Department of Mechanical Engineering Seminar

(Co-hosted by Civil Engineering Department)

2pm, 10/1/2020 Thursday

https://ccny.zoom.us/j/5945451937

Dr. Romit Maulik

Margaret Butler Fellow

Leadership Computing Facility, Argonne National Laboratory

"Scalable Scientific Machine Learning for Computational Fluid Dynamics"

Abstract

The past few years have seen tremendous growth in machine learning algorithm development and deployment for scientific applications. Preliminary successes have promised accurate physics emulation solely from data, improved accuracy in numerical simulations, reduced times to solution for computationally intractable problems among others. Some literature has also claimed that machine learning (ML) may aid in extreme event detection and novel physics discovery. However, the content of this talk shall focus on some "practical" issues related to machine learning that are frequently overlooked when dealing with scientific applications. Some of the questions that we seek to answer are: How do we use ML methods when faced with a limited budget for training and testing data? How do we deal with spatially unstructured data with temporally varying degrees of freedom? Although neural networks are expressive learning tools, how do we construct better architectures for our target application? How do we integrate machine learning into our present software stack to allow for the concurrent use of numerical data generation, experimental data acquisition, computation, and learning on novel computing platforms?

Biosketch

Romit Maulik is the Margaret Butler Postdoctoral Fellow at the Leadership Computing Facility at Argonne National Laboratory. He is also associated with the Mathematics and Computer Science division working with the RAPIDS team at the SciDAC Computer Science institute. His research interests are centered around the development of scalable physics-informed machine learning algorithms for a variety of applications such as for fluid and kinetic closure modeling, geophysical emulation, and model-order reduction. He is also interested in high-performance machine learning, with a particular emphasis on the integration of generic data science frameworks into legacy software on novel computing architectures.