

# The Supernetwork Sentinel

## Winter 2018

Welcome to the Winter 2018 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 research achievements and impact, the INFORMS Conference, and the visit of Center Associate Professor Dmytro Matsypura from Australia. We also highlight upcoming events and speaking engagements. As always, we include a list of our recent Center publications.

Anna Nagurney  
 John F. Smith Memorial Professor  
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**Isenberg PhD alum and Center Associate Dr. Dmytro Matsypura visits the Supernetwork Lab accompanied by Center Associate Dr. Jose M. Cruz and Doctoral Student Center Associates**

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**Center Associates enjoying dinner in**



**Houston at the INFORMS conference**

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## Research Attracts Media Coverage – Makes Sustained Impact

The Supernetwork Center is focused not only on research, but on research that makes an impact. We are delighted to report that this research is being recognized in multiple ways.

For example, the paper, **Competitive Food Supply Chain Networks with Application to Fresh Produce**, which was published in the *European Journal of Operational Research* (2013), **224(2)**, 273-282, and was co-authored by Center Associate Professor Min Yu of the University of Portland and the Center Director, has been listed in the top most highly cited papers in this top journal in the past five years. This paper was also recognized by the Editors of the journal at the Euro Conference in Poznan, Poland, in 2016.

In addition, the paper, **The Closed-Loop Supply Chain Network with Competition, Distribution Channel Investment, and Uncertainties**, co-authored by Center Associates: Professor Qiang Qiang of the Pennsylvania State University Malvern, Professor Ke Ke of Central Washington University, Professor Trisha Anderson of Texas Wesleyan University, and Professor June Dong of SUNY Oswego, which was published in the journal *Omega* (2013), **41(2)**, 186-194, is among the most highly cited papers in this journal in the past five years! This is a tremendous achievement.



(l-r) Dr. Chaitra Gopalappa, the Center Director, and Karen Li at her honors thesis defense

A big congratulations to Karen Li, who is an Isenberg School alumna, class of 2017, and also was a recipient of the 21<sup>st</sup> Century Leaders Award last May at graduation, on the publication of the paper, **Hospital Competition in Prices and Quality: A Variational Inequality Framework**, A. Nagurney and K. Li, *Operations Research for Health Care* (2017), **15**, 91-101.

This paper was an outgrowth of her honors dissertation, whose committee, Professor Anna Nagurney co-chaired. Commonwealth Honors College at the University of Massachusetts Amherst [had a featured writeup on Karen's publication and accomplishments](#). Karen is now employed as a Clinical Research Coordinator by Brigham and Women's Hospital in Boston.

The Supernetwork Team continues to conduct research on blood supply chains with several seminal papers co-authored by Professor Amir H. Masoumi of Manhattan College, Professor Min Yu, and the Center Director, and with Doctoral Student Center Associate Pritha Dutta, who is working on various game theory aspects. Professor Anna Nagurney was interviewed by Karen Brown for New England Public Radio for a piece: **'Critical' Blood Shortage Comes Down to Weather, Flu and Supply Chain**. [The transcript of the interview and the link to the radio segment can be accessed here](#).

The segment was also rebroadcast on New Hampshire public radio and Vermont public radio.

## INFORMS Conference in Houston Serves as a Great Reunion Venue – Student Chapter Garners National Award

Despite Hurricane Harvey, which hit Texas in late August 2017, the [annual INFORMS conference did take place there, October 22-25, 2017, and it was a huge success](#). As is the tradition among our Supernetwork Center Associates, this annual conference serves as the venue for us to get together from locations far and wide. It was a very busy, exciting conference.



The Houston Convention Center – INFORMS Conference venue

[In the session on Networks and Supply Chains](#), organized by the Center Director, Center Associate Professor Patrick Qiang of Penn State Malvern spoke on his latest closed-loop

supply chain research; Doctoral Student Center Associate Deniz Besik presented on supply chain competition and outsourcing, joint with the Center Director and Center Associate Professor Min Yu. Also, Center Associate Professor Amir H. Masoumi spoke on mergers and acquisitions in blood banking systems (work with Professor Min Yu and the Center Director), and Center Associate Dong "Michelle" Li of Arkansas State University presented on consumer learning of product quality with time delay (with the Center Director and Professor Yu). All of these presentations, we are pleased to report, were on papers that have been recently published or are now in press. In particular, the paper presented by Deniz Besik was published in the *Journal of Global Optimization* in the volume displayed at the Springer booth. It was also exciting to see the *Competing on Supply Chain Quality* book, co-authored by the Center Director and Professor Michelle Li on display.



