

Thomas C. Sharkey

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Academic Positions

- **Associate Professor**, Department of Industrial and Systems Engineering, Rensselaer Polytechnic Institute, July 2015 - Present.
- **Assistant Professor**¹, Department of Industrial and Systems Engineering (formerly known as Decision Sciences and Engineering Systems), Rensselaer Polytechnic Institute, August 2008-June 2015.

Education

- **Ph.D.**, Department of Industrial and Systems Engineering, University of Florida, August 2008.
Dissertation Title: *Approaches to nonlinear and infinite-dimensional network design problems in supply chain optimization*.
Dissertation Advisor: H. Edwin Romeijn.
- **M.S.E.** in Mathematical Sciences, Department of Applied Mathematics and Statistics, Johns Hopkins University, May 2004.
- **B.S.** in Mathematical Sciences (with Honors), Department of Applied Mathematics and Statistics, Johns Hopkins University, May 2004.

Funded Research

Funded Federal Grants

- *CAREER: New Scheduling Models for Supply Chain Restoration, Construction, and Redesign*, National Science Foundation, Manufacturing Enterprise Systems Program, July 1, 2013 - June 30, 2018, \$415K (Base of \$400K with \$15K of REU supplements).
- *Collaborative Research: Dynamic Resource Allocation Models for Law Enforcement Operations against Illegal Drug Trafficking*, National Science Foundation, Service Enterprise Systems Program, June 1, 2013 - May 31, 2016, \$201K (with Chase Rainwater, University of Arkansas).
- *RAPID: Identifying and Modeling the Interdependencies of Restoration Efforts across Infrastructures*, National Science Foundation, Infrastructure Management and Extreme Events Program, February 1, 2013 - January 31, 2014, \$31K (lead PI, with Joe Chow, William Wallace, John Mitchell).

¹Due to a parental leave in Fall 2011, my tenure case was reviewed and approved in Fall 2014.

Center Funding

- *Decision Technologies to Support Coastal Infrastructure Resilience*, Coastal Hazards, Department of Homeland Security Center of Excellence, February 1, 2016 - June 30, 2018, \$160K (co-PI, with John Mitchell and William Wallace).
- *Dynamic Modeling of Arctic Resource Allocation*, Command, Control, and Interoperability Center for Advanced Data Analytics, Department of Homeland Security Center of Excellence, July 1, 2013 - June 30, 2016, \$150K (co-PI, with Martha Grabowski and William Wallace).
- *Cyber-Security and Interdependent Infrastructures: A Data Analytic Approach*, Command, Control, and Interoperability Center for Advanced Data Analytics, Department of Homeland Security Center of Excellence, July 1, 2014 - June 30, 2016, \$80K (co-PI, with John Mitchell and William Wallace).

Refereed Journal Articles

1. N. Ni[†], B.J. Howell[†], and T.C. Sharkey. Modeling the impact of unmet demand in supply chain resiliency planning. Forthcoming in *Omega*.
2. H. Sun[†] and T.C. Sharkey. Approximation algorithms for fractional optimization problems arising in dispatching rules for integrated network design and scheduling problems. *Journal of Global Optimization*, 68(3): 623-640, 2017.
3. H. Nguyen[†] and T.C. Sharkey. A computational approach to determine damage in infrastructure networks from outage reports. *Optimization Letters*, 11(4): 753-770, 2017.
4. R. Garrett[†], T.C. Sharkey, M. Grabowski, and W.A. Wallace. Dynamic resource allocation to support oil spill response planning for energy exploration in the Arctic. *European Journal of Operational Research*, 257(1): 272-286, 2017.
5. E. Heath[†], J.E. Mitchell, and T.C. Sharkey. Applying ranking and selection procedures to long-term mitigation for improved network restoration. *EURO Journal on Computational Optimization*, 4(3): 447-481, 2016.
6. T.C. Sharkey and S.G. Nurre[†]. Video tutorials within an undergraduate operations research course: Student perception on their integration and creating a blended learning environment. *INFORMS Transactions on Education*, 17(1): 1-12, 2016.
7. T.C. Sharkey, S.G. Nurre[†], H. Nguyen[†], J.H. Chow, J.E. Mitchell, and W.A. Wallace. Identification and classification of restoration interdependencies in the wake of Hurricane Sandy. *Journal of Infrastructure Systems*, 22(1): 04015007, 2016.
8. T.C. Sharkey, B. Cavdaroglu, H. Nguyen[†], J. Holman[†], J.E. Mitchell, and W.A. Wallace. Interdependent network restoration: On the value of information-sharing. *European Journal of Operational Research*, 244(1): 309-321, 2015.
9. S.G. Nurre[†] and T.C. Sharkey. Integrated network design and scheduling problems with parallel identical machines: Complexity results and dispatching rules. *Networks*, 63(4): 306-326, 2014.

