國 立 清 華 大 學 數 學 系 學 術 演 講
NTHU MATH Colloquium

講題　Neural Networks for Numerical Partial Differential Equations: New Tools and Approaches

講者　林得勝 教授 (陽交大應數系)

時間　2023.03.20 (Mon.) 16:00 – 17:00

地點　第三綜合大樓**2樓 Room 201**（**請同學配戴口罩**）

茶會　15:30, Room 707

Abstract

Neural networks have emerged as powerful tools for solving partial differential equations (PDEs) numerically. Traditional numerical methods for solving PDEs, such as finite difference, finite element, or spectral methods, can be computationally expensive and may require considerable expertise to implement. In contrast, neural networks can be trained to approximate the solution to a PDE directly from input data, making them potentially faster and more accessible.

In this talk, we will introduce a machine learning methodology based on neural networks to solve PDEs. We will discuss our recent work on solving elliptic interface problems using neural network methods. Specifically, we will introduce a topology enforcement layer in the network to enforce the underlying topology of the problem. This makes it possible to represent discontinuous functions and solve problems on periodic domains more efficiently by including appropriate units in the layer. The topology enforcement layer provides a new approach to solving such problems compared to traditional neural networks, which may struggle to represent discontinuous functions and may not have built-in periodicity.