Pathwise convergence of the Euler scheme for rough and stochastic differential equations

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Abstract

First and higher order Euler schemes play a central role in the numerical approximations of stochastic differential equations. While the pathwise convergence of higher order Euler schemes can be adequately explained by rough path theory, the first order Euler scheme seems to be outside its scope, at least at first glance.

In this talk, we show the convergence of the first order Euler scheme for differential equations driven by càdlàg rough paths satisfying a suitable criterion, namely the so-called Property (RIE), along time discretizations with mesh size going to zero. This property is verified for almost all sample paths of various stochastic processes and time discretizations. Consequently, we obtain the pathwise convergence of the first order Euler scheme for rough stochastic differential equations driven by these stochastic processes.

The talk is based on joint work with A. L. Allan, A. P. Kwossek, and C. Liu.

*Punctual, i.e. sine tempore!