

# The Supernetwork Sentinel

## Winter 2015

Welcome to the Winter 2015 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 conferences, on our NSF project, on accolades received and upcoming events, as well as other news.



**The Center Director and audience members after Professor Tilman Wolf's seminar**

As always, we also include a list of our recent Center publications. We thank you for your support.

Anna Nagurney  
 John F. Smith Memorial Professor  
 Director – Virtual Center for Supernetworks  
<http://supernet.isenberg.umass.edu>



**Professor Anna Nagurney with Dr. Candi Yano and Dr. Radhika Kulkarni, newly inducted INFORMS Fellows at INFORMS San Francisco**

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## Center Associates Prominent at INFORMS Conference in San Francisco

The INFORMS Annual Meeting, which took place in San Francisco, California, November 9-12, 2014 was a terrific reunion and meeting venue for many Center Associates!

The Center Director organized an invited session: Supply Chain Network Competition: Advances in Models, Methods, and Applications, at which Doctoral Student Center Associate Dong "Michelle" Li presented the talk, co-authored with the Center Director: **Supply Chain Network Competition with Information Asymmetry in Quality and Minimum Quality Standards**. Center Associate Professor Patrick Qiang of Penn State University Malvern spoke on: **The Closed-loop Supply Chain Network with Competition and Design for Remanufactureability**. Center Associate Professor Min Yu of the University of Portland in Oregon presented a paper with the Center Director and Professor Jonas Floden of the University of Gothenburg in Sweden: **Supply Chain Network Sustainability under Competition and Frequencies of Economic Activities**. Also, Center Associate Professor June Dong of SUNY Oswego presented in the session on work with Jun Ma of China: **Supply Chain Supernetwork Model with Supplier Risk Diversification**.



(l-r) back row: Drs. Min Yu, June Dong, Ke Ke, Doctoral students Sara Saberi and Dong Li front row: Drs. Patrick Qiang, Anna Nagurney, Amir H. Masoumi

Also, Doctoral Student Center Associate Sara Saberi presented at INFORMS the paper, **A Network Economic Model of a Service-Oriented Internet with Choices and Quality Competition**, co-authored with Doctoral Student Center Associate Dong "Michelle" Li, the Center Director, and Professor Tilman Wolf.

Center Associate Professor Amir H. Masoumi of Manhattan College presented his latest research on biopharma supply chains and Center Associate Professor Ke Ke of Central Washington University spoke on her latest work on financial networks.



(l-r) Professors Cruz, Nagurney, and Yu in the conference display area in San Francisco

Center Associate Professor Trisha Anderson of Texas Wesleyan University was also a presenter. She spoke at [a session on supply chains that Center Associate Professor Jose M. Cruz of UConn organized](#). Her co-author was Center Associate Professor Zugang "Leo" Liu of Penn State University Hazleton.



Several Center Associates with colleagues enjoying the WORMS (Women in Operations Research and the Management Sciences) lunch at INFORMS

The Center Associates also very much enjoyed the ceremony in San Francisco at which the INFORMS student chapters were recognized for outstanding activities during the 2013 year. The UMass Amherst INFORMS Student Chapter, whose President last year was Doctoral Student Center Associate Shivani Shukla, received the cum laude award from INFORMS at the ceremony. In attendance were Doctoral Student Center Associates Sara Saberi and Dong Li and former Chapter officers Dr. Amir H. Masoumi and Dr. Min Yu, as well as many members and

officers. Professor Anna Nagurney has served as the Chapter's Faculty Advisor for over a decade.

Center Associate Dr. Padma Ramanujam of SAS was also in attendance at the INFORMS conference.



**This year's UMass Amherst INFORMS Student Chapter is Michael Prokle standing on the left**

## NSF Network Innovation Through Choice Project

We were delighted that our NSF project: *Network Innovation Through Choice* was renewed for a year with additional funding. This grant has supported, in part, two Doctoral Student Center Associates, Sara Saberi and Dong "Michelle" Li. The Fall semester we were very busy developing game theory models to capture the network economics associated with the Future Internet Architecture (FIA) known as ChoiceNet. The grant is a multi-university one, with UMass Amherst as the lead institution with Professor Tilman Wolf of the College of Engineering and Professor Anna Nagurney as the PI and Co-PI, respectively. Working with us on the project are also faculty (and students) from the University of Kentucky, NCState and RENCi.

