Stochastic resetting and hierarchical synchronization
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Stellingen

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Stochastic resetting and hierarchical synchronization

van

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Part I

1. The Laplace transform of the generating function of an additive functional for a process without stochastic resetting is related via a simple equation to the same object for the process with stochastic resetting .

2. The large deviation rate function for an additive functional of Brownian motion with resetting is given by a variational formula involving the rate function for the reset process, the rate function for the same additive functional of Brownian motion without resetting and the rate function for the duration of the reset periods.

3. Stochastic resetting is not confining enough to induce a large deviation principle for an observable that does not already satisfy a large deviation principle without resetting. It does however modify the large deviation rate function.

4. If the mean of an additive functional diverges without resetting, then the mean will become finite when resetting is added, and the rate function will be zero above the mean under certain mild assumptions.

5. It is important to reset oneself occasionally in order to keep working efficiently.

6. The communication of our work to others is one of the best ways to truly understand what we have done, and can be very effective in solving difficult problems.

Part II

1. The behavior of the Kuramoto model on the hierarchical lattice can be classified into three universality classes. Sufficient conditions for two of these universality classes involve only the sum of the inverses of the interaction strengths for the successive hierarchical level.

2. The level at which synchronization is lost in the hierarchical Kuramoto model (in the universality class where this occurs) is bounded above by the level at which the sum of the inverses of the interaction strengths for each hierarchical level exceeds the value 4.

3. In the Kuramoto model on a two-community network, the bifurcation point that arises when there is a negative interaction between oscillators in different communities can be fully characterised via a simple set of two equations. The first involves the function that controls the self-consistency equation for the one-community noisy Kuramoto model, the second gives the synchronization level at the bifurcation point in terms of the interaction strengths.

4. The mathematical analysis of the two-community noisy Kuramoto model provides new insight into the behaviour of the biological clock that is relevant for neurobiologists.

5. The feeling of perfect synchrony with others, for example in music, is one of the greatest pleasures life has to offer.

6. In order to taste the fruitiness of coffee it should not be roasted too darkly.