THE UNIVERSITY OF HONG KONG

Institute of Mathematical Research
Department of Mathematics#

Numerical Analysis Seminar

A priori regularity of the reverse heat flow and dimension-dependent complexity of higher-order diffusion samplers

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Abstract

We establish arbitrary-order a priori regularity estimates for the reverse heat flow in the Ornstein--Uhlenbeck setting, that is, for the probability-flow ODE of score-based diffusion models. For compactly supported, possibly singular targets satisfying a dimension-uniform doubling condition on supporting-cap masses, we bound the iterated material derivatives of the flow and their first spatial derivatives pointwise, with constants independent of the dimension dd and explicit in time and support radius. The proof rests on two ingredients: a spatially uniform bound on normal-direction posterior fluctuations, which is the only point where the geometry of the target enters, and a centered posterior-moment normal form closed under material differentiation. This algebraic structure, together with a weighted regularity calculus, yields quantitative bounds at every order, including the mixed space--time directional derivatives required by Runge--Kutta stages.

Date:	September 29, 2026 (Tuesday)
Time:	11:00 am – 12:00 noon
Venue:	Room 210, Run Run Shaw Building, HKU

All are welcome