A very exciting event that several researchers on this project took part in was [GEC21, October 20-23, 2014, at Indiana University](#). Professor Tilman Wolf and Professor Jim Griffioen of the University of Kentucky presented [a two-part tutorial on ChoiceNet at this conference which is available online.](#)

The goal of ChoiceNet is to enable choices and the associated economic relationships between entities in the network. ChoiceNet makes it possible for network service providers to compete for customers and be rewarded for quality and innovation. In today's network, money enters the network ecosystem only around the edges: consumers (individuals or enterprises) pay access providers for Internet service. Most access providers, in turn, pay

other ISPs to carry their traffic to/from the rest of the Internet. Indeed, most end-to-end traffic in the Internet traverses at least three distinct service providers.



**Professor Tilman Wolf in the center**

ChoiceNet's economy plane aims to give assurances to providers that they can compete for customers and be compensated for the services they render. At the same time, ChoiceNet provides users with the ability to select from a set of offerings and combine them to form complex services, thereby separating services that are currently entangled in the current Internet. Key to such an architecture is the ability to market services and then form or dissolve business relationships on (potentially small) time-scales. Moreover, ChoiceNet must enable providers (and consumers) to prove (or verify) that the contracted service was rendered as promised.

More information on ChoiceNet, including several publications, [can be found here.](#)

## Hosting Professor Tilman Wolf

On December 5, 2014, we had the pleasure of hosting Professor Tilman Wolf in our UMass Amherst INFORMS Speaker Series. Professor Wolf's talk was on **An Economy Plane for the Internet**. Professor Wolf is an Associate Dean at the College of Engineering at UMass Amherst. He has kindly provided us with his presentation, [which has been posted here.](#)

His talk gave an outstanding motivation and overview of why ChoiceNet, which is the Future Internet Architecture that we are developing, will lead to greater innovation of the Internet in terms of network services. He presented multicasting and why multicasting has not been as successful as had been originally theorized that it would be. He described the principles of ChoiceNet. It was thrilling for the doctoral students who have worked with us to see their papers and names in his presentation! He emphasized how ChoiceNet would offer more

choices in terms of duration-based contracts and even, if desired by consumers, enhanced cybersecurity.

## Upcoming ICS Conference in Richmond

[The INFORMS Computing Society \(ICS\) is holding its 2015 conference in Richmond, VA, January 11-13.](#) Doctoral Student Center Associate Sara Saberi and the Center Director will be attending the conference and presenting their paper, co-authored with Professor Tilman Wolf and Center Associate Professor Ladimer S. Nagurney of the University of Hartford. The paper is titled: [A Game Theory Model for a Differentiated Service-Oriented Internet with Duration-Based Contracts](#). The paper appears in the [Proceedings of ICS 2015: Operations Research and Computing: Algorithms and Software for Analytics](#), Brian Borchers, J. Paul Brooks, and Laura McLay, Editors, INFORMS (2015) pp 15-29.

## UMass Amherst INFORMS Student Chapter Celebrates 10<sup>th</sup> Anniversary

On Friday, October 3, 2014, the award-winning [UMass Amherst INFORMS Student Chapter](#) celebrated its 10<sup>th</sup> Anniversary. The celebration took place at the Isenberg School of Management in Room 210 from 4:30-6:30PM. During this period the chapter has received 7 national awards from its parent society INFORMS (Institute for Operations Research and the Management Sciences) and, to-date, 8 awards.

Many Center Associates have served as Chapter Officers, with its first President being Dr. Tina Wakolbinger. Both she as well as Center Associates Professor Patrick Qiang of Penn State University Malvern and Professor Amir H. Masoumi of Manhattan College have been recognized with the Judith B. Liebman Award of INFORMS for their outstanding service with the chapter.

The event began with a ceremony at which several tribute videos were shown. These were touching and spoke to the value of having this student chapter, which not only has hosted numerous renowned speakers in Operations Research and the Management Sciences, but has also built a community through many social and professional activities. The officers, in turn, have had excellent leadership opportunities and experiences and the chapter members have also made many long-lasting friendships that continue once the students receive their degrees.

