Curriculum Vitae
Tamra J. Carpenter

DIMACS
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Work Experience

Rutgers University   **Piscataway, NJ**

Research Professor   June 2006 - present

Associate Director
Center for Discrete Mathematics & Theoretical Computer Science (DIMACS)

DIMACS was founded as an NSF "science and technology center" in 1988 to foster research and educational programs on topics that lie at the interface of discrete mathematics and theoretical computer science. My role is to facilitate new and ongoing research and education programs at DIMACS.

Telcordia Technologies/Bellcore   **Morristown/Piscataway, NJ**

Senior Scientist & Director   1998-June 2006

Managed the Network Models & Algorithms Research Group whose research focused on network optimization and network traffic modeling. Conducted research and led projects on various network optimization problems including a wide variety of equipment location problems in broadband access network design and in optical networking. Studied bandwidth allocation in IP, SONET and transparent optical networks. Served as a resource for technical writing on government and commercial proposals across Telcordia Applied Research.

Research Scientist   August 1992-1998

Conducted research on network design and optimization problems involving cost-effective equipment location, network survivability and planning under uncertainty. Project leader for several projects in this area.

Princeton University   Princeton, NJ

Visiting Lecturer with rank of Associate Professor   Feb. 1999 – July 1999
Research Assistant   Sept. 1988 - Aug. 1991
Teaching Assistant   Sept. 1988 - Aug. 1991

Research specializing interior point methods for quadratic programming. Work focused on developing computationally efficient procedures by examining internal algorithmic strategies and external formulation tactics.

GE Corporation

Princeton, NJ

Senior Systems Analyst   August 1986 - August 1987

RCA Corporation   Princeton, NJ

Operations Research Analyst   August 1984 - August 1986

Education

Princeton University   Princeton, NJ

Ph.D. in Operations Research   May 1992
Dissertation Title: *Practical Interior Point Methods for Quadratic Programming*
Advisor: Irvin Lustig

Carnegie-Mellon University   Pittsburgh, PA

M.S. in Applied Mathematics   May 1984
Thesis Title: *The Traveling Salesman Problem in Graphs with 2-edge 1-node Cutsets*
Advisor: Gerard Cornuejols

University of North Carolina   Chapel Hill, NC

B.A. in Chemistry and Mathematics   May 1982

Research Interests

- Telecommunication network design and equipment location including access network planning, optical network planning, and handling uncertainty in network planning. Efficient routing in telecommunication networks.

- Optimization for emergency preparedness and response.

- Earlier research focused on large-scale optimization, including interior-point methods, quadratic programming, and stochastic optimization.

Awards and Honors

- Princeton University Honorific Fellowship, 1991-1992.
- Princeton University, School of Engineering and Applied Science Fellowship, 1987-1988.
- Honors Program at the University of North Carolina.
- Phi Beta Kappa.

Patents

- Method and System for Design and Routing in Transparent Optical Networks, Patent application 20050169196 by Telcordia Technologies, filed January 30, 2004.

- Digital Subscriber Line Network Deployment Method, patent number 7,082,401, issued July, 25, 2006.

Papers and Publications

Refereed Journals and Book Chapters

- "Telecommunications Access Network Design", with H. Luss, in *Handbook of Optimization in Telecommunications,* M. Resende and P. Pardalos (eds.), Kluwer Academic Publishers, 2006.

- "Comparing heuristics for demand routing and slot assignment on ring networks", with S. Cosares, *Telecommunication Systems,* 21, 319-337, 2002.

- "Node placement and sizing for copper broadband access networks", with M. Eiger, P. Seymour, and D. Shallcross, *Annals of Operations Research,* 106, 199-228, 2001.

- "Client-server caching with expiration timestamps", with R. Carter, M. Cochinwala, and M. Eiger, *Distributed and Parallel Databases,* 10, 5-22, 2001.

- "Studies of random demands on network costs", with D. Heyman and I. Saniee, *Telecommunication Systems*, 10, 409-421, 1999.

- "A simple approximation algorithm for two problems in circuit design", with S. Cosares, J. Ganley, and I. Saniee, *IEEE Transactions on Computers*, 47, 1310-1312, 1998.

