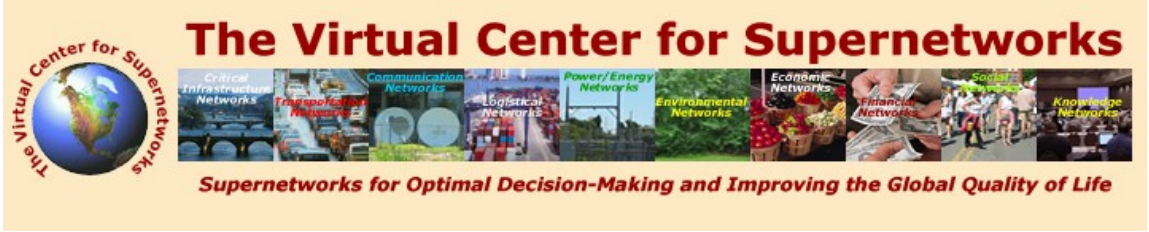

The Supernetwork Sentinel

Winter 2017

Welcome to the Winter 2017 edition of ***The Supernetwork Sentinel***, the newsletter of the Virtual Center for Supernetworks at the Isenberg School of Management, UMass Amherst. ***The Supernetwork Sentinel*** is published in Fall, Winter, and Summer editions. The newsletter's purpose is to keep you informed of events, activities, and successes of the Virtual Center for Supernetworks, the Center Associates, and the Supernetworks Laboratory for Computation and Visualization. In this newsletter, we report on a new book, conference presentations, and various accolades. As always, we also include a list of our recent Center publications.

Anna Nagurney
John F. Smith Memorial Professor
Director – Virtual Center for Supernetworks
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(l-r) Center Associates Professors Trisha Anderson, Anna Nagurney Sara Saberi, with Doctoral Student Center Associate Deniz Besik and Center Associate Professor Patrick Qiang at the INFORMS Conference in Nashville, Tennessee

(l-r) Center Director and Professors Rae Zimmerman and Quanyan Zhu after her keynote talk at New York University

Doctoral Student Center Associate with Keynote Speaker Professor Dimitri Bertsekas of MIT at INFORMS Computing Society Conference in Austin, Texas

Inside

The Center Director Keynotes Conference at NYU

The Center Director was a keynote speaker at the Conference on Decision and Game Theory in Security, which took place at the Tandon School of Engineering at New York University (NYU), November 2-4, 2016. The title of her keynote talk was: **Game Theory Models of Cybercrime and Cybersecurity Investments Under Network Vulnerability.** Her keynote talk presentation can be downloaded here.

Her host at the conference, and the General Chair, was Professor Quanyan Zhu of NYU. The conference was an intellectual feast and brought top game theorists who work on security from across the globe together. The caliber of the paper presentations was very high. Also, the social engagements were wonderful as was the conference banquet held at the NYU Faculty Club.

Information on the conference can be viewed here.

Professor Anna Nagurney giving her keynote talk

The Attendees at the Game Theory and Security Conference at NYU

Center Associates Shine at INFORMS Conferences – Garner Awards

The Annual National INFORMS (Institute for Operations Research and the Management Sciences) Conference took place this year in Nashville, Tennessee, November 13-16, 2016. Supernetwork Center Associates presented many papers and were also recognized with awards.

Also, just prior to the conference, Doctoral Student Center Associate Shivani Shukla took part in the Future Academicians Doctoral Colloquium organized by INFORMS in Nashville.

Besides the professional activities, the Center Associates also enjoyed social activities.

