FACULTAD DE CIENCIAS
FÍSICAS Y MATEMÁTICAS
UNIVERSIDAD DE CHILE

CMM
Center for
Mathematical
Modeling

cmm.uchile.cl

Beauchef 851, edificio norte, piso 7
Santiago, CHILE
CP 837 0456

tel +56 2 2978 4870

Seminario Aprendizaje de Máquinas

Expositor
David Sondak
Departamento: Institute for Applied Computational Science (IACS)
Harvard University

Sitio web: https://iacs.seas.harvard.edu/people/david-sondak

Título

Physics-based Models for Uncertainty Quantification in Chemical Kinetics

Abstract:

Prediction is a core element of science and engineering. Sophisticated mathematical models exist to make predictions in a variety of physical contexts including materials science, fluid mechanics, and solid mechanics. Most of these models do not have known analytical solutions. Moreover, they are generally difficult to solve numerically. In order to perform numerically tractable computations, researchers often try to develop reduced models that account for the essential physics while doing away with the complexity of the full model. Development of reduced models necessarily induces model errors and the impact of these errors on scientific and engineering predictions must be assessed and quantified. Even the most sophisticated mathematical models contain errors and uncertainties due to the limits of human knowledge. The field of uncertainty quantification seeks to rigorously quantify uncertainties and assess their impact on predictions in scientific and engineering applications.

This talk will begin by providing an overview of uncertainty quantification in the context of scientific and engineering predictions. I will then discuss recent results on the development of inadequacy models for chemical kinetics with applications to turbulent combustion. In particular, a new physics-based inadequacy model is introduced that accounts for model error between a detailed chemical kinetics model and a reduced model. Limitations and extensions of the model are discussed. If time permits, I will describe recent attempts to develop physics-aware machine learning algorithms that may be able to learn model terms in reduced models. Examples from fluid turbulence and astrophysics will be presented.

Lunes 15 de enero a las 12:00 hrs. Sala de Seminarios John Von Neumann, 7mo piso, torre norte, Beauchef 851.

CONICYT
Ministerio de Educación
Gobierno de Chile

cnrs