

Thermodynamics and embedding of generalized Langevin equations

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For Markovian dynamics, stochastic thermodynamics provides a consistent framework relating macroscopic thermodynamic properties to the properties of individual trajectories under time-reversal. By contrast, for non-Markovian dynamics, where the evolution depends on the history of the process, the definition of time-reversal is ambiguous and there is no established framework of stochastic thermodynamics. In this talk, I will explore the possibility of defining the thermodynamics of non-Markovian dynamics based on Markovian embedding. Focusing on linear (or semi-linear) generalized Langevin equations, I will clarify the conditions under which such equations can be represented by higher-dimensional Markovian Langevin equations. In particular, I will discuss the invariance of entropy production under the embedding representation, which allows for a unique identification of the entropy production of a non-Markovian system based on its Markovian representation.

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