submitted to *Transportation Research B*.

D.S Altner, R.K. Ahuja, O. Ergun, and J.B. Orlin. 2010. Very large-scale neighborhood search. *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, Wiley.

A.K. Nemani, and R.K. Ahuja. 2010. OR models in freight railroad industry. *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, wiley.

A.K. Nemani, and R.K. Ahuja. 2010. Minimum spanning trees. *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, Wiley.

A.K. Nemani, and R.K. Ahuja. 2010. Shortest path problems. *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, Wiley.

B. Vaidyanathan, and R.K. Ahuja. 2010. Minimum cost flow problem. *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, Wiley.

B. Vaidyanathan, and R.K. Ahuja. 2010. Multicommodity flow problem. *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, Wiley.

F.Z. Sargut, and R.K. Ahuja. 2010. Maximum flow problem. *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, Wiley.

R.K. Ahuja, A. Kumar, and K.C. Jha. 2009. New advances in solving the weapon–target assignment problem. *Handbook of Military Industrial Engineering*, edited by Adedeji B. Badiru, Marlin U. Thomas, CRC Press.

- D.S. Altner, R.K. Ahuja, O. Ergun, and J.B. Orlin. 2009. Very large-scale neighborhood search. To appear in *Search Methodologies: Introductory Tutorials in Optimization and Decision Support Techniques*, edited by E. Burke and G. Kendall, Springer.
- O. Şeref, R.K. Ahuja, and J.B. Orlin. 2009. Incremental network optimization: Theory and algorithms. *Operations Research* 57, 586-594.
- G. Sahin, and R.K. Ahuja. 2009. Lower bounding techniques for the degree-constrained network design problem. To appear in *Networks*.
- A. Kumar, B. Vaidyanathan, K.C. Jha, and R.K. Ahuja. 2009. Railroad crew scheduling. *Encyclopedia of Optimization*, Second Edition, edited by C. A. Floudas and P. Pardalos, Kluwer Academic Publishers, pp. 3227-3236.
- A. Kumar, B. Vaidyanathan, and R.K. Ahuja. 2009. Railroad locomotive scheduling. *Encyclopedia of Optimization*, Second Edition, edited by C. A. Floudas and P. Pardalos, Kluwer Academic Publishers, pp. 3236-3245.
- R.K. Ahuja, T.L. Magnanti, and J.B. Orlin. 2009. The maximum flow problem. *Encyclopedia of Optimization*, Second Edition, edited by C. A. Floudas and P. Pardalos, Kluwer Academic Publishers, pp. 2009-2020.
- R.K. Ahuja, T.L. Magnanti, and J.B. Orlin. 2009. The minimum cost flow problem. *Encyclopedia of Optimization*, Second Edition, edited by C. A. Floudas and P. Pardalos, Kluwer Academic Publishers, pp. 2095-2108.
- F.Z. Sargut, R.K. Ahuja, T.L. Magnanti, and J.B. Orlin. 2009. Maximum flows. A book chapter to appear in *The Handbook of Graph Algorithms and Applications*, Volume I, edited by K. Thulasiraman, T. Nishizeki and G. Xue, CRC Press.
- B. Vaidyanathan, R.K. Ahuja, T.L. Magnanti, and J.B. Orlin. 2009. Minimum cost flows. A book chapter to appear in *The Handbook of Graph Algorithms and Applications*, Volume I, edited by K. Thulasiraman, T. Nishizeki and G. Xue, CRC Press.
- B. Vaidyanathan, R.K. Ahuja, T.L. Magnanti, and J.B. Orlin. 2009. Multi-commodity flows. A book chapter to appear in *The Handbook of Graph Algorithms and Applications*, Volume I, edited by K. Thulasiraman, T. Nishizeki and G. Xue, CRC Press.
- D. Altner, R.K. Ahuja, O. Ergun, and J.B. Orlin. 2009. Very large-scale neighborhood search. A book chapter to appear in *CRC Handbook of Discrete and Combinatorial Mathematics*, Second Edition, K.H. Rosen (Editor-in-chief), CRC Press, New York.
- B. Vaidyanathan, R.K. Ahuja, and J.B. Orlin. 2008. The locomotive routing problem. *Transportation Science* 42, 492-507.
- K.C. Jha, R.K. Ahuja, and G. Sahin. 2008. New approaches for solving the block-to-train assignment problem. *Networks* 51, 48-62.
- R.K. Ahuja and D.S. Hochbaum. 2008. Solving linear cost dynamic lot sizing problems in  $O(n \log n)$  time. *Operations Research* 56, 2008, 255-261.
- D. Aleman, A. Kumar, R.K. Ahuja, H.E. Romeijn, and J.F. Dempsey. 2008. Neighborhood search approaches to beam orientation optimization in intensity modulated radiation therapy treatment planning. *Journal of Global Optimization* 42, 769-784.
- B. Vaidyanathan, R.K. Ahuja, J. Liu, and L.A. Shughart. 2008. Real-life locomotive planning: New formulations and computational results. *Transportation Research B* 42, 147-168.
- R.K. Ahuja, W. Huang, H.E. Romeijn, and D. Romero Morales. 2007. A heuristic approach to the multi-period single-sourcing problem with production and inventory capacities and perishability constraints. *INFORMS Journal on Computing* 19, 14-26.

