

The Supernetwork Sentinel

Winter 2019

Welcome to the Winter 2019 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 major speaking engagements, honors and accolades, as well as upcoming events. As always, we include a list of our recent Center publications.

Anna Nagurney
 John F. Smith Memorial Professor
 Director – Virtual Center for Supernetworks
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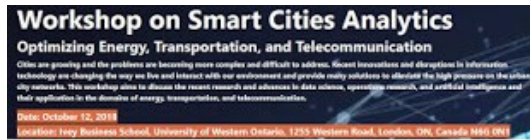
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Recent Center Publications

Smart Cities Analytics Workshop in Canada

On October 11, 2018, the Center Director had the pleasure of being a keynote speaker at the Workshop on Smart Cities Analytics held at the Ivey School of Business on London, Ontario,



Speakers



Arna Nagurney
University of Massachusetts
Amherst



Ivana Ljubic
ESSEC Business School



Pierre Pinson
Technical University of Denmark



Chanthanya Bandi
Kellogg School of Management



Hari Mahmassani
Northwestern University



Xianbin Wang
University of Western Ontario



Robert Shorten
University College Dublin

Canada. The workshop was organized by Professor Joe Naoum-Sawaya and Professor Bissan Ghaddar.

Her talk was entitled: **Sustainable Supply Chains for Sustainable Cities**. [This and other presentations can be downloaded from the Supernetwork Center site.](#)

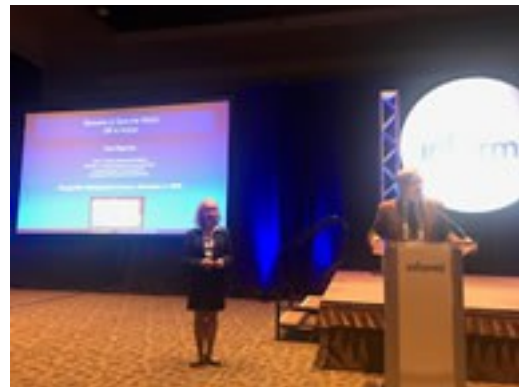
The format of the workshop, with 45 minute presentations, allowed for deep and very stimulating discussions.



Group photo after the Smart Cities Analytics Workshop

INFORMS Conference in Phoenix Serves as Terrific Reunion Venue

This year's Annual INFORMS Meeting took place in Phoenix, Arizona, November 4-7, 2018 with approximately 6,000 conferees. The [Center Director was among the plenary/keynote speakers](#) and was very honored to deliver the Omega Rho Distinguished Lecture at the conference. The title of her plenary talk was: [Networks to Save the World: OR in Action](#).



Professor Nagurney being introduced by Professor Tim Anderson prior to her Omega Rho Lecture

She was especially delighted to see several Center Associates in the audience of about 2,000 and many wonderful colleagues!



Photo taken after the Omega Rho Lecture at INFORMS Phoenix

In addition to numerous presentations delivered by Center Associates at this conference, [the UMass Amherst INFORMS Student Chapter received](#) the Cum Laude Award from INFORMS at the conference. Special congratulations to Doctoral Student Center Associate Deniz Besik, who served as the Chapter's President last year, and to Doctoral Student Center Associate

Mojtaba Salarpour, who served as the Chapter's Communication Director.



Doctoral Student Center Associates Pritha Dutta and Deniz Besik with Chapter Members and their Award

This is the 12th consecutive award from INFORMS that the Chapter has received. The Center Director Professor Anna Nagurney has been serving as the Faculty Advisor of the Chapter since its inception in 2004. [The Chapter is involved in organizing a Speaker Series and also social and other professional events and its members come from the Isenberg School of Management and the College of Engineering at UMass Amherst.](#)



Center Associates get together for a dinner hosted by the Center Director at INFORMS Phoenix

The Center Associates were very visible and active at this conference, presenting talks, serving on panels, and also on prize committees.

Center Associate Professor Jose M. Cruz of the School of Business at the University of Connecticut organized the session: **Sustainability and the Triple Bottom Line: Social, Environmental (or Ecological) and Financial**, at which Center Associates Professor Dong "Michelle" Li of Babson College, Professor Shivani Shukla of the University of San Francisco, and Doctoral Student Center Associates Deniz Besik and Pritha Dutta

presented their research, the latter two on work conducted with the Center Director.