The celebration included a slide show prepared by the chapter's webmaster, Ekin Koker, which featured all the photos taken of chapter activities over a decade! Delicious international cuisine was served and even several alums came back including Professor Amir H. Masoumi with his family and Jan Sudra.



UMass Amherst INFORMS Chapter Student Officers with award plaques



Chapter members and guests enjoying the 10<sup>th</sup> Anniversary celebration

## Kudos and News

We congratulate Doctoral Student Center Associates Sara Saberi on her receipt of her second Isenberg Scholar Award. Sara received this prestigious recognition both in the Spring 2014 and the Fall 2014. She is among a select number of doctoral students so recognized. The award includes a \$10,000 Fellowship. Also, Sara's paper, **A Network Economic Game Theory Model of a Service-Oriented Internet with Price and Quality Competition in Both Content and Network Provision**, co-authored with the Center Director and Professor Tilman Wolf, was published in the INFORMS journal, *Service Science* (2014), **6(4)**, 229-250.

Doctoral Student Center Associate Dong "Michelle" Li took part in two doctoral colloquia this past Fall: the INFORMS Doctoral Colloquium, which took place on November 7, 2014, prior to the INFORMS San Francisco Annual Meeting, and

the Doctoral Student Consortium for Post-Proposal Defense Students on November 22, 2014, at the 2014 Meeting of the Decision Sciences Institute in Tampa, Florida. We congratulate Michelle on her selection for these two special programs.

Professor Anna Nagurney was informed that she was selected a Visiting Fellow of All Souls College at Oxford University in England for the 2015-2016 Trinity Term. While at Oxford, she will be provided with free accommodation, receive meals at Common Table, and also be provided with a workroom in the college. Professor Nagurney will be continuing her research on supply chains and quality competition while at Oxford.

Professor Anna Nagurney will give an invited talk, **Sustainable Supply Chains for Sustainable Cities**, at the [Φ-SOE Fachverband Physik sozio-ökonomischer Systeme \(Physics of Socio-Economic Systems Division\), German Physical Society](#), Spring Meeting, in Berlin, Germany, March 15-20, 2015. She will also be presenting a seminar at MIT at the Department of Civil and Environmental Engineering on February 18, 2015.

Center Associate Professor Ladimer S. Nagurney served as the Interim Chair of the Department of Electrical and Computer Engineering at the University of Hartford in the Fall 2014.

Center Associates Professor Patrizia Daniele of the University of Catania in Italy and Professor Tina Wakolbinger of the Vienna University of Economics and Business are serving on the Program Committee of the Dynamics of Disasters Conference that will take place in Kalamata, Greece, June 29-July 2, 2015. The Center Director is one of the three Conference Co-Organizers.

Professor Patrizia Daniele is also the organizer of the stream, **Recent Advances in Dynamics of Variational Inequalities and Equilibrium Problems**, for EURO 2015, Glasgow, Scotland, July 12-15, 2015.

We congratulate both Professors Daniele and Wakolbinger on the publication of their paper, with Professor Fuminori Toyasaki of York University, **A Variational Inequality Formulation of Equilibrium Models for End-of-life Products with Nonlinear Constraints**, *European Journal of Operational Research* (2014), **236**, 340-350.

We congratulate Professor Zugang "Leo" Liu, who has been informed that he has been awarded a sabbatical from Penn State Hazleton as has Professor Ladimer S. Nagurney from the University of Hartford.

Congratulations to Professor Ke Ke, who was nominated for a teaching award at her university!

Professor Patrick Qiang is the Track Chair for International Business for the 2015 NEDSI Conference, March 20-22, 2015, in Cambridge, MA.

Congratulations to Professors Min Yu and Amir H. Masoumi on the publication of their chapter, **An Integrated Disaster Relief Supply Chain Network Model with Time Targets and Demand Uncertainty**, with the Center Director, in *Regional Science Matters: Studies Dedicated to Walter Isard*. This prestigious volume also contains a chapter by the Nobel laureate in Economics, Professor Paul Krugman.

