

The Supernetwork Sentinel

Summer 2017

Welcome to the Summer 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 OpEd articles, major achievements, conference presentations, upcoming Dynamics of Disasters conference, 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
<http://supernet.isenberg.umass.edu>



(l-r) Pritha Dutta, Basilio Gentile of ETH Zurich after his talk, the Center Director, and Deniz Besik



Karen Li being recognized for her 21st Century Leaders Award
 Contents – Copyright 2017-© - University of Massachusetts Amherst

(l-r) Drs. Anna Nagurney, Sara Saberi, and Mzamo Mangaliso at the UMass Amherst Graduate Commencement



Inside

Center Director Invited to Venues Supported by the UNODC and NSF

Major Achievements by Center Associates

Supernetwork Center Associates Prominent at POMS Conference

Upcoming Dynamics of Disasters Conference

Game Theory and Disasters Plus Critical Infrastructure in *The Conversation*

Kudos and News

Recent Center Publications

Major Achievements by Center Associates

There have been several notable milestones that merit special recognition.

Congratulations to Shivani Shukla who, on May 10, 2017, successfully defended her doctoral dissertation: **Game Theory for Security Investments in Cyber and Supply Chain Networks**. The Center Director was the chair of her dissertation committee. Her committee members were: Professors Adams Steven, Hari Balasubramanian and Eric Gonzales. Both Professors Balasubramanian and Gonzales are from the College of Engineering at UMass Amherst. Dr. Shukla has accepted a tenure track Assistant Professorship offer from the School of Management at the University of San Francisco in California.



Shivani Shukla with her dissertation committee after her defense

In April 2017, Center Associate Dr. Michelle Li was awarded the College of Business Outstanding Undergraduate Teaching Award at Arkansas State University at a special awards dinner.



Dr. Michelle Li with her award and colleague Dr. Mello

Karen Li, an Operations and Information Management major at the Isenberg School of Management, successfully defended her honors thesis on April 28, 2017 at the state-wide Undergraduate Research Conference, which took place at the UMass Amherst Campus Center. The title of her thesis is: **Hospital Competition in Prices and Quality: A Variational Inequality Framework**. The Center Director was the chair of her committee with the Co-Chair being Professor Chaitra Gopalappa of the College of Engineering.



(l-r) Professors Gopalappa, Nagurney, and Karen Li

In addition, Professor Anna Nagurney nominated Karen for the 2017 21st Century Leaders Award at UMass Amherst and she was one of ten recipients of this prestigious award, given at the Undergraduate Commencement on May 12, 2017. Given that there were over 5,000 undergraduates receiving their degrees, this is a huge and very well-deserved honor.

That same evening, Karen was recognized with other awardees at a lavish banquet at UMass Amherst and three generations of her family attended.



(l-r) Isenberg School Dean Dr. Mark A. Fuller, Karen Li, Amherst Fire Chief Tim Nelson, the Center Director, and Associate Dean of Engineering Dr. Tilman Wolf

On May 12, 2017, Center Associate Professor Sara Saberi of the Foisie School of Business at WPI, took part in UMass Amherst Graduate Commencement at which she was presented with her diploma and the Center Director had the pleasure of hooding her. Dr. Saberi successfully defended her doctoral dissertation last summer and the Center Director chaired her dissertation committee. She has completed her first year as a tenure track Assistant Professor at the Foisie School.



Dr. Sara Saberi with her husband and the Professor Anna Nagurney

Supernetwork Center Associates Prominent at POMS Conference

[The Production and Operations Management Society \(POMS\) Conference took place this year May 5-8, 2017, in Seattle, Washington.](#)

Center Associate Professor Tina Wakolbinger of the Vienna University of Economics and Business organized several sessions on humanitarian logistics. Doctoral Student Center Associate Deniz Besik presented the paper, **Supply Chain Network Capacity Competition with Outsourcing: A Variational Inequality Framework**, which was co-authored with the Center Director and Center Associate Professor Min Yu of the Pamplin School of Business at the University of Portland in Oregon. This paper is now in press in the *Journal of Global Optimization*.

Also, Center Associate Professor Michelle Li presented a co-authored paper, also with the Center Director and Professor Yu: **Consumer Learning of Product Quality with Time Delay: Insights from Spatial Price Equilibrium Models with Differentiated Products**.

In addition, presenting at the conference were Center Associates Professor Zugang "Leo" Liu of Pennsylvania State University Hazleton and

Professor June Dong of the School of Business at SUNY Oswego. Professor Dong presented the paper, **Suppliers Risk Management and Robustness Analysis**, which is on joint work with Dr. Jun Ma. Professor Liu presented the paper, **Supply Chain Competition with Strategic Supplier Collaboration**, which is on joint work with Professor Jia Wang.



