A VARIATIONAL APPROACH TO NONLINEAR AND INTERACTING DIFFUSIONS

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This talk presents a novel variational calculus to analyze the stability and the propagation of chaos properties of nonlinear and interacting diffusions.
This differential methodology combines gradient flow estimates with backward stochastic interpolations, Lyapunov linearization techniques as well as spectral theory.
This framework applies to a large class of stochastic models including non homogeneous diffusions, as well as stochastic processes evolving on differentiable manifolds, such as constraint-type embedded manifolds on Euclidian spaces and manifolds equipped with some Riemannian metric.
We present uniform as well as almost sure exponential contraction inequalities at the level of the nonlinear diffusion flow, as well as, uniform propagation of chaos properties w.r.t. the time parameter are also provided. Illustrations are provided in the context of a class of gradient flow diffusions arising in fluid mechanics and granular media literature.