TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

Dipartimento di Fisica

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Seminar

Tuesday, 7 May 2024 - h. 14:00

Fisica della Materia room (Department of Physics)

Dr. Fernando GONZALEZ

Centre Européen de Recherche et de
Formation Avancée en Calcul Scientifique (CERFACS)

"Predicting the Unpredictable: Machine Learning Strategies for Turbulent Flows"

Abstract

Turbulent flows are complex, chaotic systems ubiquitous in nature and engineering, presenting formidable challenges for prediction and control. In recent years, machine learning has emerged as a promising tool for tackling this longstanding problem. However, predicting turbulent flows is a task that has yet to succeed, as has other accomplishments of artificial intelligence in fields such as natural language processing, computer vision, or biology. In this talk, we will first formulate the fundamental issues that appear while training Neural Networks to predict turbulent flows. Secondly, we will address, through examples, two of these problems: prediction stability and data scarcity. For the first one, we will showcase how stability can be enforced through regularization strategies and the effects of these methods on the outcome of the trained models. For the second problem, we will showcase how lower generalization error can be achieved through online learning, bypassing the need to store and manage large volumes of data and taking advantage of HPC clusters for training Neural Networks at scale.

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