



Harold Larnder Prize

Anna Nagurney



Anna Nagurney is the John F. Smith Memorial Professor at the Isenberg School of Management at the University of Massachusetts Amherst and the Director of the Virtual Center for Supernetworks, which she founded in 2001. She holds ScB, AB, ScM, and PhD degrees from Brown University in Providence, RI. She is the author of 14 books, more than 200 refereed journal articles, and over 50 book chapters. She presently serves on the editorial boards of a dozen journals and two book series and is the editor of another book series.

Professor Nagurney has been a Fulbrighter twice (in Austria and Italy), was a Visiting Professor at the School of Business, Economics and Law at the University of Gothenburg in Sweden, and was a Distinguished Guest Visiting Professor at the Royal Institute of Technology (KTH) in Stockholm. She was a Visiting Fellow at All Souls College at Oxford University during the 2016 Trinity Term and a Summer Fellow at the Radcliffe Institute for Advanced Study at Harvard in 2017 and 2018. Anna has held visiting appointments at MIT and at Brown University and was a Science Fellow at the Radcliffe Institute for Advanced Study at Harvard University in 2005–2006. She has been recognized for her research on networks with the Kempe Prize from the University of Umea, the Faculty Award for Women from the US National Science Foundation, the University Medal from the University of Catania in Italy, and was elected a Fellow of the RSAI (Regional Science Association International), an INFORMS (Institute for Operations Research and the Management Sciences) Fellow, and a Network Science Society Fellow. In 2019, she became the first female recipient of the Constantin Caratheodory Prize from the International Society of Global Optimization. Anna has also been recognized with several awards for her mentorship of students and her female leadership with the WORMS Award, for example, and the Moving Spirit Award. Anna was one of 44 Women in STEM featured in the STEM Gems book as a role model for young women. Her research has garnered support from the AT&T Foundation, the Rockefeller Foundation through its Bellagio Center programs, the Institute for International Education, and the National Science Foundation. She has given plenary/keynote talks and tutorials on 5 continents. She is an active member of several professional societies, including INFORMS, POMS, and RSAI and was the Omega Rho Distinguished Lecturer in 2018 and is a 2020 IFORS Distinguished Lecturer.

Anna's research focuses on network systems from transportation and logistical ones, including supply chains, to financial, economic, social networks and their integration, along with the Internet. She studies and models complex behaviors on networks with a goal towards providing



frameworks and tools for understanding their structure, performance, and resilience and has contributed to the understanding of the Braess paradox in transportation networks and the Internet. She has been researching sustainability and quality issues with applications ranging from pharmaceutical and blood supply chains to perishable food products and fast fashion, to humanitarian logistics and disaster management. She has advanced methodological tools used in game theory, network theory, equilibrium analysis, and dynamical systems. She was a Co-PI on a multi-university NSF grant with UMass Amherst as the lead: Network Innovation Through Choice, which was part of the Future Internet Architecture (FIA) program, and she was recently a Co-PI on an NSF EAGER grant.

Harold Larnder Memorial Lecture

Trade Wars: OR in the Economic Battlefields

OR, from its military origins, has evolved to impact virtually every economic sector from agriculture to manufacturing to services. When it comes to war between nations, the weaponry is apparent - from flying missiles and bombs to stealth cyber weapons. The weapons of trade wars are, in contrast, economic, imposed by countries on products produced by other countries. Powerful trade war weapons used by governments include tariffs, quotas or combination thereof, known as tariff rate quotas. They affect not only the prices that you and I pay for our favorite foods such as avocados, cheeses, and maple syrup but even their quality!

Global supply chains are the networks that enable fresh produce year round, smart phones at our fingertips, the latest fashions on demand, household appliances that we have come to depend on, and raw materials for crucial manufacturing processes. The resulting trade flows from origins to consumption are essential to the prosperity of nations and to the well-being of their citizenry.

Game theory allows us to quantify the effects of decisions of one adversary (or competitor) on others and has a long history of being applied by the military during war games; used by businesses to determine strategy, and now central to the understanding of the effects of trade wars. Proper use of game theory can quantify a priori what the impacts of trade barriers will be on producers (both domestic and foreign), on consumers, and on governments. In addition, using game theory, embedded with algorithms, different scenarios and responses of governments, such as the tightening or loosening up of trade barriers, can be simulated. The need for such a framework is extremely relevant given the prevalence of tariffs and quotas in the news, with the coupled uncertainty.

In this talk, I will discuss how OR is contributing to the methodological arsenal for the analysis of trade wars. In particular, I will describe recent modeling and algorithmic research and advances motivated by various economic trade policies that have been imposed on a spectrum of products by various countries across the globe. I will present both perfectly competitive and oligopolistic supply chain network models and associated applications, focusing on food, as well as food quality, and demonstrate who benefits and who loses under a spectrum of trade policies.