RUTGERS–NEW BRUNSWICK
School of Arts and Sciences

Department of Statistics

Department of Statistics Seminar Series

Luhuan Wu
Center for Computational Mathematics
Flatiron Institute

Sequential Monte Carlo meets diffusion models

Wednesday, October 8th, 2025
12:10-1:30 PM
SEC 117

Zoom Meeting: Meeting ID: 983 2864 8232
Password: 665123

https://rutgers.zoom.us/j/98328648232?pwd=gcHifQ9OouKZnUY0EHLe8sjNXaV1oj.1

Light refreshments will be served in Hill 452, 11:40am

Abstract:

Diffusion models have emerged as a powerful paradigm for generative modeling. They are grounded in a pair of Markovian forward and reverse denoising dynamics. In this talk, I will explore how sequential Monte Carlo (SMC) methods, in particular, twisted SMC, can offer principled solutions to two sampling problems related to diffusion models.

In the first part, I will introduce the Twisted Diffusion Sampler (TDS), a purely inference-time algorithm for conditional sampling in diffusion models with asymptotic guarantees. TDS provides an appealing scaling property between computational cost and statistical accuracy, improving empirical performance even with a small number of particles. We illustrate TDS in image generation and protein design tasks. The link to this page can be found [https://arxiv.org/abs/2306.17775].

In the second part, I will turn to the classical problem of sampling from an unnormalized distribution. I will present the Reverse Diffusion Sequential Monte Carlo (RDSMC) sampler, which operates on an annealing schedule constructed from the diffusion reverse denoising process. This approach yields unbiassed estimation of normalization constants and consistency sampling, enabling application ins a variety of sampling tasks. The link to this page can be found [https://arxiv.org/abs/2508.05926].

Bio:

Luhuan Wu is an associate research scientist in the Center for Computational Mathematics at the Flatiron Institute. She will be joining the Department of Applied Mathematics and Statistics at Johns Hopkins University as an Assistant Professor in July, 2026. She completed her Ph.D. in Statistics at Columbia University, supervised by John Cunningham and David Blei, and her main research interests span generative models, approximate inference and Bayesian modeling.