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Memory in stochastic and chaotic processes

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Detection and quantification of presence of memory in various stochastic and chaotic processes is discussed. Short introduction of definitions, signatures, and measures is presented, and several examples of the application of the introduced formalism are discussed in detail.

These examples show that nonmarkovian are: most of proceses with stationary correlation function $C(t,s) = C(|t-s|)$ (with notable exception of stationary Ornstein-Uhlenbeck process), chemical reaction, fractional Brownian motions, chaotic processes from Feigenbaum cascade, and quantum processes interacting with heat bath. The discussed methods can be applied also to experimental data in the form of sample paths. It is shown in this way that nonmarkovian are, among others, the driven transport through nanochannels, and Brownian motions of nanoparticles inside living cells.

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