THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

DEPARTMENT OF APPLIED MATHEMATICS
應 用 數 學 系

Seminar

Prof. Jian-Guo LIU

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Topic

An Efficient Solver with Convergence Analysis for Mean-Field Games via the Best Response and Evolution

Date| Time

2 December 2024 (Monday) | 14:50 – 15:30 (HK Time)

Venue

TU817

Abstract:

A mean-field game (MFG) seeks the Nash Equilibrium of a game involving a continuum of players. It has broad applications across economics, social sciences, and, more recently, generative models.

In a MFG, each player aims to identify the best strategy to minimize their individual cost in response to the overall population state distribution.

Given the Nash Equilibrium state, the single player's best strategy results in the same state.

The Nash Equilibrium is the fixed point of the best-response mapping, though a fixed-point iteration does not always converge.

Fictitious play is an iterative algorithm involving best-response mapping and a weighted average of state distributions. Each iteration is computationally efficient, and fictitious play applies to a wider class of MFGs than many existing methods. However, the convergence mechanism of this algorithm remains unclear, especially in non-potential MFGs. In this work, we establish the first convergence rate estimate for fictitious play in non-potential MFGs by analyzing the stability of the best-response mapping alongside a Lyapunov function. This approach provides a concrete interpretation of a folklore theorem in game theory within the mean-field game context.

This is a joint work with Jiajia Yu, Xiuyuan Cheng and Hongkai Zhao.

ALL ARE WELCOME