Also, in an invited session on **Game Theory and Networks**, organized by colleagues at MIT, Professor Shivani Shukla presented the paper, **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.

In addition, in the invited session, **Transportation Problems with Public Impact**, organized by colleagues at Georgia Tech, Doctoral Student Center Associate Deniz Besik presented a paper co-authored with the Center Director and Professor Min Yu of the University of Portland, **Dynamics of Quality as a Strategic Variable in Complex Food Supply Chain Network Competition: The Case of Fresh Produce**, published in *Chaos* 28: (2018), 043124.

Professor Dmytro Matsypura of the University of Sydney in Australia presented the paper, **Exact IP-Based Approaches for the Longest Induced Path Problem**, which is joint work with A. Veremyev, O. Prokopyev, and E. Pasiliao.

Center Associate Professor Patrick Qiang of Pennsylvania State University Great Valley presented the co-authored paper, **A Mathematical Programming Model With Equilibrium Constraints For Competitive Closed Loop Supply Chain Network Design.**



Journal of Global Optimization Editorial Board meeting at INFORMS Phoenix with Center Associate Professor Dmytro Matsypura and the Center Director present

Center Director Speaks at the Congreso Futuro in Chile

Professor Anna Nagurney had the great honor and pleasure of speaking at the extraordinary [2019 Congreso Futuro, which took place in Chile](#)

from [January 14-20](#). She was invited to speak at this truly unique Congress last April via a formal letter from [Senator \(Senador\) Guido Girardi Lavín](#), President, Future Challenges, Science, Technology and Innovation Commission, who was writing on behalf of the Chilean Congress, the Government of the Republic of Chile, and the Chilean Academy of Sciences. This year's Congress was the eight annual one and the Congress has become the most important free and open-access scientific forum in Latin America. The Futuro Congreso is unique in the region for providing Nobel laureates, scientists, researchers, artists, opinion leaders and citizens alike the opportunity to experience some of the world's most cutting-edge research, participate in the understanding of emerging trends and actively engage in the innovation of ideas and debates that directly influence the globe.



The stunning venue of the Congreso Futuro in Santiago, Chile

The Congreso Futuro was a transformative event and experience [with about 100 presenters from around the globe](#). The attention to detail was incredible, with an individual itinerary provided for each speaker plus each speaker was assigned a student volunteer. The Congress consists of TED-like talks as well as panels and Professor Nagurney thoroughly enjoyed sessions on topics ranging from artificial intelligence to climate change to food insecurity.

In addition to snacks and lunches provided to the speakers there was even a magnificent banquet hosted by the Chilean President Sebastián Piñera at the Presidential Palace in Santiago.

The Center Director had the pleasure of speaking in Santiago on January 15 and then at [one of the regional venues in Valparaiso on January 17](#). At the former, she was part of a session on *Making Sense of Complexity Through Simplicity* that included Daniel Hurtado of the Pontificia Universidad Católica de Chile, Robert Sutor of IBM, and Brian Farrell of Harvard University. Her talk in Santiago was on [The Era of Supernetworks](#) and it was livestreamed. Her presentation in Valparaiso was on [Women in](#)

[Science: A Personal Journey](#) and [the video can be accessed here \(with Spanish translation\)](#).



The Center Director with Nobel laureate Dr. Michael Kosterlitz and his wife at the Presidential Palace in Santiago, Chile

Joining her in Valparaiso at the National Congress were [the Nobel laureate Michael Kosterlitz, Professor at her alma mater Brown University, Amber Case, and Floyd Romesberg](#).

Each talk was followed by a very stimulating panel and discussions.



Professor Anna Nagurney speaking at the Congreso Futuro in Valparaiso, Chile



Group photo of speakers with 8 Latin American ambassadors at lunch after Congreso Futuro Valparaiso



With other speakers at the Congreso Futuro after the banquet at the Presidential Palace in Santiago, Chile

The Center Director is grateful to Senator Guido Girardi Lavín for an extraordinary scientific, cultural, and social week and she thanks the organizers, speakers, and volunteers for lasting memories. She had the pleasure of being interviewed by several journalists, including Macarena Pizarro of CNN Chile.

