

RAVINDRA K. AHUJA

Professor, Industrial and Systems Engineering

Co-Director, Supply-Chain and Logistics Engineering Center (SCALE)

University of Florida, Gainesville, FL 32611

URL: www.ise.ufl.edu/ahuja

Email: ahuja@ufl.edu

President & CEO, Innovative Scheduling, Inc.

GTEC, 2153 Hawthorne Road, Suite 128, Gainesville, FL 32641

URL: www.InnovativeScheduling.com

Email: ravi@InnovativeScheduling.com

Dr. Ahuja is a Professor in Industrial and Systems Engineering at the University of Florida, Gainesville. 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 papers 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. Professor Ahuja is also a *Fellow* of INFORMS.

Professor Ahuja founded the company, Innovative Scheduling, Inc., in 2000 to bring cutting-edge operations research and optimization techniques to the field of transportation and scheduling. This company is now developing network models for very large-scale decision problems in transportation and packaging them into interactive web-enabled decision support systems. The company, which now has over 20 employees, aspires to build decision support systems for complex planning and scheduling problems arising in all modes of transportation including railroads, airlines, trucking, and shipping.

Professor Ahuja publishes widely and is a coauthor of over 90 research papers and book chapters in industrial engineering, operations research and computer science. 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 has also taken a lead role in developing course curriculum that will integrate information technology skills within the Industrial Engineering and Operations Research curriculum. He is a coauthor of two books designed to accomplish this objective: (i) "*Developing Spreadsheet-Based Decision Support Systems*," M.M.H. Seref, R.K. Ahuja, and W.L. Winston, Dynamic ideas, 2007; and (ii) "*Developing Web-Enabled Decision Support Systems*," A.A. Pol and R.K. Ahuja, Dynamic ideas, 2007. His work on curriculum development in Industrial Engineering was selected as a Finalist for the "*Innovations in Curriculum Award*" given by the Institute of Industrial Engineers (IIE) in 2007.

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;
Airline Scheduling;
Railroad Scheduling;

Associate Editorships:

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

Employment History:

8/98 – Present: Professor (with tenure), Industrial & Systems Engineering, Univ. of Florida
1/04 – Present: President & CEO, Innovative Scheduling, Inc., Gainesville
7/97 – 8/98: Visiting Professor, Sloan School of Management, MIT
8/96 – 6/97: Visiting Professor, Faculty of Management, Rutgers University
1989-1996 (Every summer): Visiting Professor, Sloan School of Management, MIT
8/86 – 12/88: Visiting Assistant Professor, Sloan School of Management, MIT
8/82 – 5/96: Faculty Member, Industrial and Management Engineering, IIT Kanpur

Recent Synergistic Activities:

2007-Present: Guest Co-Editor of the Focus Issue of the journal *Transportation Science* on Railroad Applications
2008-Present: Guest Co-Editor of the Focus Issue of the journal *Networks* on Optimization in Scheduled Transportation Network
2006 – Present: 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 Research Projects:

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

- ▶ 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

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.

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 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:

- ▶ MOPTA Symposium, Bethlehem; August 2009.
- ▶ 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:

- ▶ 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.*”
- ▶ Mohammad Jaradat, Dissertation Title: “*Algorithms for Airline and Truck Scheduling Problems.*”

Academic Responsibilities:

- ▶ Department Representative for the College of Engineering Tenure & Promotion Committee; 2005-2009
- ▶ 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 (Forthcoming in 2009)
- ▶ 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:

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 *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, Wiley.

A.K. Nemani, and R.K. Ahuja. 2009. OR models in freight railroad industry. To appear in *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, wiley.

A.K. Nemani, and R.K. Ahuja. 2009. Minimum spanning trees. To appear in *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, Wiley.

A.K. Nemani, and R.K. Ahuja. 2009. Shortest path problems. To appear in *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, Wiley.

B. Vaidyanathan, and R.K. Ahuja. 2009. Minimum cost flow problem. To appear in *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, Wiley.

B. Vaidyanathan, and R.K. Ahuja. 2009. Multicommodity flow problem. To appear in *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, Wiley.

F.Z. Sargut, and R.K. Ahuja. 2009. Maximum flow problem. To appear in *Wiley Encyclopedia of Operations Research and Management Science*, edited by James J. Cochran, Wiley.

