Pathwise convergence of Taylor schemes for SDEs via rough paths

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Abstract

The convergence of numerical schemes for stochastic differential equations such as Euler-Maruyama or Milstein is usually quantified in terms of strong or weak convergence, which both involve averages over sample paths. This comes as no surprise, if one recalls that Itô calculus is a fundamentally non-pathwise theory. We will show how one can use (anisotropic) rough path theory (a pathwise stochastic calculus) to systematically investigate the pathwise convergence of Taylor schemes for SDEs.