unipg
A.D. 1308
DIPARTIMENTO
DI INGEGNERIA
CIVILE E AMBIENTALE

International Doctoral Program in Civil and Environmental Engineering

SEMINAR

A journey from data-driven to model-driven damage identification of structures
Perspectives for scalability to regional SHM

Prof. Enrique GARCÍA-MACÍAS
Deparment of Department of Structural Mechanics
and Hydraulic Engineering
Universit y of Granada

Location:
UNIPG Campus of Engineering
Via G. Duranti, 93, Perugia
Room 7

Timetable:
December 11th 2023 - 12:30 a.m. (CET)

Abstract
This seminar presents an overview of my career over the last five years in the field of Structural Health Monitoring (SHM), portraying a story of vocational search, the importance of curiosity and fascination with scientific discoveries, and the approach to research through play and the pure pleasure of scientific exploration. In particular, this seminar presents my experience on the realm of SHM from a statistical pattern recognition perspective, understanding structures as alive assets that respond to their environmental conditions, and with a clear commitment to the automation of processes to make an effective impact on engineering practice. On this basis, the seminar will span from the feature extraction problem exploiting heterogeneous monitoring data, to the development of automated data-driven damage identification techniques. Illustrated through several real-world application case studies, a thorough discussion will be provided on the possibilities for automation, software implementation, and damage identification capabilities of data-driven unsupervised techniques. This discussion will motivate the interest for physics-driven damage identification techniques, providing a natural pathway for the integration of the modern concept of Digital Twins. The possibilities for bringing this concept into continuous SHM systems for real-world large-scale structures will be illustrated through several case studies, with particular focus on the potential for their implementation in broad use software platforms. Finally, the seminar will present some perspectives on the future of SHM for the management of the health condition of complete infrastructural systems, as well as the potential role of Artificial Intelligence to solve the scalability limitations of current SHM techniques.

Prof. E. García-Macías graduated with a Bachelor of Civil Engineering with First Class Honours in 2011 at the University of Granada (Spain) and completed his Ph.D. cum laude in 2018 at the University of Seville, Spain. After his time as a post-doctoral researcher in 2019 at the University of Perugia and as a Teaching Fellow at Imperial College London in 2020, he completed a second Ph.D. at the University of Perugia (Italy) in 2023. Currently, he holds a position as Assistant Professor at the University of Granada in Spain. His main scientific interests are organized along two main lines, including (i) multifunctional self-diagnostic materials, and (ii) Structural Health Monitoring (SHM). An EB member of ERX and Heritage, Dr. García-Macías has published more than 50 high-impact scientific articles, contributed to more than 20 conferences, and conducted research in 5 different institutions. Recognized as one of the World's Top 2% Scientists in 2022 according to Stanford University's ranking, the contributions of García-Macías have been recognized by several research awards such as the extraordinary thesis award by the University of Seville, the best thesis award by the Royal Academy of Doctors of Spain, and the Young Investigator Award by the Royal Academy of Sciences of Seville.