Center Associates dining together in Nashville

(l-r) Professors Trisha Woolley, Patrick Qiang, and Sara Saberi at the WORMS (Women in Operations Research and the Management Sciences) Awards Lunch at the conference

The Center Director with several INFORMS Fellows at the Fellows Award Luncheon

The Center Director organized a session on Novel Applications of Network Optimization in which Center Associate Professor Dong "Michelle" Li of Arkansas State University presented their paper, **A General Multitiered Supply Chain Network Model of Quality Competition with Suppliers**. This paper was published in the *International Journal of Production Economics* in 2015. Also, in the same session Center Associate Professor Zugang "Leo" Liu of Pennsylvania State University Hazleton presented a paper, joint with J. Wang: **Supply Chain Network Equilibrium with Strategic Financial Hedging Using Futures Contracts.**

In addition, Center Associate Professor Ding Zhang, of SUNY Oswego, presented the paper: **A Time-space Network Model for Medical Resources Allocation in an Epidemic Outbreak** in the session. Concluding the session was a talk given by the Center Director on joint work with Emilio Allvarez Flores and Ceren Soylu, **A Generalized Nash Equilibrium Network Model for Post-disaster Humanitarian Relief**. This paper appears as the lead article in the journal *Transportation Research E* in the November 2016 issue.

Center Associate Professor Sara Saberi of Worcester Polytechnic Institute chaired a session on Service Science and presented the paper, coauthored with the Center Director and T. Wolf: **A Network Economic Game Theory Model of a Service-oriented Internet with price and Quality Competition in Both Content and Network Provision**. This paper was published in the INFORMS journal *Service Science* in 2014.

Doctoral Student Center Associate Shivani Shukla presented in the session: Optimization in Cyber Defense organized by Dr. Les Servi of MITRE Corp. She spoke on joint work with the Center Director and with Center Associate Professor Patrizia Daniele of the University of Catania in Italy. The title of their paper: **A Supply Chain Network Game Theory Model of Cybersecurity Investments with Nonlinear Budget Constraints.** This paper was published in the first issue of 2017 in the *Annals of Operations Research.*

Center Associate Professor Dmytro Matsypura from the University of Sydney in Australia gave two presentations at the INFORMS conference: **Using Critical Component Detection in Graphs for Wildfire Fuel Management** and **Solution Approaches to Network Design Problems with Decision Dependent Uncertainty**, joint with N. Richmond, and P. Krokhmal.

Center Associate Professor Amir H. Masoumi of Manhattan College presented a joint paper with Center Associate Professor Min Yu of the University of Portland: **Analysis of Blood Banking Operations at the Time of Low Demand**.

Center Associate Professor Jose Cruz of the University of Connecticut organized a session for the INFORMS conference on Sustainable and Responsible Supply Chain Management in which he and Center Associate Professor Trisha Anderson of Texas Wesleyan University spoke. Professor Cruz's talk was on: **Social Responsibility Investments: Financial Networks Analysis**. Professor Anderson's talk was on: **Corporate Environmental and Social Responsibility in Supply Chains: Exploring Actions and Performance.**

It was special to see the book, *Competing on Supply Chain Quality: A Network Economics Perspective*, co-authored by Professors Dong Li and Anna Nagurney on display at the Springer booth at the conference.

(l-r) Professors Dong Li and Anna Nagurney

Another highlight of the INFORMS conference was having the UMass Amherst INFORMS Student Chapter recognized with its 11th award from INFORMS in as many years with even alums coming back for the ceremony and reception that followed. The Center Director has served as the Faculty Advisor to this chapter since 2004 and many Doctoral Student Center Associates have served as officers of this chapter.

Center Associates, Students, and UMass Faculty with the Award Plaque

In addition, the Center Director was recognized with the Inaugural Distinguished Service Award from INFORMS, which she was given by the award committee chair, Professor Lauren Davis.

(l-r) Professors Anna Nagurney and Lauren Davis

Doctoral Student Center Associate Deniz Besik gave her first presentation as a doctoral student at the INFORMS Computing Society Conference, which was held in Austin, Texas, January 15-17, 2017. Deniz's talk was based on the paper, **Quality in Competitive Fresh Produce Supply Chains with Application to Farmers' Markets,** co-authored with Professor Anna Nagurney.

Deniz Besik presenting at the INFORMS Computing Society Conference in Texas

Many the Center Associate conference presentations can be accessed here.

Competing on Supply Chain Quality Book Finalist for Book Award

The book, *Competing on Supply Chain Quality: A Network Economics Perspective,* co-authored by Professors Dong "Michelle" Li and Anna Nagurney, was a finalist for the Ouvrages Primes aux Plumes des Achate 2016, which is an annual award given in France for the best supply chain book published that year.