(l-r) Deniz Besik, Dr. Li, Dr. Wakolbinger, Dr. Toyasaki, and Dr. Liu



(l-r) Dr. June Dong and Dr. Min Yu at POMS in Seattle

Upcoming Dynamics of Disasters Conference

We are delighted that the 3rd International Dynamics of Disasters Conference will take place in Kalamata, Greece, July 5-9, 2017. Professor Anna Nagurney is co-organizing this conference with Professor Ilias S. Kotsireas of Wilfrid Laurier University in Canada, Professor Panos M. Pardalos of the University of Florida, and Professor Fuad Aleskerov of the Higher School of Economics in Russia. The Program Committee includes Center Associates Professor Tina

Wakolbinger and Professor Patrizia Daniele of the University of Catania in Italy. Professor Daniele has a co-authored paper on game theory and disaster relief that will be presented there with the Center Director, her student Valeria Caruso, and Emilio Alvarez Flores, who graduated from the Isenberg School of Management in May 2016 and is now working for Cisco. Professor Wakolbinger also will have a co-authored paper presented there and Center Associate Professor Dmytro Matsypura of the School of Business at the University of Sydney in Australia will present his work on wildfire fuel management, which is joint work with Professor Oleg Prokopyev of the University of Pittsburg.

Also taking part in the conference is Center Associate Professor Ladimer S. Nagurney of the University of Hartford, who will be speaking on disaster communications.

[Additional information on the conference as well as the schedule is available here.](#)

Prior to this conference, Professor Anna Nagurney will be speaking at the [EU RO Hope 2017 Conference in Vienna, Austria, which is being organized by Professor Tina Wakolbinger.](#)

Game Theory and Disasters Plus Critical Infrastructure in *The Conversation*

The Center Director, Professor Anna Nagurney, since the last edition of this newsletter in Winter 2017, has had two articles published in *The Conversation*. On March 9, 2017, her article, [How Disaster Relief Effort Could Be Improved with Game Theory](#), was published.

And, on April 19, 2017, her article, [Calculating Where America Should Invest in Its Transportation and Communication Networks](#), was published. Both articles were picked up by the Associated Press and published on numerous news sites, including phys.org.

On February 14, 2017, an interview conducted with Professor Anna Nagurney, inspired by her article on blood supply chains, [Uncertainty in Blood Supply Chains Creating Challenges for Industry](#), and published in *The Conversation* on January 8, 2017, [aired on Public Radio](#) and was also broadcast nationally afterwards.

She will be interviewed for a radio program in late July on critical infrastructure.

Kudos and News

Center Associate Professor Amir H. Masoumi of Manhattan College was the Chair of the Organizing Committee of the Business Analytics Competition, which took place at his college, May 21-23, 2017. This annual spring competition brings multiple undergraduate teams from across the US together to test their knowledge and to practice their skills in this area.

One of the judges in the competition was Center Associate Dong "Michelle" Li of the School of Business at Arkansas State University.

[More information on the competition can be found here.](#)

Congratulations to Center Associate Professor Ding Zhang of the School of Business at SUNY Oswego. His paper, **Strategic Design of a Competing Supply Chain Network for Markets with Deterministic Demands**, co-authored with S. Rezapour, R. Z. Farahani, and F. Mohammadust, received the *IMA Journal of Management Mathematics* Best Paper Prize 2016! Professor Zhang is hosting Dr. Bing Xu, February 2017-February 2018, as a Visiting Scholar and continuing his research on supply chain management.

Congratulations to Center Associate Professor Patrizia Daniele. Her paper, **Cybersecurity Investments with Nonlinear Budget Constraints: Analysis of the Marginal Expected Utilities**, joint with Professors Maugeri and Anna Nagurney, was published in *Operations Research, Engineering, and Cyber Security: Trends in Applied Mathematics and Technology*, N.J. Daras and Th.-M. Rassias. Eds., Springer (2017), 117-134. Also, her paper, **A Supply Chain Network Game Theory Model of Cybersecurity Investments with Nonlinear Budget Constraints**, with Professor Anna Nagurney and Shivani Shukla, was published in the *Annals of Operations Research* (2017), **248(1)**, 405-427.



The Center Director with other speakers on Expert Panel in DC on March 2, 2017

On March 2, 2017, the Center Director gave a keynote talk, [A Scientific Approach to Financial Supernetworks](#), as part of an International Expert Panel in Washington DC. The expert panel was organized and supported by the UNODC, the OSCE, and Drexel University.

