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DIPARTIMENTO DI INGEGNERIA CIVILE E AMBIENTALE

International Doctoral Program in Civil and Environmental Engineering

SEMINAR

An Introduction to Population-Based SHM: When is a Bridge Not an Aeroplane?

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Timetable:
October 12th 2023 - 12:00 a.m. (CET)

Location:
UNIPG Campus of Engineering, Via G. Duranti, 93, Perugia
Aula Magna

Link to the seminar

Abstract

One of the main problems in data-based SHM is the scarcity of labelled data from damage states of structures. This issue limits applications of machine learning technologies to supervised learning and cuts off access to higher-level diagnostic systems. In recent years, Population-Based SHM has been proposed as a means of alleviating the problem by allowing transfer of knowledge between structures in populations in such a way that damage-state data for individual structures can inform diagnostics across the population. However, transfer is only possible between structures or substructures which are sufficiently similar that the inference is meaningful and positive. In order to measure similarity between structures, the ideas of irreducible-element (IE) and attributed-graph (AG) models have been introduced, such that structures are represented in an abstract metric space which allows principled comparisons. This framework will work, in principle, even for heterogeneous populations of disparate structures. This paper gives a high-level overview of the concepts involved, including some necessary results from graph theory and complex network theory, and discusses the issues involved in comparing the bridge and aeroplane structures in the title.

Professor Worden began academic life as a theoretical physicist, with a degree from York University and a PhD in Mechanical Engineering from Heriot-Watt University eventually followed. A period of research at Manchester University led to an appointment at the University of Sheffield in 1995, where he has happily remained since. Keith's research is mainly concerned with applications of advanced signal processing and machine learning methods to structural dynamics, particularly in structural health monotoring and nonlinear dynamics. The primary applications are in the aerospace industry, civil infrastructure and offshore wind.

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