Functional Runge-Kutta Methods for Stochastic Delay Differential Equations

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Abstract

Stochastic Delay Differential Equations (SDDEs) hold significant importance in the advanced modeling of problems in the natural sciences, economics and engineering, e.g., those related to supply chains and sustainable innovation in general. While time integration is essential for simulating and understanding their behavior and properties, it poses nontrivial challenges due to the presence of both randomness and memory effects. In this talk we present an extension to SDDEs of the so-called *functional* Runge-Kutta methods, introduced for DDEs in [2] and further analyzed in [1], which provide an approximation to the whole history of the system at each time step. This allows for greater freedom in the choice of the integration mesh beyond the necessary breaking points independently of the delay structure or the underlying Brownian motion, thus potentially overcoming the limitation of traditional methods, which typically require commensurable delays and step sizes.

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References

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