**The Center Director at the Springer booth**

In addition, Center Associate Professor Shivani Shukla from the University of San Francisco presented on her work with the Center Director on cybersecurity in a session organized by Dr. Les Servi of MITRE. The Center Director also presented on her disaster relief and game theory research, co-authored with Center Associate Professor Patrizia Daniele of the University of Catania in Italy, Emilio Alvarez Flores, and Valeria Caruso, [in an invited session.](#)

Doctoral Student Center Associate Pritha Dutta presented the paper: **Competition for Blood Donation: A Nash Equilibrium Network Framework** in [a session on Game Theory.](#)

The session: **Sustainable and Responsible Supply Chain Management** organized by Center Associate Professor Jose M. Cruz of the School of Business at the University of Connecticut had presentations by Professor Min Yu and also by Professor Sara Saberi of WPI.

Professor Dmytro Matsypura traveled from the University of Sydney in Australia to present his co-authored research in a session on **Network**

**Optimization.** Center Associate Professor Trisha Anderson of Texas Wesleyan University also presented a paper.



**Center Associates at INFORMS Houston after one of the many sessions that they spoke at**

[The full INFORMS Houston program can be searched here.](#)

Another highlight of this INFORMS Conference was that the University of Massachusetts Amherst INFORMS Student Chapter was recognized with its 12<sup>th</sup> award in as many years! The chapter received the Magna Cum Laude Award from INFORMS for its activities. Kudos and thanks to Doctoral Student Center Associate Pritha Dutta who served as the Chapter President last year and to this year's Chapter President, Doctoral Student Center Associate Deniz Besik, for their outstanding leadership of the chapter!



**The Center Director with Several Chapter Members and with Pritha Dutta holding the award plaque**

## **Professor Dmytro Matsypura Delivers Brilliant Lecture at Isenberg**

On November 3, 2017, we had the pleasure of hearing Center Associate Professor Dmytro Matsypura of the School of Business at the

University of Sydney in Australia deliver a brilliant lecture at the Isenberg School of Management in our INFORMS Speaker Series. Dr. Matsypura is an Isenberg School PhD alumnus and was on sabbatical last Fall.

Dr. Matsypura spoke on his latest research on a topic of great relevance -- that of wildfire fuel management. The talk was based on an article with the same title, **Wildfire Fuel Management: Network-based Models and Optimization of Prescribed Burning**, published in the *European Journal of Operational Research*, (2018), 264(2), 774-796. The article was co-authored by Professor Oleg A. Prokopyev of the University of Pittsburgh and an undergraduate student of Matsypura's: Aizat Zahar, who is from Malaysia and has since graduated.

Dr. Matsypura had the audience at the edges of their seats as he spoke about the number of wildfires in the past year in the US, and in Canada (over 50,000 each with millions of hectares burned) and how the model he constructed with Prokopyev and Zahar can assist in prescribed burning, while taking into consideration not only the biology of the fuel provided by the vegetation in the region, but also zones, and how often the prescribed burning takes place. He described in a very eloquent and commanding way the nonlinear equations underlying the model and how they can be linearized; how graphs can be used to represent zones in a region, and the role that network interdiction plays. The audience very much appreciated the way in which he presented different objective functions that the authors had explored and how this impacted the solutions as well as the computational results. In addition, he described a heuristic that was very effective.



**Group photo taken after Dr. Matsypura's presentation**

Dr. Matsypura noted that there are very few papers in this area and even mentioned that we can learn a lot from aborigines as to how to do prescribed burning. Australia has been doing prescribed burns for 30-40 years now and the goal is to burn on purpose so as to remove

"fuel" and to do it sustainably.

Dr. Matsypura was also interviewed by Doctoral Student Center Associate Pritha Dutta and [the interview is now posted on youtube](#). Posting of interviews with speakers is a terrific initiative begun this year by the President of the University of Massachusetts Amherst INFORMS Student Chapter, Doctoral Student Center Associate Deniz Besik. [An interview with Dr. Renata Konrad who spoke earlier last semester can be viewed here](#).

Joining us for lunch afterwards at the University Club was Center Associate Professor Amir H. Masoumi of Manhattan College.



