

國立清華大學數學系學術演講

NTHU MATH Colloquium

講題 生成AI — 擴散模型的演進：從誕生到提升生成效能與可控性

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時間 2024.02.27 (Tue.) 16:00 – 17:00

地點 第三綜合大樓**1樓 Room 101**

茶會 15:30, Room 707

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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