CLOSING THE ODE-SDE GAP IN SCORE-BASED DIFFUSION MODELS THROUGH THE FOKKER-PLANCK EQUATION

TEO DEVENEY

Score-based diffusion models have emerged as one of the most promising frameworks for deep generative modelling, due to their state-of-the art performance in many generation tasks while relying on mathematical foundations such as stochastic differential equations (SDEs) and ordinary differential equations (ODEs). Empirically, it has been reported that ODE-based samples are typically inferior to SDE-based samples. In this talk we describe the range of dynamics and approximations that arise when training score-based diffusion models, and derive a theoretical upper bound on the Wasserstein 2-distance between the ODE- and SDE-induced distributions in terms of a Fokker--Planck residual. Numerically, we implement this residual as a regularisation term during training and attain samples which support our theoretical findings, resulting in a potential avenue to improve ODE-based samples from score-based diffusion models.