



Graduate Seminar

Paolo Bocchini, PhD

*Professor and Director of the Center
for Catastrophe Modeling and Resilience
at Lehigh University*

February 10, 2025 (4:00 pm - 5:30 pm), Tiernan Hall - Room 106

[Zoom Link: Click Here](#) Meeting ID: 994 3917 6432 Passcode: 058807

Multi-Scale Catastrophe Modeling and Resilience Assessment of Power Transmission Lines

Abstract

The power grid is one of the most critical lifelines for our society, and yet it is still very vulnerable to extreme events, such as windstorms and hurricanes. The seminar will cover a series of studies aimed at performing quantitative analyses of individual power infrastructure assets and entire power transmission systems. The seminar will span multiple scales of analysis and show how transitioning from one scale to the next requires carrying all the relevant information, while simplifying everything that does not significantly impact the final results. For example, a detailed mechanical model of the behavior of bolted connections that control the dynamic response of lattice transmission towers is calibrated with experimental results and then simplified into a zero-length finite element. The non-linear vibrations of power conductor cables can be linearized, if the origin of the series expansion is selected appropriately. The reliability analysis of a large power grid during the passage of a hurricane can be computed efficiently, if appropriate surrogate models for power conductors and support structures are included. The seminar will present published and in-progress work and show how the various contributions fit in the context of catastrophe modeling and regional resilience analysis.

About the Speaker

Paolo Bocchini is a professor and the director of the “Center for Catastrophe Modeling and Resilience” at Lehigh University. His research is related to the application of probabilistic concepts, computational mechanics, operational research, and other analytical and numerical tools to civil engineering problems. Currently, his main areas of focus are catastrophe modeling, resilience assessment, and optimal allocation of resources for the design, retrofit, and recovery of infrastructure systems subjected to extreme events. He also serves as the Director of Graduate Programs in the Department of Civil and Environmental Engineering of Lehigh University and as Associate Editor for the ASCE Journal of Structural Engineering.



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