

JOINT
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PHYSICS ENHANCED MACHINE LEARNING FOR DYNAMICS: AT THE NEXUS OF DATA AND MODELS

Speaker

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Abstract

Modern engineering structures form complex - often interconnected - assemblies that operate under highly varying loads and adverse environments. To ensure a resource-efficient, safe and resilient operation of such systems, it is imperative to understand their performance as-is; a task which can be effectuated through Structural Health Monitoring (SHM). This talk elaborates on use of monitoring and twinning technologies as a means to recast our engineering approach into one that regards structures and infrastructures as animate cyber-physical systems. We offer a view to fusing data and models via physics-enhanced machine learning schemes for modelling dynamical systems. We discuss the spectrum of such schemes as this unfolds from white to grey to black-box representations, which pose different requirements in terms of availability of physics and data. An optimal balance is sought with the aim to faithfully represent structures across their operational envelope, to reliably predict their performance under future stressors, and to advise on preventive and remedial actions at both the unit and fleet (system) level. We exemplify such a hybrid approach toward establishing closed-loop twin representations on a number of use cases drawing from civil, wind energy and aerospace structures.

Biography

Eleni Chatzi is the Chair of Structural Mechanics and Monitoring in the Department of Civil, Environmental and Geomatic Engineering at ETH Zurich. Her research interests include the fields of Structural Health Monitoring (SHM), hybrid modelling and data-driven assessment of engineered systems. Amongst various positions of trust in this domain, she serves as an editor for major journals in the field (including Mechanical Systems and Signal Processing, the Journal of Sound and Vibration, Data Centric Engineering and (nature) Science Reports), she is the current Vice-President of the European Academy of Wind Energy (EAWE), and the President of the Swiss Branch of the ECCOMAS association (SWICCOMAS). She led the recently completed ERC Starting Grant "WINDMIL" on the topic of Smart Monitoring, Inspection and Life-Cycle Assessment of Wind Turbines. Her work in the domain of self-aware infrastructure was recognized with the 2020 Walter L. Huber Research prize, awarded by the American Society of Civil Engineers (ASCE) and the EASD Junior Research Prize in the area of Computational Structural Dynamics.



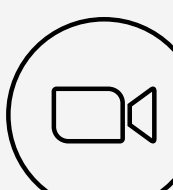
18 January 2024
Thursday



3:00 pm - 4:00 pm



**Civil Engineering
Conference Room
Room 3574 (Lift 27/28)
HKUST**



Zoom Link
Meeting ID: 914 6237 9218
Passcode: 556894

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