- "Making a case for robust optimization models", with D. Bai and J. Mulvey, *Management Science*, 43, 895-907, 1997.

- "SONET ring sizing with genetic algorithms", with N. Karunanithi, *Computers and Operations Research*, 24, 581-591, 1997.

- "Symmetric indefinite systems for interior point methods", with R. J. Vanderbei, *Mathematical Programming*, 58, 1-32, 1993.

- "Higher order predictor-corrector interior point methods with application to quadratic objectives", with I. Lustig, J. Mulvey, D. Shanno, *SIAM Journal on Optimization*, 3, 696-725, 1993.

- "Separable quadratic programming via a primal-dual interior point method and its use in a sequential procedure", I. Lustig, J. Mulvey, D. Shanno, *ORSA Journal on Computing*, 5, 182-191, 1993.

- "An interior point method for quadratic programs based on conjugate projected gradients", with D. F. Shanno, *Computational Optimization and Applications*, 2, 5-28, 1993.

- "Formulating two-stage stochastic programs for interior point methods", I. Lustig and J. Mulvey, *Operations Research*, 39, 757-770, 1991.

- "Spontaneous fusion of phosphatidylcholine small unilamellar vesicles in the fluid phase", with B. R. Lentz and D. R. Alford, *Biochemistry*, 26, 5389-5397, 1987.

Conference Proceedings

- "Models for Fiber-to-the-Premises (FTTP) Access Network Deployment", with M. Eiger, H. Luss, R. Menendez, and M. Seely in *Technical Proceedings of OFC/NFOEC*, March, 2005.

- "Capacity Planning for Cable High-speed Data Services", with K. R. Krishnan, A. Neidhardt, and M. Eiger, in *Proceedings of the National Cable & Telecommunications Association Conference*, New Orleans, LA, May, 2004.

- "Cost-conscious impairment-aware routing", with J. Gannett, J. Jackel, R. Menendez, D. Shallcross, and A. Von Lehmen, in *Technical Proceedings of the Optical Fiber Conference*, Anaheim CA, February, 2004.

- "Impairment-aware design and routing for transparent optical networks", with M. Eiger, J. Gannett, J. Jackel, R. Menendez, D. Shallcross, and A. Von Lehmen, in *Technical Proceedings of the 2003 National Fiber Optic Engineers Conference,* pp. 1093-1102, Orlando, FL, September, 2003.

- "Maximizing the transparency advantage in optical networks", with J. Gannett, J. Jackel, D. Shallcross, and A. Von Lehmen, in *Technical Proceedings of the Optical Fiber Conference*, pp. 616-617, Atlanta GA, March, 2003.

- "Practical issues and algorithms for analyzing terrorist networks", with G. Karakostas and D. Shallcross, to appear in *Proceedings of the Western MultiConference*, San Antonio, TX, January, 2002.

- "Planning and provisioning for cable Internet services", with P. Bates, Y. Chandramouli, J. Des Marais, M. Eiger, K. Krishnan, and A. Neidhardt, in *Technical Proceedings of the 2002 National Fiber Optic Engineers Conference,* Dallas, TX, September, 2002.

- "Enhancements to traffic engineering for multi-protocol label switching", with K. R. Krishnan and D. Shallcross, in *Proceedings of the 17th International Teletraffic* Congress, Salvador da Bahia, Brazil, December, 2001.

- "Enhanced xDSL planning", with C. Behrens, M. Eiger, Y. Ho, and P. Seymour, in *Technical Proceedings of the 2001 National Fiber Optic Engineers Conference,* Baltimore, MD, July 2001.

- "Data caching for telephony services", with R. Carter, M. Cochinwala, and M. Eiger, in *Proceedings of the 2000 International Database Engineering & Applications Symposium (IDEAS 2000),* 101-109.

- "Network planning for XDSL", with C. Behrens, M. Eiger, Y. Ho, H. Luss, G. Seymour, P. Seymour, and G. Truax, in *Technical Proceedings of the 2000 National Fiber Optic Engineers Conference,* Volume 2, 507-517.

