

Inference of fluctuating information flow via machine learning

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Stochastic information flow (SIF) quantifies information flow at the trajectory level, overcoming the limitations of conventional symmetric, ensemble-averaged measures. However, computational difficulties have hindered the empirical application of the SIF. In this work, we propose a scalable deep-learning method for estimating the SIF from general time-series data. Its applications to an exactly solvable two-particle model, Kuramoto oscillators, and empirical trajectories of interacting motile cells demonstrate the utility of SIF as a data-driven indicator of cooperative structures.

[1] Y. Oh, E. Kwon, and Y. Baek, arXiv:2605.13509.