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Department of Civil and Environmental Engineering  
Case Western Reserve University  
Bingham Bldg. Room 235  
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Cleveland, OH 44106

## Civil and Environmental Engineering Department Seminar

# Probabilistic Resilience Assessment of Interdependent Systems

**Paolo Bocchini**

Department of Civil and Environmental Engineering, Lehigh University

*Date:* Friday December 4, 2020, 12:45 – 2:00 PM

*Zoom Meeting ID:* 913 9974 3238 *Passcode:* 576579

<https://cwru.zoom.us/j/91399743238?pwd=QlVTVWJFVUdFGZDVON2ZMVMZ1eFlxdz09>

### Abstract

Resilience is the ability of a system to withstand and rapidly recover from shocks of various nature. Over the last decade, “resilience” has become a common keyword used to describe one of the most desirable features of structures, infrastructure, communities, and complex systems in general. Utility companies from Verizon to Con Edison, as well as major cities, counties, and entire states had to train their employees to perform “disaster resilience analyses”, to identify weaknesses in their systems and address them. This opened a broad market for consulting firms who perform these assessments. The current situation has shown that our society needs to be resilient not only to natural disasters like earthquakes and hurricanes, but also other threats, like pandemics, environmental hazards, and economic downfalls.

This seminar will present a general approach to study the resilience of multiple interdependent systems and discuss recent research advancements in the various tasks needed to complete these assessments, such as the selection of representative hazard scenarios, the creation of surrogate models that capture the probability of failure of components and subcomponents, the simulation of the post-disaster decision and recovery phase, as well as models to capture the complex dependencies and interdependencies among the various agents in these complex situations. The seminar will be an opportunity also to discuss the PRAISys Platform, a software package that is in open beta and can be used to assess the resilience of complex systems. This software is one of the outcomes of a multi-million dollar project supported by the NSF that involved 58 scholars under the leadership of Dr. Bocchini.

### About the speaker:



Dr. Bocchini is an Associate Professor and Director of Graduate Programs in the Department of Civil and Environmental Engineering of Lehigh University. Before joining Lehigh's Faculty he was a Research Associate at the Advanced Technology for Large Structural Systems (ATLSS) Engineering Research Center. Previously, he held Research Grants at the University of Bologna, from which he received his Ph.D. in Structural Mechanics and his Laurea degree (B.Sc. + M.Sc.) in Civil Engineering. Most of his Ph.D. dissertation was developed at Columbia University, where he was a Visiting Scholar in the Department of Civil Engineering and Engineering Mechanics. He is also an Alumnus of the Collegio Superiore Alma Mater Studiorum.

Dr. Bocchini's research activity is related to the use of probabilistic concepts, computational mechanics, operational research, and other numerical tools in civil engineering problems. Most of his recent research deals with civil infrastructure networks and consists in the application of data science, theory of reliability and random fields to these complex systems. He has developed computational techniques for the assessment of the time-dependent network reliability and for the optimization of the network life-cycle management. Currently, his main focus is the resilience- and cost-based optimal allocation of resources for the design, retrofit, and recovery of infrastructure networks subjected to extreme events. Dr. Bocchini leads a research team of approximately 15 members and he has secured more than \$4 million in research funding while at Lehigh. He has published his research in top archival journals and his paper on resilience and sustainability of the civil infrastructure is the most cited in the ASCE Journal of Infrastructure Systems.