[†]Denotes one of my students.

10. J. Qiu[†] and T.C. Sharkey. A dynamic edge covering and scheduling problem: Complexity results and approximation algorithms. *Optimization Letters*, 8(4): 1201–1212, 2014.
11. S.G. Nurre[†], R. Bent, F. Pan, and T.C. Sharkey. Managing operations of plug-in hybrid electric vehicle (PHEV) exchange stations for use with a smart grid. *Energy Policy*, 67: 364–377, 2014.
12. J. Qiu[†] and T.C. Sharkey. Integrated dynamic single facility location and inventory planning problems. *IIE Transactions*, 45(8): 883–895, 2013. Highlighted in the July 2013 issue of *Industrial Engineer*.
13. B. Cavdaroglu, E. Hammel, J.E. Mitchell, T.C. Sharkey, and W.A. Wallace. Integrating restoration and scheduling decisions for disrupted interdependent infrastructure systems. *Annals of Operations Research*, 203(1): 279–294, 2013.
14. S.G. Nurre[†], B. Cavdaroglu, J.E. Mitchell, T.C. Sharkey, and W.A. Wallace. Restoring infrastructure systems: An integrated network design and scheduling problem. *European Journal of Operational Research*, 223(3): 794–806, 2012.
15. W. van den Heuvel, O.E. Kundakcioglu, J. Geunes, H.E. Romeijn, T.C. Sharkey, and A.P.M. Wagelmans. Integrated market selection and production planning: Complexity and solution approaches. *Mathematical Programming*, 134(2): 395–424, 2012.
16. A.K. Malaviya[†], C. Rainwater, and T.C. Sharkey. Multi-period network interdiction models with applications to city-level drug enforcement. *IIE Transactions*, 44(5): 368–380, 2012.
17. F. Michael[†] and T.C. Sharkey. Generator location problems for mitigating unmet demand in local power infrastructure systems. *The Homeland Security Review*, 5(3): 213–224, 2011.
18. T.C. Sharkey, J. Geunes, H.E. Romeijn, and Z.-J. Shen. Exact algorithms for integrated production planning and facility location problems. *Naval Research Logistics*, 58(5): 419–436, 2011.
19. T.C. Sharkey. Network flow problems with pricing decisions. *Optimization Letters*, 5(1): 71–83, 2011.
20. T.C. Sharkey, H.E. Romeijn, and J. Geunes. A class of nonlinear nonseparable continuous knapsack and multiple-choice knapsack problems. *Mathematical Programming*, 126(1): 69–96, 2011.
21. M.H. Dinitz, J.M. Gold, T.C. Sharkey, and L. Traldi. Graphical representations of clutters. *Ars Combinatoria*, 94: 303–320, 2010.
22. T.C. Sharkey and H.E. Romeijn. Greedy approaches for a class of nonlinear Generalized Assignment Problems. *Discrete Applied Mathematics*, 158(5): 559–572, 2010.
23. H.E. Romeijn, T.C. Sharkey, Z.-J. Shen, and J. Zhang. Integrating facility location and production planning decisions. *Networks*, 55(2): 78–89, 2010.
24. T.C. Sharkey and H.E. Romeijn. Simplex-inspired algorithms for solving a class of convex programming problems. *Optimization Letters*, 2(4): 455–481, 2008.
25. T.C. Sharkey and H.E. Romeijn. A simplex algorithm for minimum-cost network-flow problems in infinite networks. *Networks*, 52(1): 14–31, 2008.