Center Associate Professor Ladimer S. Nagurney presented the paper, **Observation of the Braess Paradox in Electric Circuits**, at the American Physical Society (APS), March Meeting, in New Orleans, Louisiana, March 13-17, 2017. The presentation was based on a paper co-authored with Professor Anna Nagurney.



Dr. Ladimer S. Nagurney at the APS Meeting

Center Associates presented three papers at the NEDSI Conference, March 22-25, 2017, in Springfield, Massachusetts. Shivani Shukla presented the paper, **A Game Theory Model for Freight Service Provision Security Investments for High-Value Cargo**, which was co-authored by Center Associates Professors Anna Nagurney, Ladimer S. Nagurney and Sara Saberi.



Shivani Shukla presenting her paper at NEDSI

Deniz Besik presented the paper, **Supply Chain Network Capacity Competition with Outsourcing: A Variational Equilibrium Framework**.



Also, at NEDSI, Pritha Dutta, presented the paper: **Competition for Blood Donations: A Nash Equilibrium Network Framework**, which is joint with the Center Director. Pritha was recognized for her presentation with the First Place Award for the best presentation by a PhD student.



Pritha Dutta receiving the First Place Award at NEDSI from the conference organizer and judge

On April 14, 2017, the UMass Amherst INFORMS Student Chapter hosted a remarkable STEM Slam at UMass Amherst. The President this past year of the Student Chapter was Pritha Dutta. Deniz Besik also served as an officer. Professor Anna Nagurney is the Faculty Advisor of this award-winning INFORMS Student Chapter. This was a very successful event and a highlight of a year filled with guest lectures and other interesting activities. [More information on the student chapter can be found here.](#)



STEM Slam on April 14, 2017

On May 2, 2017, outstanding UMass Amherst INFORMS Student Chapter Officers were recognized with Service Awards.



Award Ceremony at the End of the Semester Party on May 2

On May 5-6, 2017, the Center Director was an invited participant in the NSF Workshop on Illicit Supply Networks, held at the University of Texas Austin. The workshop brought together social scientists and operations researchers to discuss possible solutions to human trafficking.



(l-r) Dr. Georgia-Ann Kludtke, the Center Director, Dr. Kayse Maass and Dr. Renata Konrad at the NSF Workshop

There will be another NSF workshop on this important topic in Washington DC in the Fall 2017.

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.

Professor Anna Nagurney will be a Summer Fellow at the Radcliffe Institute for Advanced Study at Harvard University. She was a Science Fellow at Radcliffe in 2005-2006. While at Radcliffe, she will be researching game theory and disaster relief.

Recent Center Publications

Please see our center articles at:

<http://supernet.isenberg.umass.edu/dart.html>

Quality in Competitive Fresh Produce Supply Chains with Application to Farmers' Markets, A. Nagurney and D. Besik (2017), in press in *Socio-Economic Planning Sciences*.

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, *European Journal of Operational Research* (2017), **260(2)**, 588-600.

Cybersecurity Investments with Nonlinear Budget Constraints: Analysis of the Marginal Expected Utilities, P. Daniele, A. Maugeri, and A. Nagurney, in *Operations Research, Engineering, and Cyber Security: Trends in Applied Mathematics and Technology*, N.J. Daras and Th.-M. Rassias. Eds., Springer (2017), 117-134.

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 Security*, 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.



Enjoying lunch on March 31, 2017 at the University Club with INFORMS Guest Speaker Dr. Ozlem Ergun of Northeastern University

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

The Center Director

Dr. Anna Nagurney
John F. Smith Memorial Professor

Center Associates

Dr. Trisha Anderson
Dr. Jose M. Cruz
Dr. Patrizia Daniele
Dr. June Dong
Dr. Ke "Grace" Ke
Dr. Dong "Michelle" Li
Dr. Zugang "Leo" Liu
Dr. Amir H. Masoumi
Dr. Dmytro Matsypura
Dr. Ladimer S. Nagurney
Dr. Qiang "Patrick" Qiang
Dr. Padma Ramanujam
Dr. Sara Saberi
Dr. Stavros Siokos
Dr. Shivani Shukla
Dr. Tina Wakolbinger
Dr. Min Yu
Dr. Ding Zhang
Dr. Lan Zhao

Doctoral Students

Deniz Besik
Pritha Dutta

Center Website:

<http://supernet.isenberg.umass.edu>

If you would like to be put on our email list, contact: supernet@isenberg.umass.edu