When switching fractional Brownian motion becomes non-Gaussian

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Abstract

Anomalous diffusion is often observed in complex systems, including single-particle tracking experiments, crowded media, and financial time series. In this talk, we consider switching fractional Brownian motion, a model in which the diffusivity changes over time while the long-range temporal correlations of fractional Brownian motion are preserved. Although the underlying process is conditionally Gaussian, temporal heterogeneity may lead to non-Gaussian displacement distributions.

During the talk we analyze kurtosis as a simple diagnostic of non-Gaussianity for Markovian and non-Markovian switching mechanisms. We show that Markovian switching leads to asymptotic Gaussianity, whereas heavy-tailed dwell times may preserve non-Gaussianity over long timescales. We also compare kurtosis with distribution-based distances such as the Hellinger distance, showing that kurtosis captures the main deviations from Gaussianity.

The talk is based on the article [1].

Keywords

switching fractional Brownian motion, Gaussianity, anomalous diffusion, heterogeneity, kurtosis, Hellinger distance

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References

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