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. To appear in *Operations Research*.

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.
- H.E. Romeijn, R.K. Ahuja, J.F. Dempsey, and A. Kumar. 2005. A column generation approach to radiation therapy treatment planning using aperture modulation. *SIAM Journal on Optimization* 15, 838-862.
- C.B. Cunha and R.K. Ahuja. 2005. Very large scale neighborhood search for the K-constrained multiple knapsack problem. *Journal of Heuristics* 11, 465-481.
- R.K. Ahuja, J.B. Orlin, S. Pallottino, M.P. Scaparra, and M.G. Scutella. 2004. A multi-exchange heuristic for the single source capacitated facility location. *Management Science* 50, 749-760.
- R.K. Ahuja and M.M. Hanna. 2004. Decision support systems development: An essential part of OR education. *Operations Research Letters* 31, April Issue, 12-13.
- R.K. Ahuja, J. Goodstein, J. Liu, A. Mukherjee, and J.B. Orlin. 2004. Solving the combined through-fleet assignment model with time windows using neighborhood search. *Networks* 44, 160-171.
- R.K. Ahuja, D. Hochbaum, and J.B. Orlin. 2004. A cut based algorithm for the convex dual of the minimum cost network flow problem. *Algorithmica* 39, 189-208.
- R.K. Ahuja, J.B. Orlin, S. Pallottino, and M.G. Scutellà. 2003. Dynamic shortest paths minimizing travel times and costs. *Networks* 41, 197-205.
- R.K. Ahuja and J.B. Orlin. 2003. Graph and network optimization. *Encyclopedia of Life Support Systems*, edited by U. Derigs.
- R. Agarwal, R.K. Ahuja, G. Laporte, and Z.J. Shen. 2003. A composite very large-scale neighborhood search algorithm for the vehicle routing problem. *Handbook of Scheduling: Algorithms, Models and Performance Analysis*. Edited by J. Y-T. Leung, Chapman & Hall/CRC, pp. 49-01 to 49-23.
- R.K. Ahuja, D. Hochbaum, and J.B. Orlin. 2003. Solving the convex cost integer dual network flow problem. *Management Science* 49, 950-964.
- R.K. Ahuja, J.B. Orlin, and D. Sharma. 2003. A composite very large-scale neighborhood structure for the capacitated minimum spanning tree problem. *Operations Research Letters* 31, 185-194.
- H.E. Romeijn, R.K. Ahuja, J.F. Dempsey, A. Kumar, and J. Li. 2003. A novel linear programming approach to fluence map optimization for intensity modulated radiation therapy treatment planning. *Physics in Medicine and Biology* 48, 3521-3542.