Upcoming 50th Anniversary of the Isenberg PhD Program

On April 5, 2019, the Isenberg School of Management will [celebrate the 50th anniversary of its doctoral program](#). Many of the special events that day will take place in the new \$62 million Business Innovation Hub. We are delighted that Center Associate Professor Tina Wakolbinger of the Vienna University of Economics and Business will be one of two keynoters at the dinner that evening with the other keynoter being Dr. Dennis Hanno, the President of Wheaton College in Massachusetts. This is an extraordinary honor!

The Center Director, who is again serving as the Management Science Area Coordinator of the PhD Program, is pleased that several Center Associates will be speaking on a panel that day that she organized: Professor Patrick Qiang of Penn State Malvern, Professor Jose M. Cruz of the University of Connecticut, and Center Associate Dr. Padma Ramanujam of SAS. Joining them will be alums Professor Davit Khachatryan of Babson College and Professor Shenghan Xu of the University of Idaho!

Also, other Center Associates will be returning to campus for this special celebration, including Center Associate Professor Dong "Michelle" Li of Babson College and Center Associate Professor Amir H. Masoumi of Manhattan College. Doctoral Student Center Associates Deniz Besik, Pritha

Dutta, and Mojtaba Salarpour will also be present at the anniversary event.

Kudos and News

Congratulations to Center Associate Professor Patrizia Daniele of the University of Catania in Italy! She is serving as a Member of the Program Committee of EURO 2019 in Dublin, Ireland, which will take place June 23-26, 2019. Several Center Associates will be speaking at this conference and the Center Director will give a tutorial on: **Game Theory and Variational Inequalities: From Transportation and Supply Chains to Financial Networks and the Internet.**

Congratulations to Center Associate Professor Ding Zhang of SUNY Oswego on the acceptance of his co-authored paper, **Integrated Optimization Model for Distribution Network Design: A Case Study of the Clothing Industry**, in the *International Transactions in Operational Research!*

Congratulations to Center Associate Professor Zugang Liu of Penn State Hazleton on the publication of his paper, **Supply Chain Network Equilibrium with Strategic Supplier Investment: A Real Options Perspective**, co-authored with Professor Jia Wang, in the *International Journal of Production Economics* in vol. 28 (2019). Also, congrats to them on the publication of their paper, **Supply Chain Network Equilibrium with Strategic Financial Hedging Using Futures**, in the *European Journal of Operational Research* (2019), **272(3)**, 962-978.

Congratulations to Center Associate Professor Patrick Qiang on the publication of his co-authored paper, **Product and Service Design for Remanufacturing, Uncertainty, and the Environmental Impact in the Closed-Loop Supply Chain Network**, in the edited volume, *Advances in Service Science*, Springer, 2019. He is serving on the Program Committee of ICSS2019: 2019 INFORMS Conference on Service Science, Nanjing University of Aeronautics and Astronautics, Nanjing, China, June 27-29, 2019.

Congratulations to Doctoral Student Center Associate Mojtaba Salarpour on the acceptance of his first paper, **An Integrated Financial and Logistical Game Theory Model for Humanitarian Organizations with Purchasing Costs, Multiple Freight Service Providers, and Budget, Capacity, and Demand Constraints**, co-authored with the Center Director and Center Associate Professor Patrizia Daniele. The paper was accepted in the *International Journal of Production Economics*

(2019). This paper will be presented at the POMS Conference in Washington DC in May.

Congratulations to Doctoral Student Center Associate Deniz Besik, whose paper, **Tariffs and Quotas in World Trade: A Unified Variational Inequality Framework**, co-authored with the Center Director and Center Associate Professor June Dong of SUNY Oswego, was published in the *European Journal of Operational Research* (2019), **275(1)**, 347-360.

Kudos to Timo Gossler, the doctoral student of Center Associate Professor Tina Wakolbinger, whose paper, **How to Increase the Impact of Disaster Relief: A Study of Transportation Rates, Framework Agreements and Product Distribution**, co-authored with Professors Wakolbinger, Anna Nagurney, and Patrizia Daniele, was published in the *European Journal of Operational Research* (2019), **274(1)**, 126-141.

