UNIVERSITÀ DI PAVIA

Università degli Studi di Pavia
Computational Mechanics & Advanced Materials Group - DICAr

3D@UniPV
Virtual Modeling and Additive Manufacturing for Advanced Materials

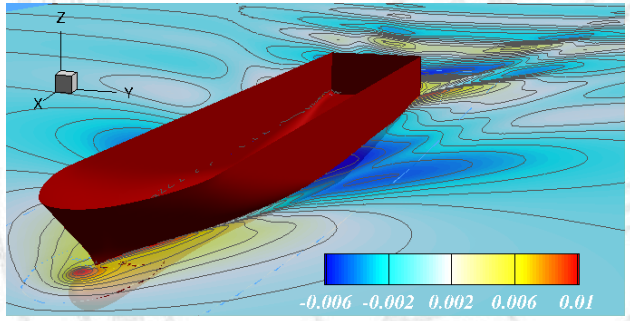
SEMINAR

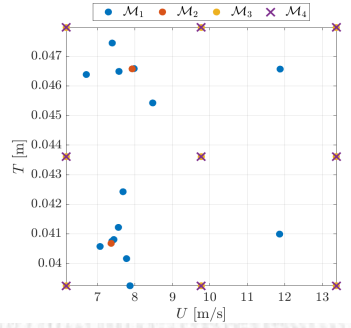
Uncertainty Quantification: dealing with uncertainties in computational science and engineering

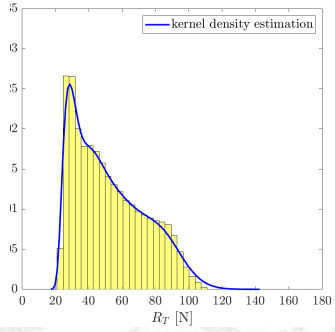
When using computational models to predict the behavior of systems, one is often confronted with the fact that the parameters of such model might be not known exactly, but rather affected by a certain degree of uncertainty. This could be due to experimental errors, poor data quality or intrinsic randomness of the parameters (e.g., wind-load, rainfall). It then becomes of paramount importance to assess the impact of such uncertainties in the outcomes of the simulation: such analysis is known as (forward) Uncertainty Quantification.

Most forward Uncertainty Quantification procedures require repeatedly calling the computational model with various values of the parameters, to explore the variability of the outcomes of the simulation. These procedures can become very expensive, therefore it is important to carefully choose the values of the parameters to be tested, and how to post-process the results: in this talk, we discuss some strategies to this end, and how to exploit the fact that multiple computational models with different costs might be available (e.g. a PDE solver with several mesh resolutions), enabling a so-called multi-fidelity approach.

We will showcase three examples: a naval engineering problem, a geophysical problem and a 3d-printing problem. If time allows, we will also discuss how to tackle the inverse Uncertainty Quantification problem, i.e., how to reduce the uncertainty on the parameters given measurements of the outcomes (e.g., assessing the uncertainty of the ground permeability from measurements of the hydraulic head).







March 12th, 2:00pm (sharp)

Online

Join Zoom Meeting:
https://us02web.zoom.us/j/87279908616?pwd=c1g4ODdOTzlEWkVRT1RXd2pIOXlaQT09

Meeting ID: 872 7990 8616

Passcode: compmech21

Dr. Lorenzo Tamellini

Consiglio Nazionale delle Ricerche - Istituto di Matematica Applicata e Tecnologie Informatiche "Enrico Magenes" (CNR-IMATI), Pavia