Submitted Journal Articles

1. E. Heath[†], J.E. Mitchell, and T.C. Sharkey. Scheduling of tasks with effectiveness precedence constraints. Submitted for publication.
2. F.E. Ahangar, C. Rainwater, and T.C. Sharkey. A decomposition approach for dynamic network interdiction models. Submitted for publication.
3. N.O. Baycik[†], T.C. Sharkey, and C. Rainwater. Interdicting layered physical and information flow networks. Submitted for publication.
4. S.G. Nurre[†] and T.C. Sharkey. Online integrated network design and scheduling problems with flexible release dates. Submitted for publication.
5. R. Loggins, J.E. Mitchell, T.C. Sharkey, and W.A. Wallace. Improving the recovery of interdependent social infrastructure systems after an extreme event: Model and application. Submitted for publication.
6. E. Hammel, J.E. Mitchell, T.C. Sharkey, and W.A. Wallace. Improving network durability using approximate dynamic programming. Submitted for publication.
7. R. Loggins, R. Little, J.E. Mitchell, T.C. Sharkey, and W.A. Wallace. CLARC: An artificial community for modeling the effects of extreme events on interdependent civil and social infrastructure systems.
8. N.O. Baycik[†], T.C. Sharkey, and C. Rainwater. A Markov Decision Process approach for balancing intelligence and interdiction operations in city-level drug enforcement.

Refereed Book Chapters

1. T.C. Sharkey and S.G. Nurre[†]. Quantitative models for infrastructure restoration after extreme events: Network optimization meets scheduling. Under review for the book *Mathematics of Planet Earth* to be published by Springer.
2. T.C. Sharkey, J. Braun[†], A. Svoboda[†], K. Toth[†], C. Tran[†], M. Grabowski, and W.A. Wallace. Dynamic modeling of Arctic resource allocation (DMARA): Overview and an application to maritime safety in the U.S. Arctic. Forthcoming in *Advanced Data Analytics for Command, Control, and Interoperability in Homeland Security*. Published by Springer.
3. S.G. Nurre[†], T.C. Sharkey, and J.E. Mitchell. Increasing the resiliency of local supply chain distribution networks against multiple hazards. *Computational Optimization in Logistics and Supply Chain Management*. Published by CRC Press, Taylor & Francis Group, 2016.
4. T.C. Sharkey. Infinite linear programs. *Encyclopedia of Operations Research and Management Science*, 2011.

Refereed Conference Proceedings

1. F. Ortiz[†] and T.C. Sharkey. Modeling the impact of user rehabilitation on illegal drug trafficking operations. *Proceedings of the Industrial and Systems Engineering Research Conference*, Pittsburgh, PA, 2017. Recipient of the Best Paper Award in the Security Engineering track.

2. M. Park, L. Cho, J. Ryan, and T.C. Sharkey. Production scheduling with queue-time constraints: Alternative formulations. *Proceedings of the Industrial and Systems Engineering Research Conference*, Montreal, Quebec, Canada, 2014.
3. S.G. Nurre[†] and T.C. Sharkey. Video tutorials: Student use and perception in an OR course. *Proceedings of the Industrial and Systems Engineering Research Conference*, San Juan, Puerto Rico, 2013.
4. B. Cavdaroglu, S.G. Nurre[†], J.E. Mitchell, T.C. Sharkey, and W.A. Wallace. Decomposition methods for restoring infrastructure systems. *Proceedings of the International Conference on Vulnerability and Risk Analysis and Management*, Hyattsville, MD, 2011.
5. S.G. Nurre[†] and T.C. Sharkey. Restoring infrastructure systems: An integrated network design and scheduling problem. *Proceedings of the Industrial Engineering Research Conference*, Cancun, Mexico, 2010.
6. A.K. Malaviya[†], C. Rainwater, and T.C. Sharkey. Multi-period network interdiction models with applications to city-level drug enforcement. *Proceedings of the Industrial Engineering Research Conference*, Cancun, Mexico, 2010. Recipient of the Best Paper Award in the Production Planning and Scheduling track.
7. T.C. Sharkey, H.E. Romeijn, and J. Geunes. Analysis of a class of nonlinear knapsack problems. *Proceedings of the Industrial Engineering Research Conference*, Orlando, FL, 2006.

