

國立中央大學數學系

專題演講

主 講 人：賴杰昕博士 (Sony AI, Tokyo, Japan)

演講題目：**Evolution of Diffusion Models: From Birth to
Enhanced Efficiency and Controllability**

演講茶會：2024年02月22日(星期四) 1:30 p.m. ~ 2:00 p.m.

茶會地點：中央大學鴻經館M306

演講時間：2024年02月22日(星期四) 2:00 p.m. ~ 3:00 p.m.

演講地點：中央大學鴻經館M107

Abstract：

Diffusion models, pioneers in Generative AI, have significantly propelled the creation of synthetic images, audio, 3D objects/scenes, and proteins. Beyond their role in generation, these models have found practical applications in tasks like media content editing/restoration, as well as in diverse domains such as robotics learning.

In this talk, we'll explore the origins of diffusion models, gaining insights into their mechanisms as differential equations (DE) solving (Song et al. ICLR 2020). With this, we introduced, FP-Diffusion (Lai et al. ICML 2023), improves the diffusion model by aligning it with its underlying mathematical structure, the Fokker-Planck (FP) Equation. Additionally, the link between diffusion models and DE solving reveals limitations associated with the slow sampling speed of thousand-step generation. Motivated by this, we'll introduce the Consistency Trajectory Model (CTM) (Kim & Lai et al. ICLR 2024), an innovative method enabling one-step diffusion model generation while preserving high fidelity and diversity. If time permits, we'll delve into controllable generation using pre-trained diffusion models, showcasing their utility in tasks such as media restoration and user-specified applications, and exploring their practical applications in industrial business.

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