Although the book did not receive the award it was a great honor to have the book nominated for the award. Information on the award and the nominees is available on the link below.

http://plumes-des-achats.com/wp-content/uploads/2016/12/2016-12-08-communiqué-de-presse-Plumes-des-Achats-2016-003.pdf

Dynamics of Disasters Book Published

The book: *Dynamics of Disasters: Key Concepts, Models, Algorithms, and Insights,* co-edited by Professor Ilias S. Kotsireas of Wilfrid Laurier University in Canada, Professor Anna Nagurney, and Professor Panos M. Pardalos of the University of Florida, was published by Springer International Publishing Switzerland in December 2016.

The volume consists of a preface, written by the co-editors, as well as 18 refereed book chapters. The volume is an outgrowth of the Dynamics of Disasters Conference, held in Kalamata, Greece, June 29-July 2, 2016. Contributors to the volume include speakers at the conference as well as invited contributors, both academics and practitioners.

The book chapters address such topics such as network criticality and network complexity for assessment of critical infrastructure during disasters, evacuation modeling and betweenness centrality, tornado detection, selective routing for post-disaster needs assessment, the donation collections routing problem, collaboratiive incident planning, current earthquake and fire preparedness plans, and experiences with the Ebola crisis.

The Center Director with copies of the book

The Center Director's paper in the volume is: **Freight Service Provision for Disaster Relief: A Competitive Network Model with Computations.** In addition, the paper of hers, co-authored with Center Associate Professor Ladimer S. Nagurney of the University of Hartford, also appears therein: **A Mean-Variance Disaster Relief Supply Chain Network Model for Risk Reduction with**

Stochastic Link Costs, Time Targets, and Demand Uncertainty.

Professor Ladimer S. Nagurney with his copy of the book

More information on the book is available on the publisher's webpage.

The next Dynamics of Disasters conference will be held in Kalamata, Greece, July 5-9, 2017. The co-organizers are the co-editors of this book as well as Professor Fuad Aleskerov of Russia. Center Associates Professor Tina Wakolbinger of the Vienna University of Economics and Business and Professor Patrizia Daniele of the University of Catania in Italy are serving on the conference program committee. Information on this conference can be found on the link below. http://www.caopt.com/DOD2017/

Blood Supply Chains in The Conversation

Professor Anna Nagurney's article**, Uncertainty in Blood Supply Chains Creating Challenges for Industry,** which was published in *The Conversation* on January 8, 2017, has generated a lot of interest. The article was reprinted in *Salon*, *The San Francisco Chronicle*, as well as other publications.

She has conducted research on blood supply chains with Professors Amir H. Masoumi and Min Yu. who, along with Professor Ladimer S. Nagurney, are her co-authors of the book, *Networks Against Time: Supply Chain Analytics for Perishable Products*, which was published in 2013 by Springer. She is also working with doctoral candidate in Management Science Pritha Dutta on various aspects of blood supply chains.

Professor Anna Nagurney was interviewed by Karen Brown of New England Public Radio on challenges in this industry and the interview should are soon.

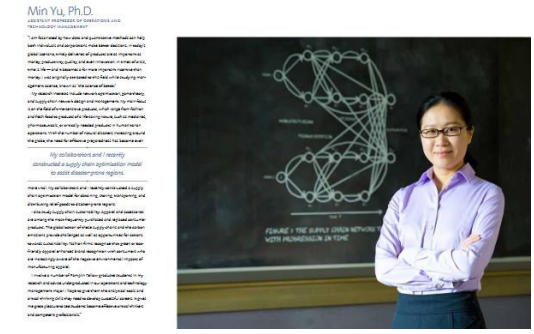
Kudos and News

Congratulations to Center Associate Professor Sara Saberi who completed her first semester as a tenure-track Assistant Professor at the Foisie School of Business at the Worcester Polytechnic Institute (WPI) in Massachusetts. Professors Anna and Ladimer S. Nagurney had a chance to meet with her when they attended the New England Security Day at WPI on November 28, 2016.