- R.K. Ahuja, J. Liu, J. Goodstein, A. Mukherjee, J.B. Orlin, and D. Sharma. 2003. Solving multi-criteria combined through-fleet assignment models. Chapter 13 in the book *Operations Research in Space and Air*, Edited by Tito A. Ciriani, Giorgio Fasano, Stefano Gliozzi, and Roberto Tadei, Kluwer Academic Publishers, pp. 233-256.
- R.K. Ahuja and J.B. Orlin. 2002. Combinatorial algorithms for inverse network flow problems. *Networks* 40, 181-187.
- R.K. Ahuja, O. Ergun, J.B. Orlin, and A.P. Punnen. 2002. A survey of very large scale neighborhood search techniques. *Discrete Applied Mathematics* 123, 75-102.
- R.K. Ahuja, J.B. Orlin, S. Pallottino, and M. Scutella. 2002. Minimum time and minimum cost path problems in street networks with traffic lights. *Transportation Science* 36, 326-336.
- R.K. Ahuja and J.B. Orlin. 2002. Very large-scale neighborhood search for airline fleet scheduling. *SIAM News*, Volume 35, Number 9, November Issue.
- R.K. Ahuja, J.B. Orlin, P. Sharma, and P.T. Soddalingam. 2002. A network simplex algorithm with $O(n)$ consecutive degenerate pivots. *Operations Research Letters* 30, 141-148.
- R.K. Ahuja, T.L. Magnanti, and J.B. Orlin. 2002. Introduction to network optimization. *Handbook of Applied Optimization*, edited by M. Resende and P. Pardalos, Oxford University Press, pp. 352-362.
- R.K. Ahuja, T.L. Magnanti, and J.B. Orlin. 2002. Maximum flow problem. *Handbook of Applied Optimization*, edited by M. Resende and P. Pardalos, Oxford University Press, pp. 363-374.
- R.K. Ahuja, T.L. Magnanti, and J.B. Orlin. 2002. Minimum spanning tree problem. *Handbook of Applied Optimization*, edited by M. Resende and P. Pardalos, Oxford University Press, pp. 422-430.
- R.K. Ahuja and J.B. Orlin. 2001. Inverse optimization. *Operations Research* 49, 771-783.
- R.K. Ahuja and J.B. Orlin. 2001. A fast scaling algorithm for minimizing separable convex functions subject to chain constraints. *Operations Research* 49, 784-789.
- R.K. Ahuja, J.B. Orlin, and D. Sharma. 2001. Multi-exchange neighborhood structures for the capacitated minimum spanning tree problem. *Mathematical Programming* 91, 71-97.
- R.K. Ahuja, J. Goodstein, A. Mukherjee, J.B. Orlin, and D. Sharma. 2007. A very large-scale neighborhood search algorithm for the combined through-fleet assignment model. *INFORMS Journal on Computing* 19, 416-428.
- P.T. Soddalingam, R.K. Ahuja, and J.B. Orlin. 2000. A new polynomial-time cycle-canceling algorithm for the minimum cost flow problem. *Networks* 36, 53-63.
- R.K. Ahuja, and J.B. Orlin. 2000. A faster algorithm for the inverse spanning tree problem. *Journal of Algorithms* 34, 177-193.
- J.B. Orlin, and R.K. Ahuja. 2000. Minimum spanning trees, Shortest paths, Maximum flows, Minimum cost flow. *CRC Handbook of Discrete and Combinatorial Mathematics*, K. H. Rosen (Editor-in-chief), CRC Press, New York, pp. 629-633, 652-683.
- R.K. Ahuja, J.B. Orlin, and A. Tiwari. 2000. A greedy genetic algorithm for the quadratic assignment problem. *Computers and Operations Research* 27, 917-934.
- R.K. Ahuja, J.B. Orlin, and D. Sharma. 2000. Very large scale neighborhood search. *International Transactions in Operations Research* 7, 301-317.
- R.K. Ahuja, J.B. Orlin, P. Zuddas, and G. Secki. 1999. Algorithms for the equal flow problem. *Management Science* 45, 1440-1455.

