National Center for Theoretical Sciences

NCTS Summer Course on Scientific Machine Learning

Venue

Room 505,
Cosmology Building,
NTU

Time

Every Monday and Tuesday,
3 hours per day,
10:00-12:00, 14:00-15:00,
July 17 - August 8, 2023

Speakers

Jingfang Huang
University of North Carolina at Chapel Hill

Petr Plechac
University of Delaware

Organizers

Tai-Chia Lin
National Taiwan University

Te-Sheng Lin
National Yang Ming Chiao Tung University

Background & Purpose

Scientific machine learning (SciML) is an emerging interdisciplinary field of research that integrates traditional scientific disciplines with machine learning methods to solve complex scientific problems. The primary goal of SciML is to enable researchers to leverage the power of machine learning to accelerate scientific discovery and to build predictive models that can simulate and optimize complex scientific systems. Scientific machine learning methods can be applied to a wide range of scientific fields, including applied mathematics, physics, chemistry, biology, geoscience, climate science, and materials science, among others. In this summer course, we aim to introduce the latest advances in scientific machine learning. Specifically, we will introduce fast algorithms in evaluating multivariate normal distributions and the transformer model; compressed representations of layer and volume potentials using algebraic variety; random Fourier features in machine learning; operator learning in PDE problems. We hope to provide new perspectives and directions for scholars and academics to study machine learning in science.

Outline

Topic 1: Compressible data on compressive network

Speaker: Jingfang Huang (UNC Chapel Hill, USA)

Date **7/17**

Title: Fast algorithm for computing the expectations of high dimensional truncated multivariate normal distributions

Date **7/18**

Title: Frequency domain statistical analysis

Date **7/31**

Title: Fast algorithm for speeding up transformer computations

Date **8/1**

Title: Compressed representations of layer and volume potentials using algebraic variety

Topic 2: Machine learning methods for PDEs

Speaker: Petr Plechac (University of Delaware, USA)

Date **7/24 7/25**

Title: Random Fourier features and connections to neural networks and approximations of differential equations

Date **8/7 8/8**

Title: Diffusion probabilistic models and their application to operator learning in parametric or random coefficient PDE problems.

Contact
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