Center Associate Professor Patrizia Daniele is serving on the program committee of the 6th International Conference on Operations Research and Enterprise Systems, in Porto, Portugal, February 23-25, 2017. Her paper, **Cybersecurity Investments with Nonlinear Budget Constraints: Analysis of the Marginal Expected Utilities,** with Professors Maugeri and Anna Nagurney, is in press in *Operations Research, Engineering, and Cyber Security: Trends in Applied Mathematics and Technology*, Th.-M. Rassias and N.J. Daras. Eds., Springer (2017).

Also, Professor Patrizia Daniele is co-editing a special issue of the *Journal of Global Optimization* devoted to Variational Inequalities, Nash Equilibrium Problems and Applications.

Congratulations to Center Associate Professor Min Yu who was one of a handful of faculty featured for their research in the University of Portland's Community of Scholars publication. Professor Yu works on time-sensitive supply chain networks with numerous applications from healthcare to fast fashion to disaster relief.



Professor Min Yu at the University of Portland Pamplin School of Business

Center Associate Professor Patrick Qiang of Penn State University Malvern is spending his sabbatical at Tongji University in China where he will be researching sustainable supply chains and sustainable financial networks. His paper, **A Closed-Loop Supply Chain Equilibrium Model with Random and Price-Sensitive Demand and Return,** co-authored with Y. Hamdouch and K. Ghoudi, is in press in the journal *Networks and Spatial Economics.*

Center Associate Professor Ke "Grace" Ke of Central Washington University is also spending her sabbatical in China. She is an expert on financial networks.

Congratulations to Center Associate Dmytro Matsypura of the University of Sydney in Australia on the publication of the following papers: **Does Portfolio Margining Make Borrowing More Attractive?**, *International Review of Financial Analysis* (2016), **43**, 128-134 (with L. Pavels) and **Estimation of Hierarchical Archimedean Copulas as a Shortest Path Problem,** *Economics Letters* (2016), **149**, 131-134 (with E. Neo and A. Prokhorov).

Congratulations to Center Associate Professor Dong Li. Her paper, **Supply Chain Performance Assessment and Supplier and Component Importance Identification in a General Competitive Multitiered Supply Chain Network Model,** co-authored with the Center Director was published in (2017), *Journal of Global Optimization,* **67(1)**, 223-250.

Center Associate Dr. Stavros Siokos, Managing Partner of ASTARTE Capital Partners in London, England, hosted a delegation from the Isenberg School of Management, including Dean Mark A. Fuller, on January 17, 2017. Dr. Siokos is very active in the Isenberg alumni network in Europe.

Congratulations to Shivani Shukla who successfully defended her doctoral dissertation proposal: **Game Theory for Security Investments in Cyber and Supply Chain Networks**, on October 31, 2016. The Center Director is chair of her dissertation committee.

Shivani Shukla with her dissertation committee post her proposal defense

Also, Shivani's paper, **Multifirm Models of Cybersecurity Investment Competition vs. Cooperation and Network Vulnerability,** co-authored with the Center Director (2017), is now in press in the *European Journal of Operational Research.* Plus, her paper, **A Supply Chain Network Game Theory Model of Cybersecurity Investments with Nonlinear Budget Constraints**, with the Center Director and Center Associate Professor Patrizia Daniele has been published in the *Annals of Operations Research* (2017), **248(1)**, 405-427.

Congratulations to Doctoral Student Center Associate Deniz Besik on the acceptance of her first journal article: **Supply Chain Network Capacity Competition and Outsourcing: A Variational Equilibrium Framework**, co-authored with the Center Director and Professor Min Yu, which is now in press in the *Journal of Global Optimization.*

Congratulations to Dr. Luis Andres Marentes, a good friend of the Center, who had worked with Professor Anna Nagurney and Professor Tilman Wolf on several NSF project related papers, on the successful defense of his doctoral dissertation on December 5, 2016 at La Universidad de Los Andes in Bogota, Colombia. Professors Wolf and Nagurney were both on his dissertation committee and Professor Nagurney attended the defense virtually.