## Recent Center Publications

Please see our center articles at:

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

**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 press in *Sustainable Fashion Supply Chain Management: From Sourcing to Retailing*, T.-M. Choi and T.C.E. Cheng, Editors, Springer, 2015.

**A Game Theory Model for a Differentiated Service-Oriented Internet with Duration-Based Contracts**, A. Nagurney, S. Saberi, T. Wol, 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) pp 15-29.

**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.

**Spatial Price Equilibrium with Information Asymmetry in Quality and Minimum Quality Standards**, A. Nagurney, D. Li, and L.S. Nagurney, *International Journal of Production Economics* (2014), **158**, 300-313.

**A Dynamic Network Economic Model of a Service-Oriented Internet with Price and Quality Competition**, A. Nagurney, D. Li, S. Saberi, and T. Wolf, in *Network Models in Economics and Finance*, V.A. Kalyagin, Th. M. Rassias, and P.M. Pardalos, Editors, Springer International Publishing Switzerland (2014), 239-264.

**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* (2014), in press.

**Equilibria and Dynamics of Supply Chain Network Competition with Information Asymmetry in Quality and Minimum Quality Standards**, A. Nagurney and D. Li, *Computational Management Science* (2014), **11(3)**, 285-315.

**A Dynamic Network Oligopoly Model with Transportation Costs, Product Differentiation, and Quality Competition**, A. Nagurney and D. Li, *Computational Economics* (2014), **44(2)**, 201-229.

**A Supply Chain Network Game Theoretic Framework for Time-Based Competition with Transportation Costs and Product Differentiation**, A. Nagurney and M. Yu, in *Optimization in Science and Engineering - In Honor of the 60th Birthday of Panos M. Pardalos*, Th. M. Rassias, C. A. Floudas, and S. Butenko, Editors, Springer, New York, (2014), 381-400.

**When and for Whom Would E-Waste be a Treasure Trove: Insights from a Network Equilibrium Model of E-Waste Flows**, T. Wakolbinger, F. Toyasaki, T. Nowak, and A. Nagurney, *International Journal of Production Economics* (2014), **154**, 263-273.

**ChoiceNet: Toward an Economy Plane for the Internet**, T. Wolf, J. Griffioen, K. Calvert, R. Dutta, G. Rouskas, I. Baldin, and A. Nagurney, *Computer Communication Review* **44(3)**, July 2014.

**Supply Chain Network Sustainability Under Competition and Frequencies of Activities from Production to Distribution**,

A. Nagurney, M. Yu, and J. Floden, *Computational Management Science* (2013), **10(4)**, 397-422.

**Supply Chain Networks with Global Outsourcing and Quick-Response Production Under Demand and Cost Uncertainty**, Z. Liu and A. Nagurney, *Annals of Operations Research* (2013), **208(1)**, 251-289.

**Pharmaceutical Supply Chain Networks with Outsourcing Under Price and Quality Competition**, A. Nagurney, D. Li, and L.S. Nagurney, *International Transactions in Operational Research* (2013), **20(6)**, 859-888.

**Design of Sustainable Supply Chains for Sustainable Cities**, A. Nagurney, *Environment & Planning B* (2013), in press.

**A Network Economic Game Theory Model of a Service-Oriented Internet with Choices and Quality Competition**, A. Nagurney, D. Li, T. Wolf, and S. Saberi, *Netnomics* (2013), **14(1-2)**, 1-25.

**The Center Director and the Center Associates wish you a Very Happy and Prosperous New Year!**

#### 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. Zugang "Leo" Liu  
Dr. Amir H. Masoumi  
Dr. Dmytro Matsypura  
Dr. Ladimer S. Nagurney  
Dr. Qiang "Patrick" Qiang  
Dr. Padma Ramanujam  
Dr. Stavros Siokos  
Dr. Tina Wakolbinger  
Dr. Min Yu  
Dr. Ding Zhang  
Dr. Lan Zhao

#### Doctoral Students

Dong "Michelle" Li  
Sara Saberi  
Shivani Shukla

#### Center Website:

<http://supernet.isenberg.umass.edu>  
If you would like to be put on our email list, contact: [supernet@isenberg.umass.edu](mailto:supernet@isenberg.umass.edu)