- "Caching for mobile communication", with R. Carter, M. Cochinwala, and M. Eiger, in *ADBIS-DASFAA 2000: Current Issues in Databases and Information Systems,* J. Stuller, J. Pokorny, B. Thalheim, and Y. Masunaga (eds.), Springer-Verlag Lecture Notes in Computer Science 1884, 37-50.

- "Automated design of fiber-to-the-curb and hybrid fiber-coax access networks", with M. Eiger, D. Shallcross, and P. Seymour, in *Proceedings of the 1996 National Fiber Optic Engineers Conference*.

- "A ring loading application of genetic algorithms", with N. Karunanithi, in *Proceedings of the 1994 ACM Symposium on Applied Computing*.

Working Papers and Technical Reports

- "Demand routing and slotting on ring networks", with S. Cosares and I. Saniee, DIMACS Technical Report 97-02.

- "Stochastic programming to promote network survivability", with D. Bai and J. Mulvey, Technical Report SOR-94-14, Princeton University.

Bellcore/Telcordia Technical Reports

- "Algorithms for flow allocation for multi-protocol label switching", with T. Bogovic, K. Krishnan, T. Ott, and D. Shallcross, Telcordia Technical Memorandum TM-26027, 2001.

- "A branch and bound algorithm for sharing optical transmitters in an HFC network", Bellcore Technical Memorandum TM-25858, 1998.

- "Studies of random demands on network costs", with D. Heyman and I. Saniee, Bellcore Technical Memorandum TM-25859, 1998. (This is an expanded version of the paper in *Telecommunication Systems*.)

- "High-level requirements for a fiber-to-the-curb network engineering tool", with M. Eiger, P. Seymour, and D. Shallcross, Bellcore Technical Memorandum TM-25411, 1996.

- "An overview of the network evaluator", with D. Bienstock and M. Eiger, Bellcore Technical Memorandum TM-25014, 1996.

- "An overview of the demand scenario generator", with M. Eiger and D. Heyman, Bellcore Technical Memorandum TM-25013, 1996.

- "Narrowband interwirecenter forecasting tool: Software description and user's manual", with O. Wasem, Bellcore Technical Memorandum TM-24286, 1994.

- "Methods to assess restoration schemes for IOF networks under CO failure scenarios", with S. Cosares and I. Saniee, Bellcore Technical Memorandum TM-TSV-022623, 1993.

Professional Activities

- Member DIMACS Executive Committee (2004-present)
- Member Institute for Mathematics and its Applications (IMA) Industrial Advisory Board (2004-2006)
- INFORMS Member
- INFORMS Telecommunication Section Member
- Mathematical Programming Society Member

- Referee for the following journals:
  Mathematical Programming
  Operations Research
  INFORMS Journal on Computing
  Networks
  Telecommunication Systems
  Journal of Heuristics
  Annals of Operations Research
  Computers and Operations Research
  ACM Transactions on Computing
  SIAM Journal on Optimization
  IEEE ACM Transactions on Networking
  IEEE Transactions on Engineering Management
  IEEE Transactions on Reliability
  Journal of Lightwave Technology

Selected Talks, Conference and Workshop Activity

Seventh New Jersey Universities Homeland Security Research Consortium Symposium
Program Committee and session co-organizer: "Planning for Emergency Response"

Institute for Mathematics and its Applications (IMA), April, 2003.
Co-organizer: "Workshop on Network Design and Management" and associated tutorial.

Optical Fiber Communication Conference (OFC), Atlanta, March, 2003.
Talk: Maximizing the Transparency Advantage in Optical Networks".

Western MultiConference, San Antonio, January, 2002.
Talk: "Practical Issues and Algorithms for Analyzing Terrorist Networks".

Joint Mathematics Meeting (AMS/MAA), New Orleans, January, 2001.
Panelist: "Mathematics in Industry".

International Symposium on Mathematical Programming, Atlanta, August, 2000.
Session Organizer: "Applications in Communication Network Design & Management".

Institute for Mathematics and its Applications (IMA), December, 1999.
Talk: "Coloring SONET Rings and Related Problems."