Photo of Dr. Marentes with his committee post his dissertation defense

Congratulations to Dr. Mahyar Amirgholy, who received his PhD from UMass Amherst in February 2016 with Professor Eric Gonzales as his advisor, on his receipt of the 2017 Milton Pikarsky Outstanding Dissertation Award from the Council of University Transportation Centers in DC. The Center Director served on his dissertation committee. More information available here.

Center Associate Professor Tina Wakolbinger of the Vienna University of Economics and Business is helping to organize the second EURO Hope mini-conference in Vienna, June 29-30, 2017. This conference is also being supported by her university and the European Working Group on Humanitarian Logistics. Professor Wakolbinger serves as the Head of the Research Institute for Supply Chain Management at her university.

Congratulations to Center Associates Professor Amir H. Masoumi and Min Yu. Their paper, A Supply Chain Generalized Network Oligopoly Model for Pharmaceuticals Under Brand Differentiation and Perishability, co-authored with Professor Anna Nagurney and published in *Transportation Research E* **48,** (2012), 762-780,

is on the short list of most highly cited papers in the journal in the past 5 years.

Recent Center Publications

Please see our center articles at:
http://supernet.isenberg.umass.edu/dart.html

Supply Chain Network Capacity Competition and Outsourcing: A Variational Equilibrium Framework, A. Nagurney, M. Yu, and D. Besik, (2017), in press in the *Journal of Global Optimization.*

Multifirm Models of Cybersecurity Investment Competition vs. Cooperation and Network Vulnerability, A. Nagurney and S. Shukla (2017), in press in the *European Journal of Operational Research.*

Cybersecurity Investments with Nonlinear Budget Constraints: Analysis of the Marginal Expected Utilities, P. Daniele, A. Maugeri, and A. Nagurney, in press in *Operations Research, Engineering, and Cyber Security: Trends in Applied Mathematics and Technology*, Th.-M. Rassias and N.J. Daras. Eds., Springer (2017).

A Supply Chain Network Game Theory Model of Cybersecurity Investments with Nonlinear Budget Constraints, A. Nagurney, P. Daniele, and S. Shukla, *Annals of Operations Research* (2017), **248(1)**, 405-427.

Supply Chain Performance Assessment and Supplier and Component Importance Identification in a General Competitive Multitiered Supply Chain Network Model, D. Li and A. Nagurney (2017), *Journal of Global Optimization,* **67(1)**, 223-250.

A Generalized Nash Equilibrium Network Model for Post-Disaster Humanitarian Relief, A. Nagurney, E. Alvarez Flores, and C. Soylu, *Transportation Research E* (2016), **95**, 1-18.

Physical Proof of the Occurrence of the Braess Paradox in Electrical Circuits, L.S. Nagurney and A. Nagurney, *EPL* (*Europhysics Letters*) (2016), **28004**.

Introduction to the Volume: Dynamics of Disasters: Key Concepts, Models, Algorithms, and Insights, I.S. Kotsireas, A. Nagurney, and P.M. Pardalos, Springer International Publishing Switzerland (2016) i-xi.

Freight Service Provision for Disaster Relief: A Competitive Network Model with Computations, A. Nagurney, in *Dynamics of Disasters: Key Concepts, Models, Algorithms, and Insights*, I.S. Kotsireas, A. Nagurney, and P.M. Pardalos, Editors, Springer International Publishing Switzerland (2016), 207-229.

A Layered Protocol Architecture for Scalable Innovation and Identification of Network Economic Synergies in the Internet of Things, T. Wolf and A. Nagurney, , *Proceedings of the 2016 IEEE First International Conference on Internet-of-Things Design and Implementation (IoTDI)*, pp 141 – 151.

A Mean-Variance Disaster Relief Supply Chain Network Model for Risk Reduction with Stochastic Link Costs, Time Targets, and Demand Uncertainty, A. Nagurney and L.S. Nagurney, in *Dynamics of Disasters: Key Concepts, Models, Algorithms, and Insights*, I.S. Kotsireas, A. Nagurney, and P.M. Pardalos, Editors, Springer International Publishing Switzerland (2016), 231-255.