Student Supervision

Current Ph.D. Students

- Ni Ni. Topic: *Resilience for Assembly Supply Chains*. Expected Graduation: May 2019.
- N. Orkun Baycik. Topic: *Novel Bilevel Programming Approaches for Interdicting Multi-Tiered Illegal Supply Chains*. Expected Graduation: May 2018.
- Huy Nguyen, co-advised with John Mitchell. Topic: *Restoration and Scheduling for Assembly Supply Chains*. Expected Graduation: May 2018.

Graduated Ph.D. Students

- Hongtan Sun. Topic: *On Approximation Algorithms and the Cost of Decentralization for Problems in Network Restoration*, June 2017. Currently at IBM.
- Emily Heath, co-advised with John Mitchell. *Optimization Approaches to Problems in Network Mitigation and Restoration*, June 2016. Currently at MITRE.
- Sarah G. Nurre. *Integrated Network Design and Scheduling Problems: Optimization Algorithms and Applications*, June 2013. Currently an Assistant Professor at the University of Arkansas.
- Jiaming Qiu. *Dynamic Resource Location Problems: New Applications, Models and Algorithms*, July 2012. Currently with Bloomberg.
- Ajay K. Malaviya. *Multi-Period Network Interdiction Problems with Applications to City-Level Drug Enforcement*, December 2010. Currently with Boston Analytics.

Graduated Master's Students (with thesis)

- Felipe Ortiz. *Modeling the Impact of Government Controlled Factors on the Illegal Drug Trafficking Supply Chain*, December 2016.
- Richard A. Garrett. *Dynamic Modeling of Arctic Resource Allocation*, August 2016.
- Brendan J. Howell. *Implications of Unmet Demand within the Context of Supply Chain Restoration*, May 2015.

Undergraduate Students

- Supervised 28 undergraduate research projects. Some example projects are:
 - Lauren Croft: Understanding risks from extreme events in multi-echelon assembly supply chains, Summer 2016.
 - Jane Braun, Kevin Toth, and Cheryl Tran: Locating and routing sensors for improved safety in maritime logistics in the Arctic, Spring 2015.
 - Ali Svoboda, Topic: Supply chain redesign problems for integrating energy-efficient manufacturing capabilities, Spring 2014-Spring 2015.
 - Jonathan Holman and Huy Nguyen, Topic: Identifying, classifying, and modeling restoration interdependencies after extreme events, Spring 2013-Spring 2014.
 - Faith Michael, Topic: Robust optimization and stochastic programming approaches for scheduling mitigation efforts against hurricanes in networked systems, Spring 2010 - Spring 2011.

Teaching Experience

Rensselaer Polytechnic Institute

- ISYE 4600/6610: Operations Research Methods. Fall 2012-2015.
 - A PhD student and myself have created a set of 25 video tutorials to serve as virtual office hours and to aid in the delivery of this course. The guide through these videos can be found at <http://homepages.rpi.edu/~sharkt/ORMVideos.html>
- ISYE 4963/6210: Theory of Production Scheduling, Spring 2009-2014.
- ISYE 4220/6961: Optimization Algorithms and Applications, Fall 2008-2010, 2012, 2013, Spring 2015, 2016.
 - This course was designed and taught for the first time in Fall 2008 in order to expose undergraduate Industrial and Systems Engineering majors to important concepts at the intersection of Operations Research and Computer Science. It has been accepted into the curriculum of the School of Engineering as ISYE-4220.
 - This course was taught in a flipped classroom fashion in Spring 2016. Students were provided short video lectures that were to be viewed outside of the classroom. The first part of each class involved students completing homework-like exercises on the material. The second part of class focused on implementation of the algorithms. Each class concluded with a ‘challenge’ to the students that introduced the concepts presented in the next video lecture.

