THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

DEPARTMENT OF APPLIED MATHEMATICS
應 用 數 學 系

# Seminar


## Prof. Wuchen LI

University of South Carolina, USA


**Topic**

Numerical Analysis on Neural Network Projected Schemes for Approximating One Dimensional Wasserstein Gradient Flows

**Date| Time**

8 January 2025 (Wednesday) | 10:30 am – 11:30 am (HK Time)

**Venue:**

TU817


**Abstract:**

We provide a numerical analysis and computation of neural network projected schemes for approximating one-dimensional Wasserstein gradient flows. We approximate the Lagrangian mapping functions of gradient flows by the class of two-layer neural network functions with ReLU (rectified linear unit) activation functions. The numerical scheme is based on a projected gradient method, namely the Wasserstein natural gradient, where the projection is constructed from the L2 mapping spaces onto the neural network parameterized mapping space. We establish theoretical guarantees for the performance of the neural projected dynamics. We derive a closed-form update for the scheme with well-posedness and explicit consistency guarantee for a particular choice of network structure. General truncation error analysis is also established on the basis of the projective nature of the dynamics. Numerical examples, including gradient drift Fokker-Planck equations, porous medium equations, and Keller-Segel models, verify the accuracy and effectiveness of the proposed neural projected algorithm. This is based on a joint work with Xinzhe Zuo (UCLA), Jiaxi Zhao (NUS), Shu Liu (UCLA), and Stanley Osher (UCLA).


**ALL ARE WELCOME**