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Gaussian and Non-Gaussian Continuous Processes, in Time, Space, and on Graphs

In statistics, stochastic processes are the main tool for modelling spatial and temporal data, and the most commonly used type are the Gaussian processes. A popular approach to define Gaussian processes is through linear stochastic differential equations driven by white noise. This methodology is often denoted the SPDE approach. By utilising methods from numerical analysis one has been able solve several of the computational bottlenecks that have hampered the usage of Gaussian processes for real world data sets, in particular for spatial statistics. I will focus on how one can apply the same methodology to create non-Gaussian processes, in space and time. I will also discuss what practical properties these processes have over their Gaussian counterpart. Further, I will present very recent work where we have extended the SPDE approach for Gaussian process, to Euclidean graphs (like street networks). Here the linear differential operators are obtained using Quantum graphs, which opens these methods for a new wide range of applications.

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