

國立中央大學數學系

專題演講

主 講 人：王士欣助理教授 (國立臺灣大學資訊工程學系)

演講題目：Test-Time Steering of Generative Models via Parallel Tempering

演講茶會：2026年10月15日(星期四) 15:30~16:00

茶會地點：中央大學鴻經館 M306

演講時間：2026年10月15日(星期四) 16:00~17:00

演講地點：中央大學鴻經館 M107

Abstract：

Modern generative models can capture rich and complex data distributions, but practical applications often require more than unconditional generation: we may want samples that satisfy a desired property, achieve high reward, or reach rare regions of the model distribution. Retraining or fine-tuning the model for every new objective can be expensive, while gradient-based guidance may be unavailable or ineffective when rewards are black-box, non-differentiable, or highly multimodal.

In this talk, I will present our recent work on test-time steering, where a pretrained generative model is kept fixed and control is performed entirely during inference. I will first introduce Source Parallel Tempering, which moves the steering problem to the simple source distribution of continuous generative models and uses parallel tempering to explore multimodal reward landscapes without requiring reward gradients. I will then discuss how similar ideas extend to masked discrete diffusion models, where reward-aware remask-and-denoise updates are combined with parallel tempering to efficiently explore separated high-reward modes in applications such as biological sequence design. Together, these works suggest a broader perspective: test-time steering can be viewed as a sampling problem over reward-tilted generative distributions, where effective control requires balancing reward optimization, model fidelity, and exploration. I will conclude with some open directions toward test-time control for generative models.