Towards Pricing Mechanisms for delay Tolerant Services, L. Marentes, T. Wolf, A. Nagurney, and Y. Donoso, *International Journal of Computers Communications & Control* (2016), **11(1)**, 77-89.

A General Multitiered Supply Chain Network Model of Quality Competition with Suppliers, D. Li and A. Nagurney, *International Journal of Production Economics* (2015), **170**, 336-356.

A Game Theory Model of Cybersecurity Investments with Information Asymmetry, A. Nagurney and L.S. Nagurney, *Netnomics* (2015), **16(1-2)**, 127-148.

A Supply Chain Game Theory Framework for Cybersecurity Investments Under Network Vulnerability, A. Nagurney, L.S. Nagurney, and S. Shukla, in *Computation, Cryptography, and Network Securit*y, N.J. Daras and M.T. Rassias, Editors, Springer International Publishing (2015), 381-298.

Supply Chain Network Competition in Price and Quality with Multiple Manufacturers and freight Service Providers, A. Nagurney, S. Saberi, S. Shukla, and J. Floden, *Transportation Research E* (2015), **77**, 248-267.

A Multiproduct Network Economic Model in Financial Services, A. Nagurney, *Service Science* (2015*),* **7(1)**, 70-81.

Design of Sustainable Supply Chains for Sustainable Cities, A. Nagurney, *Environment & Planning B* (2015), **42(1)**, 40-57.

A Supply Chain Network Game Theory Model with Product Differentiation, Outsourcing of Production and Distribution, and Quality and Price Competition, A. Nagurney and D. Li, *Annals of Operations Research* (2015), **228(1)**, 479-503.

An Integrated Disaster Relief Supply Chain Network Model with Time Targets and Demand Uncertainty, A. Nagurney, A.H. Masoumi, and M. Yu, in *Regional Science Matters: Studies Dedicated to Walter Isard,* edited by P. Nijkamp, A. Rose, and K. Kourtit, Springer International Publishing Switzerland (2015), 287-318.

Fashion Supply Chain Network Competition with Ecolabelling, A. Nagurney, M. Yu, and J. Floden, in *Sustainable Fashion Supply Chain Management: From Sourcing to Retailing*, T.-M. Choi and T.C.E. Cheng, Editors, Springer (2015), 61-84.

A Game Theory Model for a Differentiated Service-Oriented Internet with Duration-Based Contracts, A. Nagurney, S. Saberi, T. Wolf, and L.S. Nagurney, in *Proceedings of ICS 2015: Operations Research and Computing: Algorithms and Software for Analytics,* B. Borchers, J. P. Brooks, and L. McLay, Editors, INFORMS (2015), 15-29.

Securing the Sustainability of Global Medical Nuclear Supply Chains Through Economic Cost Recovery, Risk Assessment, and Optimization, Anna Nagurney, Ladimer S. Nagurney, and Dong Li, *International Journal of Sustainable Transportation* (2015), **9(6)**, 405-418.

A Network Economic Game Theory Model of a Service-Oriented Internet with Price and Quality Competition in Both Content and Network Provision, S. Saberi, A. Nagurney, and T. Wolf, *Service Science* (2014), **6(4)**, 229-250.

Supply Chain Network Competition in Time-Sensitive Markets, A. Nagurney, M. Yu, J. Floden, and L. S. Nagurney, *Transportation Research E* (2014), **70**, 112-127.

A Cournot-Nash-Bertrand Game Theory Model of a Service-Oriented Internet with Price and Quality Competition Among Network Transport Providers, A. Nagurney and T. Wolf, *Computational Management Science* (2014), **11(4)**, 475-502.

The Center Director and Center Associates thanks you for your support!

The Center Director

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John F. Smith Memorial Professor

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Dr. Dmytro Matsypura
Dr. Ladimer S. Nagurney
Dr. Qiang "Patrick" Qiang
Dr. Padma Ramanujam
Dr. Sara Saberi
Dr. Stavros Siokos
Dr. Tina Wakolbinger
Dr. Min Yu
Dr. Ding Zhang
Dr. Lan Zhao

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