**Lunch in honor of Professor Matsypura**

## **Center Director Appointed to KSE Academic Board**

Professor Anna Nagurney has been appointed to the International Academic Board of the Kyiv School of Economics (KSE) in Ukraine. The school is the top economics program in Ukraine and is similar to programs such as CEU, NES, and CERGE-EI. Many of the KSE alumni have top-level positions in the government. Chairing the KSE International Academic Board is Dr. Yuriy Gorodnichenko, who is an award-winning professor in the Department of Economics at the University of California – Berkeley.

The International Academic Board is set up to assure the quality and credibility of the educational programs and the analytical products of the School. It is a group of scholars who provide advice on and evaluation of the academic integrity of the KSE programmatic operations. Professor Anna Nagurney's appointment to the board is through 2021. Also joining the board is Professor Larry Samuelson of the Economics Department of Yale University. Professors Samuelson and Nagurney were both Visiting Fellows at All Souls College at Oxford University in England and overlapped there during the Trinity term in 2016.

## Upcoming Events and Speaking Engagements

This will be a very busy, event-packed semester. As part of the UMass Amherst INFORMS Speaker Series we will be hosting Professor Hari Balasubramanian of the Department of Mechanical and Industrial Engineering at UMass Amherst on February 9. Professor Balasubramanian is an expert on healthcare and we are very much looking forward to having him kickoff our "spring" semester Speaker Series. Then, on February 23, 2017, we are thrilled that Professor Jim Orlin of the Sloan School at MIT will be the guest speaker. Professor Orlin is renowned for his work on networks and is an INFORMS Fellow and we are delighted that he will be coming to Isenberg! On March 23, 2018, we will welcome Dr. Les Servi of Mitre Corp, who will be speaking in our series. Dr. Servi is an INFORMS Fellow and one of the most active INFORMS members. We are eagerly awaiting his visit and presentation. And, on March 30, 2018, we will be hosting the talk and visit of Professor Burcu Balcik who is renowned for her work on humanitarian logistics. Dr. Davit Khachatryan, an Isenberg PhD alum in Management Science, who has worked at PWC and is now at Babson College, will close out our Speaker Series on April 20, 2018.

On February 16, 2018, the Center Director will be speaking at the Foisie School of Business at WPI, and was invited by her former doctoral student, Center Associate Dr. Sara Saberi, who is now a professor there. The title of her talk is: **Game Theory Network Models for Disaster Relief**. Professor Anna Nagurney will also be giving an invited seminar at the University of Wisconsin Madison on April 6, 2018.

The Center Director will be giving two keynotes at conferences this spring: at the VINEPA 2018 Conference in Reggio Calabria, Italy, March 8-9 and at the 18<sup>th</sup> Swiss Transport Research Conference, Monte Verite Ascona, Switzerland, May 16-18, 2018. One of the chairs of the former conference is Center Associate Professor Patrizia Daniele of the University of Catania in Italy.

## Kudos and News

Congratulations to Center Associate Professor Patrizia Daniele who was promoted to Full Professor on October 1, 2017! Congratulations also to Professor Daniele on the publication of her paper, **A Network Model for Minimizing Total Organ Transplant Costs**, joint with her doctoral student, Valeria Caruso, which was published in the *European Journal of Operational Research* (2018), **266(2)**, 652-662. Also, Professor Daniele's paper, **Cybersecurity Investments with Nonlinear Budget**

**Constraints and Conservation Laws: Variational Equilibrium, Marginal Expected Utilities, and Lagrange Multipliers**, with G. Colajanni, S. Giuffre, and A. Nagurney (2017), is now in press in the *International Transactions in Operational Research*.

Congratulations to Center Associate Professor Sara Saberi of the Foisie School of Business at Worcester Polytechnic Institute (WPI) on the publication of her paper, **A Competitive Multiperiod Supply Chain Network Model with Freight Carriers and Green Technology Investment Option**, co-authored with the Center Director, Professor Joe Sarkis of WPI, and Center Associate Professor Jose M. Cruz of the School of Business at the University of Connecticut. The paper was published in the *European Journal of Operational Research* (2018), **266(3)**, 934-949.

Congratulations to Center Associate Professor Shivani Shukla who completed her first semester of her tenure track Assistant Professorship at the School of Management at the University of San Francisco in California!

Congratulations to Center Associate Professor Tina Wakolbinger on the publication of her paper, [Funds Allocation in NPOs: The Role of Administrative Cost Ratios](#), joint with her doctoral student Christian Burkart, and Professor Fuminori Toyasaki of York University in Canada, in the *Central European Journal of Operations Research* (Open Access) (2017). Professor Wakolbinger is on the Scientific Committee of the EURO HOPE miniconference, which will take place September 13-14, 2018, in Leuven, Belgium.