INFORMS Meeting, Philadelphia, November, 1999.
Session Organizer: "Combinatorial Optimization Solutions for Problems in Industry".

Princeton Operations Research Society, Princeton University, April, 1998.
Talk: "Some Applications of Operations Research in Telecommunications."

Fourth INFORMS Telecommunications Conference, Boca Raton, March, 1998.
Talk: "Studies of Random Demands on Network Costs."

INFORMS National Meeting, San Diego, May, 1997.
Talk: "Fiber-to-the-Curb Network Design: Facility Location on a Tree."

Rutgers Center for Operations Research (RUTCOR), Rutgers University, February, 1997.
Talk: "Coloring SONET Rings."

INFORMS National Meeting, New Orleans, November, 1995.
Talk: "Matching and Balancing in Telecommunication Demand Forecasting."

DIMACS Leadership Program in Discrete Mathematics, May, 1995.
Talk: "Bringing the Information Superhighway to your Doorstep."

Third INFORMS Telecommunications Conference, Boca Raton, March, 1995.
Talk: "Stochastic Programming to Promote Network Survivability."

ORSA/TIMS Joint National Meeting, Boston, April, 1994.
Talk: "Alternate Views of SONET Ring Sizing."

ORSA/TIMS Joint National Meeting, Phoenix, November, 1993.
Talk: "DCS Participation in Central Office Failure Recovery."

DIMACS seminar, September, 1992.
Talk: "A Taste of Interior-Point Methods."

ORSA/TIMS Joint National Meeting, Anaheim, November, 1991.
Talk: "Symmetric Indefinite Systems for Interior Point Methods."
Talk: "A Conjugate Projected Gradient Based Interior Point Method."

ORSA/TIMS Joint National Meeting, Philadelphia, October, 1990.
Talk: "A Primal-Dual Interior Point Method for Convex Nonlinear Programs."
Talk: "WRIP Workshop: Nonlinear Extensions to OB1."
Doctoral Colloquium Participant

Mentoring & Teaching

Ph.D. Thesis Committees

- Adam Berger, "Large-scale Stochastic Programming with Applications to Finance", Princeton University, 1995.

- Dawei Bai, "Robust Optimization with Applications in Finance and Telecommunications", Princeton University, 1996 (second reader).

Bellcore/Telcordia Summer Interns

- Joel Sokol, "Fast Heuristics for Combinatorial Problems in Network Design", 1997. Ph.D. Massachusetts Institute of Technology, 1999.

- David Mazur, "A Column-generation Approach to Fiber-to-the-Curb Access Network Planning", 1996. Ph.D. Johns Hopkins University, 1999. (This summer project was the basis for Dave's Ph.D. dissertation.)

- Hyunyoung Lee, "An Interface for the Demand Scenario Generator", 1995. M.S. Boston University, 1997.

- Karen Singer, "Generating Realistic Random Telecommunication Networks", 1994. Ph.D. Johns Hopkins University, 1995.

Mentor, Telcordia/IMA Postdoc

- Christine Cheng, 2000-2002. Ph.D. Johns Hopkins University, 1999.

Lecturing

Princeton University   Spring 1999
"Optimization Under Uncertainty"
- A core course for juniors and seniors whose curricula emphasize operations research. Covered basic concepts in multi-objective optimization, decision theory, sensitivity analysis, and stochastic programming.

Teaching Assistance

Princeton University:

"Computer Methods in Problem Solving"   Spring 1991
- An introductory computing course for freshmen and sophomores that stressed basic problem solving skills using the C language and computer graphics.

"Systems Analysis Techniques"   Fall 1990
- A course for second year graduate students in the Woodrow Wilson School for public policy emphasizing public sector applications which may involve risk, uncertainty, and ethical issues.

"Strategies in Modeling: Public and Corporate Decisions"   Fall 1988, 1989
- A senior level course in the Engineering Management Systems Program that stressed modeling and solution methods for "real-world" problems.

Carnegie-Mellon University:

Calculus I and II

"Methods of Applied Mathematics I"
- A sophomore level course in ordinary differential equations.

"Optimization for Social Sciences II"
- A sophomore level course covering basic ideas in nonlinear optimization.