*March 31, 2017*
*Skinner Hall Room 12*
*11:00a.m-12 noon*
*(Refreshments at 10:30 am)*

Hosted By

UMass Amherst
Student Chapter of informs

Professor
Anna Nagurney

# *Restoration of Network Connectivity in Large-Scale Disaster Response Problems*

Due to the ubiquitous nature of disruptive extreme events, the functionality of the critical infrastructure systems is constantly at risk. In case of a disruption, in order to minimize the loss in the society, service networks operating on the critical infrastructure systems should be restored as quickly as possible. As an illustrative case study, we consider a road network blocked by debris in the aftermath of a disaster. In this work, we develop mathematical models that capture the important characteristics of the debris related operations in each stage along with methodologies for solving these mathematical models efficiently. Specifically, we introduce a novel network science inspired measure to quantify the criticality of components within a disrupted service network and develop a heuristic that prioritizes the restoration efforts based on this measure. We analyze the performance of the plans with respect to a resilience notion that includes both the network's ability to withstand the disruptions and the impact of the restoration activities on the recovery of the emergency service network functionality. Furthermore, we compare the proposed plans with the current restoration guidelines proposed by FEMA and observe that our methodology provides a more resilient recovery plan. Finally, we explore the relationship between a service network's resilience and its topological and operational characteristics under different disruption scenarios and derive insights and recommendations on how to design resilient service networks. The methods and insights provided in this work can be extended to other disrupted large scale critical infrastructure systems in which the ultimate goal is to enable service functionality.

Dr. Özlem Ergun,
Professor, Mechanical and Industrial Engineering,
Northeastern University

Dr. Özlem Ergun was the Coca-Cola Associate Professor in the School of Industrial and Systems Engineering at Georgia Institute of Technology until August 2014 when she joined Northeastern University. She has also co-founded and co-directed the Health and Humanitarian Systems Research Center at the Supply Chain and Logistics Institute. She received a B.S. in Operations Research and Industrial Engineering from Cornell University in 1996 and a Ph.D. in Operations Research from the Massachusetts Institute of Technology in 2001. Dr. Özlem Ergun's research focuses on the design and management of large-scale networks. She has applied her work on network design, management and collaboration to problems arising in the airline, ocean cargo and trucking industries. Recently, Dr. Ergun's work has been focused on the use of systems thinking and mathematical modeling in applications with societal impact. She has worked with organizations that respond to humanitarian crisis around the world, including: UN WFP, UNHCR, IFRC, CARE USA, FEMA, USACE, CDC, AFCEMA, and MedShare International.