Distinguished Lectures

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Nonlinear Fokker-Planck-Kolmogorov Equations as Gradient Flows on the Space of Probability Measures

by

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Time: 5:00pm – 6:00pm
Venue: LT-10, Yeung Kin Man Academic Building

ABSTRACT

We propose a general method to identify nonlinear Fokker-Planck-Kolmogorov equations (FPK equations) as gradient flows on the space of Borel probability measures on R^d with a natural differential geometry. Our notion of gradient flow does not depend on any underlying metric structure such as the Wasserstein distance, but is derived from purely differential geometric principles. Moreover, we explicitly identify the associated energy functions and show that these are Lyapunov functions for the FPK solutions. Our main result covers classical and generalized porous media equations, where the latter have a generalized diffusivity function and a nonlinear transport-type first-order perturbation.

Keywords: Gradient flow, nonlinear Fokker-Planck equations, generalized porous media equation, differential geometry, Barenblatt solution
2020 MSC: 35Q84 (Fokker-Planck eq.), 35K55 (nonl. Parab. Eq.), 76S05 (flows in porous media), 58B20 (Riem. Geometry on infin. Dim. Spaces), 37B35 (gradient-like behavior), 35B40 (asympt. Behavior of sol. To PDE)

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