Seminar/Talk

Nonlinear kinetic equations as gradient flows

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Many evolutionary PDEs, both linear and nonlinear (e.g., the heat and porous medium equations), can be seen as gradient flows in the Wasserstein metric space of probability measures. This classical result provides general tools for existence, numerical approximation, uniqueness, and convergence estimates under weak assumptions. In this talk, we extend this perspective to dynamics driven by an interplay of conservative and dissipative effects.Our main result is the interpretation of the nonlinear kinetic Fokker-Planck equation as a gradient flow of the free energy in a suitable space of measures. The geometry of this space is physically motivated, induced by discrepancies that measure the minimal force needed to steer one configuration into another. As a consequence, we obtain approximations of solutions via an implicit Euler scheme.This talk is based on arXiv:2502.15665, in collaboration with G. Brigati (ISTA) and J. Maas (ISTA), and ongoing work with G. Brigati (ISTA), G. Carlier (CEREMADE, Paris Dauphine-PSL), and J. Dolbeault (CEREMADE, Paris Dauphine-PSL).

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Office Bldg West / Ground floor / Heinzel Seminar Room (I21.EG.101)

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