Toward Theoretical Insights into Diffusion Trajectory Distillation via Operator Merging

厉茗
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时间：2025年12月18日 15:00-16:00

地点：光华楼东主楼 1513

Abstract:

Diffusion trajectory distillation methods accelerate sampling in diffusion models by training a student model to approximate the multi-step denoising process of a pretrained teacher model in a single step. However, theoretical insights into the trade-offs between distillation strategies and generative quality are limited. In this talk, we address this gap by interpreting trajectory distillation as an operator merging problem in the linear regime, where each teacher step is a linear operator on noisy data. We propose a dynamic programming algorithm to compute the optimal merging strategy, ensuring maximal signal fidelity preservation. Additionally, we show that a sharp phase transition exists in the optimal strategy, driven by data covariance structures. Our findings provide theoretical insights and practical guidance for improving distillation strategies. This is joint work with Professor Weiguo Gao.

个人简介：

Ming Li is a third-year Ph.D. candidate at the School of Mathematical Sciences, Fudan University, supervised by Professor Weiguo Gao. Her research interests lie in the mathematical theory and algorithmic optimization of generative models, as well as their applications in scientific computing.