- R.K. Ahuja, K.C. Jha, and J. Liu. 2007. Solving real-life railroad blocking problems. *Interfaces* 37, 404-419.
- R.K. Ahuja, A. Kumar, and K.C. Jha. 2007. Exact and heuristic algorithms for the weapon-target assignment problem. *Operations Research* 55, 1136-1146.
- R.K. Ahuja, J. Goodstein, A. Mukherjee, J.B. Orlin, and D. Sharma. 2007. A very large-scale neighborhood search algorithm for the airline combined through-fleet assignment problem. *INFORMS Journal on Computing* 19, 646-657.
- B. Vaidyanathan, K.C. Jha, and R.K. Ahuja. 2007. Network flow-based approaches for the railroad crew scheduling problem. *IBM Journal of Research & Development* 51, 325-344.
- M.M.H. Seref and R.K. Ahuja. 2007. Spreadsheet-based decision support systems. Chapter 14 in the book *Handbook on Decision Support Systems*, edited by F. Burstein and C.W. Holsapple, Springer Verlag, pp. 277-298.
- J. Liu, R.K. Ahuja, and G. Sahin. 2007. Optimal network configuration and capacity expansion of railroads. *Journal of the Operational Research Society*, 1-10.
- R.K. Ahuja, K.C. Jha, J.B. Orlin, and D. Sharma. 2007. A very large-scale neighborhood search algorithm for the quadratic assignment problem. *INFORMS Journal on Computing* 19, 646-657.
- R.K. Ahuja, O. Ergun, J.B. Orlin, and A.P. Punnen. 2007. Very large-scale neighborhood search: Theory, Algorithms, and Applications. A chapter in the book "*Approximation Algorithms and Metaheuristics*," edited by T.F. Gonzalez, Chapman & Hall, pp. 20-1 to 20-12.
- H.E. Romeijn, R.K. Ahuja, J.F. Dempsey, and A. Kumar. 2006. A new linear programming approach to radiation therapy treatment planning problems. *Operations Research* 54, 201-216.
- R.K. Ahuja, C.B. Cunha, and G. Sahin. 2005. Networks models in railroad planning and scheduling. A chapter in the book entitled "*Tutorials in Operations Research*", Vol. 1, pp. 54-101, 2005.
- R.K. Ahuja and H. Hamacher. 2005. A network flow algorithm to minimize beam-on time for unconstrained multileaf collimator problems in cancer radiation therapy. *Networks* 45, 36-41.
- R.K. Ahuja, J. Liu, J.B. Orlin, D. Sharma, and L.A. Shughart. 2005. Solving real-life locomotive scheduling problems. *Transportation Science* 39, 503-517.
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