SEMINARI INGEO

UNIVERSITÀ DEGLI STUDI "G. D'ANNUNZIO" – CHIETI PESCARA

Life-cycle analysis of engineering systems subject to corrosion and shocks: a multi-hazard perspective

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Aula 28 (piano terra, viale Pindaro 42, Pescara)

Short CV

Leandro Iannacone conducts interdisciplinary research that combines knowledge in structural engineering, hazard science, and statistics to inform disaster risk management with a focus on quantifying community-level resilience and adequately communicating risk to the stakeholders. He is currently a postdoctoral researcher in the DE|RISC Lab at University College London. He earned his PhD at the University of Illinois Urbana-Champaign (2022) in the MAE Center (Multi-hazard Approaches to Engineering) under the supervision of Prof. Paolo Gardoni. has degrees in Statistics from the University of Illinois Urbana-Champaign (M.S. 2019), in Structural Engineering from the University of Pisa (M.S. 2016), and in Civil and Environmental Engineering from the University of Pisa (B.S. 2012). His research work focuses on multi-hazard life-cycle analysis, deterioration modeling, Value of Information analysis, vulnerability and fragility modeling, and resilience quantification, among other topics. In a broader sense, his interests lie in the implementation of sophisticated statistical techniques to gather, analyze, and update data pertaining to civil infrastructure systems.

Abstract

Corrosion and shock events significantly impact the structural integrity and operational efficiency of engineering systems, leading to cascading effects on safety, reliability, and sustainability. The purpose of Life-Cycle Analysis (LCA) is to predict, evaluate, and manage these effects throughout the entire lifespan of the system. It enables engineers and decision-makers to anticipate vulnerabilities, implement proactive mitigation measures, and optimize resource allocation at various stages of an engineering system's life. A comprehensive LCA for a system exposed to multiple hazards must consider potential interactions among hazard events, and it should address the cascading consequences that may arise from the close interplay of hazards, whether they are dependent or independent. Additionally, the uncertainties associated with the phenomena under investigation should be properly quantified, to enable decision-makers to integrate and navigate the associated risks when making informed decisions about the system.

This seminar discusses the latest advancements in Multi-hazard LCA at the regional scale. It investigates the different types of interactions that can exist across hazards, and how they can be incorporated into a mathematical framework to generate realistic sequences of events. It then discusses how the consequences of such events can be modeled, accounting for the possible deteriorated condition of the system, and the possible cascading effects of subsequent hazards. Utilizing advanced statistical models, the evolution of the system's state variables, representing its time-varying physical properties, is captured. These models facilitate the quantification of system performance, accompanied by uncertainty bounds crucial for informed decision-making. Finally, the seminar addresses the harmonization of damage quantification across various hazards and proposes the use of a uniform scale to quantify damage and consequences in a hazard-agnostic way.