- P.T. Soddalingam, R.K. Ahuja, and J.B. Orlin. 1999. Solving inverse spanning tree problems through network flow techniques. *Operations Research* 47, 291-300.
- C.C. Aggarwal, R.K. Ahuja, J. Hao, and J.B. Orlin. 1998. Diagnosing infeasibilities in network flow problems. *Mathematical Programming* 81, 263-280.
- P.T. Soddalingam, P. Sharma, and R.K. Ahuja. 1997. A new pivot selection rule for the network simplex algorithm. *Mathematical Programming* 78, 149-158.
- R.K. Ahuja. 1997. The balanced linear programming problem. *European Journal of Operational Research* 101, 29-38.
- R.K. Ahuja and J.B. Orlin. 1997. Developing fitter genetic algorithms. *ORSA Journal of Computing* 7, 251-253.
- R.K. Ahuja, M. Kodialam, A.K. Mishra, and J.B. Orlin. 1997. Computational investigation of maximum flow algorithms. *European Journal on Operational Research* 97, 509-542.
- R.K. Ahuja. 1997. Paths and Flows. *Annotated Bibliographies in Combinatorial Optimization: Chapter 17*, John Wiley & Sons, 283-306.
- R.K. Ahuja and J.B. Orlin. 1997. Equivalence of primal simplex and dual simplex algorithms for the maximum flow problem. *Operations Research Letters* 20, 101-108.
- R.K. Ahuja, J.L. Batra, S.K. Gupta, and A.P. Punnen. 1996. Optimal expansion of capacitated transshipment networks. *European Journal of Operational Research* 89, 176-184.
- R.K. Ahuja and J.B. Orlin. 1996. Use of representative counts in computational testing of algorithms. *ORSA Journal on Computing* 6, 318-330.
- R.K. Ahuja, T.L. Magnanti, J.B. Orlin, and M.R. Reddy. 1995. Applications of Network Optimization. *Handbooks of Operations Research and Management Science, Volume 7: Network Models*, Edited by M. O. Ball, T. L. Magnanti, C. L. Monma, and G. L. Nemhauser, Elsevier, North-Holland, Amsterdam, pp. 1-83.
- R.K. Ahuja and J.B. Orlin. 1995. A capacity scaling algorithm for the constrained maximum flow problem. *Networks* 25, 89-98.
- G.G. Polak and R.K. Ahuja. 1995. A polynomial-time algorithm for message routing in hierarchical communication networks. *European Journal of Operational Research* 80, 139-146.
- R.K. Ahuja, J.B. Orlin, C. Stein, and R.E. Tarjan. 1994. Improved algorithms for bipartite network flows. *SIAM Journal on Computing* 23, 906-933.
- R. K. Ahuja, A.V. Goldberg, J. B. Orlin, and R.E. Tarjan. 1992. Finding minimum-cost flows by double scaling. *Mathematical Programming* 53, 243-266.
- R.K. Ahuja and J.B. Orlin. 1992. The scaling network simplex algorithm. *Operations Research* 40, S5-S13.
- J.B. Orlin and R.K. Ahuja. 1992. New scaling algorithms for the assignment and minimum cycle mean problems. *Mathematical Programming* 54, 41-56.
- R.K. Ahuja, T.L. Magnanti, and J.B. Orlin. 1991. Some recent advances in network flows. *SIAM Review* 33, 175-219.
- J.B. Orlin and R.K. Ahuja. 1991. Distance-directed algorithms for maximum flow and parametric maximum flow problems. *Naval Research Logistics* 38, 413-430.
- R.K. Ahuja, K. Mehlhorn, J.B. Orlin, and R.E. Tarjan. 1990. Faster algorithms for the shortest path problem. *Journal of ACM* 37, 213-223.

- R.K. Ahuja, T.L. Magnanti, and J.B. Orlin. 1989. Network Flows *Handbooks in Operations Research and Management Science*. Vol. 1: Optimization, Edited by G. L. Nemhauser, A. H. G. Rinnooy Kan, and M. J. Todd, Elsevier, North-Holland, Amsterdam, pp. 211-360.
- R.K. Ahuja, J.B. Orlin, and R.E. Tarjan. 1989. Improved time bounds for the maximum flow problem. *SIAM Journal of Computing* 18, 939-954.
- R.K. Ahuja and J.B. Orlin. 1989. A fast and simple algorithm for the maximum flow problem. *Operations Research* 37, 748-759.
- R.K. Ahuja. 1988. Minimum cost to reliability ratio path problem. *Computers and Operations Research* 15, 83-89.
- R.K. Ahuja and V.V.S. Murty. 1987. New lower planes for the network design problems. *Networks* 17, 113-127.
- R.K. Ahuja and V.V.S. Murty. 1987. Exact and heuristic algorithms for the optimum communication spanning tree problem. *Transportation Science* 21, 163-170.
- R.K. Ahuja. 1986. Algorithms for the minimax transportation problem. *Naval Research Logistics Quarterly* 33, 725-740.
- R.K. Ahuja. 1985. Minimax linear programming problem. *Operations Research Letters* 4, 131-134.
- R.K. Ahuja, J.L. Batra, and S.K. Gupta. 1984. A parametric algorithm for the convex cost flow and related problems. *European Journal of Operational Research* 16, 222-235.
- R.K. Ahuja, J.L. Batra, and S.K. Gupta. 1983. Combinatorial optimization with rational objective functions: A communication. *Mathematics of Operations Research* 8, 314.
- R.K. Ahuja, J.L. Batra, and S.K. Gupta. 1981. The constrained maximum flow problem. *Scientific Management of Transport Systems*, N. K. Jaiswal (Ed.), North-Holland Publishing Co., 304-316.
- R.K. Ahuja and A.K. Mittal. 1981. Maximum arc-disjoint and node-disjoint flows in two-commodity networks. *Opsech* 18, 92-103.