Kudos to Center Associate Dr. Stavros Siokos, Managing Partner of Astarte Capital Partners in London, England. Astarte Capital Partners was named "Most Innovative Manager of 2017" by the Institutional Asset Management awards. The award was presented November 15, 2017 at the Pierre Hotel in NYC.

Congratulations to Center Associate Professor Ding Zhang of SUNY Oswego on the publication of his paper, **The Influence of Reference Effect on Pricing Strategies in Revenue Management Settings**, joint with H. Yang and C. Zhang, which was published in the *International Transactions in Operational Research* (2017), **24(4)**, 907-924.

Congratulations to Center Associate Professor Dong "Michelle" Li of Arkansas State University and to Center Associate Professor Min Yu of the University of Portland. Their paper, co-authored with the Center Director, **Consumer Learning of Product Quality with Time Delay: Insights from Spatial Price Equilibrium**

**Models with Differentiated Products**, (2017), is in press in the journal *Omega*.

Also, a big congratulations to Professors Amir H. Masoumi and Min Yu on the publication of their paper, **Mergers and Acquisitions in Blood Banking Systems: A Supply Chain Network Approach**, *International Journal of Production Economics* (2017), **193**, 406-421. This paper was co-authored with the Center Director.

On November 17, 2017, the Center Director had the pleasure of speaking at the University of Alabama in Tuscaloosa and was sponsored, in part, by the INFORMS Speakers program. The topic of her presentation was cybersecurity.



(l-r) Dr. Burcu Keskin, the Center Director, and Dr. Karthik Murali at the University of Alabama

We are delighted to announce that Professors Ilias S. Kotsireas, Panos M. Pardalos, and Anna Nagurney have secured a contract with the publisher Springer and are in the process of co-editing another volume entitled: *Dynamics of Disasters: Algorithmic Approaches and Applications*. This volume contains a collection of refereed papers presented at the Dynamics of Disasters conference in Kalamata, Greece, July 5-9, 2017, as well as other contributions.

## Recent Center Publications

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

**A Competitive Multiperiod Supply Chain Network Model with Freight Carriers and Green Technology Investment Option**, S. Saberi, J.M. Cruz, J. Sarkis, and A. Nagurney, *European Journal of Operational Research* (2018), **266(3)**, 934-949.

**Cybersecurity Investments with Nonlinear Budget Constraints and Conservation Laws: Variational Equilibrium, Marginal Expected Utilities, and Lagrange Multipliers**, G. Colajanni, P. Daniele, S. Giuffre, and A.

Nagurney (2017), in press in the *International Transactions in Operational Research*.

**Consumer Learning of Product Quality with Time Delay: Insights from Spatial Price Equilibrium Models with Differentiated Products**, D. Li, A. Nagurney, and M. Yu (2017), in press in *Omega*.

**A Variational Equilibrium Network Framework for Humanitarian Organizations in Disaster Relief: Effective Product Delivery Under Competition for Financial Funds**, A. Nagurney, P. Daniele, E. Alvarez Flores, and V. Caruso, to appear in *Dynamics of Disasters: Algorithmic Approaches and Applications*, I.S. Kotsireas, P.M. Pardalos, and A. Nagurney, Editors, Springer International Publishing Switzerland.

**Hospital Competition in Prices and Quality: A Variational Inequality Framework**, A. Nagurney and K. Li, *Operations Research for Health Care* (2017), **15**, 91-101.

**Quality in Competitive Fresh Produce Supply Chains with Application to Farmers' Markets**, A. Nagurney and D. Besik, *Socio-Economic Planning Sciences* (2017), **60**, 62-76.

**A Multitiered Supply Chain Network Equilibrium Model for Disaster Relief with Capacitated Freight Service Provision**, A. Nagurney, presented at the 3rd International Conference on Dynamics of Disasters, Kalamata, Greece, July 5-9, 2017.

**Mergers and Acquisitions in Blood Banking Systems: A Supply Chain Network Approach**, A.H. Masoumi, M. Yu, and A. Nagurney, *International Journal of Production Economics* (2017), **193**, 406-421.

**Supply Chain Network Capacity Competition and Outsourcing: A Variational Equilibrium Framework**, A. Nagurney, M. Yu, and D. Besik, *Journal of Global Optimization* (2017), **69(1)**, 231-254.

**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.

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

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