

Localizing Energy Dissipation in Cellular Processes

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Identifying whether a process is in equilibrium, quantifying how far it lies from equilibrium, and determining optimal reduced descriptions of non-equilibrium processes remain challenging open problems. Here, we discuss how novel data-driven techniques grounded in stochastic thermodynamics can be used to efficiently learn these features directly from experimental data. In particular, we show how entropy production can be localized in space and time, and how maximally dissipative coordinates can be consistently inferred as effective low-dimensional descriptions of non-equilibrium processes. We further discuss applications to experimental biophysical systems and outline key challenges and limitations.