Kudos also to Center Associates Professors Shivani Shukla of the University of San Francisco, Sara Saberi of WPI, and Ladimer S. Nagurney of the University of Hartford on the publication of their paper, **A Game Theory Model for Freight Service Provision Security Investments for High-Value Cargo**, co-authored with the Center Director, in *Economics of Transportation* (2018), **16**, 21-28. This paper is one of the most downloaded in the journal.

On October 5, 2018, the Center Director delivered a seminar on **Game Theory Network Models for Disaster Relief** at the University of Michigan in Ann Arbor. She very much enjoyed seeing colleagues there and meeting with doctoral students.



The Center Director with doctoral students in Industrial and Operations Engineering at the University of Michigan

Center Associate Professor Sara Saberi of WPI is serving as the Secretary of WOMRS (Women in Operations Research and the Management Sciences). Congratulations to her on her appointment to the Editorial Board of *Transportation Research E*.

Congratulations to Doctoral Student Center Associate Pritha Dutta on the successful defense of her doctoral dissertation proposal: **Blood Supply Chain Networks in Healthcare: Game Theory Models and Numerical Case Studies**.

Recent Center Publications

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

An Integrated Financial and Logistical Game Theory Model for Humanitarian Organizations with Purchasing Costs, Multiple Freight Service Providers, and Budget, Capacity, and Demand Constraints, Anna Nagurney, Mojtaba Salarpour, and Patrizia Daniele, accepted for publication in the *International Journal of Production Economics* (2019).

Supply Chain Network Competition Among Blood Service Organizations: A Generalized Nash Equilibrium Framework, A. Nagurney and P. Dutta, *Annals of Operations Research* (2018), in press.

Competition for Blood Donations, A. Nagurney and P. Dutta, *Omega* (2018), in press.

Tariffs and Quotas in World Trade: A Unified Variational Inequality Framework, Anna Nagurney, Deniz Besik, and June Dong, *European Journal of Operational Research* (2019), **275(1)**, 347-360.

How to Increase the Impact of Disaster Relief: A Study of Transportation Rates, Framework Agreements and Product Distribution, Timo Gossler, Tina Wakolbinger, Anna Nagurney, and Patrizia Daniele, *European Journal of Operational Research* (2019), **274(1)**, 126-141.

A Game Theory Model for Freight Service Provision Security Investments for High-Value Cargo, Anna Nagurney, Shivani Shukla, Ladimer S. Nagurney, and Sara Saberi, *Economics of Transportation* (2018), **16**, 21-28.

Dynamics of Quality as a Strategic Variable in Complex Food Supply Chain Network Competition: The Case of Fresh Produce, A. Nagurney, D. Besik, and M. Yu, *Chaos* 28: (2018), 043124.

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, *International Transactions in Operational Research* (2018), **25(5)**, 1443-1463.

Consumer Learning of Product Quality with Time Delay: Insights from Spatial Price Equilibrium Models with Differentiated Products, D. Li, A. Nagurney, and M. Yu, *Omega* (2018), **18**, 150-168.

Preface to Volume: Dynamics of Disasters: Algorithmic Approaches and Applications, in *Dynamics of Disasters: Algorithmic Approaches and Applications*, I.S. Kotsireas, P.M. Pardalos, and A. Nagurney, Editors, Springer International Publishing Switzerland (2018), pp v-viii.

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, in *Dynamics of Disasters: Algorithmic Approaches and Applications*, I.S. Kotsireas, P.M. Pardalos, and A. Nagurney, Editors, Springer International Publishing Switzerland (2018), pp 109-133.

A Multitiered Supply Chain Network Equilibrium Model for Disaster Relief with Capacitated Freight Service Provision, A. Nagurney, in *Dynamics of Disasters: Algorithmic Approaches and Applications*, I.S. Kotsireas, P.M. Pardalos, and A. Nagurney, Editors, Springer International Publishing Switzerland (2018), pp 85-108.

Advances in Disaster Communications: Broadband Systems for First Responders, L.S. Nagurney, in *Dynamics of Disasters: Algorithmic Approaches and Applications*, I.S. Kotsireas, P.M. Pardalos, and A. Nagurney, Editors, Springer International Publishing Switzerland (2018), pp 135-156.

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.

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. Soyulu, *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.



The UMass Amherst INFORMS Student Chapter celebrated its Cum Laude Award from INFORMS with a cake

The Center Director and Center Associates thank 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
Mojtaba Salarpour

Center Website:

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