University of Florida

- ESI 4312: Operations Research 1. Fall 2007.

- EIN 4343: Inventory and Supply Chain Systems. Spring 2007.

Professional Activities

Editorial Activities

- Associate Editor, *IISE Transactions*, Focus Issue on Design and Manufacturing, January 2017 - Present.
- Associate Editor, *IISE Transactions*, Focus Issue on Operations Engineering and Analysis, April 2013-Present.
- Editorial Board Member, *Journal of Industrial and Management Optimization*, August 2012-August 2014.
- Editorial Board Member, *Journal of Global Optimization*, July 2009-Present.
- Referee for *Operations Research*, *Naval Research Logistics*, *European Journal of Operational Research*, *Networks*, *IIE Transactions*, *SIAM Journal on Optimization*, *Production and Operations Management*, *Risk Analysis*, *INFORMS Transactions on Education*, *Discrete Applied Mathematics*, *INFORMS Journal on Computing*, *Journal of Global Optimization*, *Annals of Operations Research*, *Computers and Industrial Engineering*, *Optimization Letters*, *Journal of the Operational Research Society*, and *Computers & Operations Research*.

Conference Activities

- Invited Session Chair, Institute of Industrial Engineers Annual Conference, 2009, 2010, 2012, 2014, 2015.
- Invited Session Chair, INFORMS Annual Meeting, 2007-2011, 2013, 2015.
- Session Chair, ISMP 2006.
- 27 invited conference presentations by me, 9 invited conference presentations by my students.

Other Professional Activities

- Member, The Teaching and Learning Collaboratory (TLC), Rensselaer Polytechnic Institute, January 2016-Present.
- Graduate Program Director, Department of Industrial and Systems Engineering, Rensselaer Polytechnic Institute, August 2015-Present.
- Member of the Graduate Advisory Committee, Department of Industrial and Systems Engineering, Rensselaer Polytechnic Institute, August 2013-Present.
- Academic Advisor for the 2012 Class of Industrial and Management Engineering undergraduate students.
- Member of the Undergraduate Advisory Committee, Department of Industrial and Systems Engineering, Rensselaer Polytechnic Institute, August 2008-May 2012.
- NSF Panelist, 2012, 2017.
- Grant proposal reviewer for the Air Force Office of Scientific Research, 2008.

Awards

- **2017 ISERC Best Paper Award**, Security Engineering Track, May 2017.
- **IISE OR Division Annual Award for Excellence in the Teaching of Operations Research**, Institute of Industrial Engineers Operations Research Division, May 2016.
- **Rensselaer Alumni Association Teaching Award**, Rensselaer Polytechnic Institute, October 2015.
- **School of Engineering Education Innovation Award**, Rensselaer Polytechnic Institute, May 2015.
- **Industrial and Systems Engineering Faculty Award for Excellence**, Rensselaer Polytechnic Institute, April 2015.
- **National Science Foundation CAREER Award**, November 2012.
- **Class of 1951 Outstanding Teaching Development Grant**, Rensselaer Polytechnic Institute, May 2012.
- **2010 IERC Best Paper Award**, Production Planning and Scheduling Track, June 2010.
- **National Science Foundation Graduate Research Fellowship**, August 2005-August 2008.
- **Graduate Student Award for Excellence in Research**, Department of Industrial and Systems Engineering, University of Florida, April 2007.
- **OEM Fellowship**, Department of Industrial and Systems Engineering, University of Florida, August 2004-August 2005.
- **Applied Mathematics Undergraduate Achievement Award**, Department of Applied Mathematics and Statistics, Johns Hopkins University, May 2004.