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Talk 2:

Rare-event statistics of interacting particle systems on scale-free networks

We study the influence of complex graphs on rare events, such as the escape from a metastable state, in systems of interacting particles on scale-free networks. We focus on examples of evolutionary game theory and epidemiology. In the framework of evolutionary game theory, by using frequency-dependent fitness and selection, we analyze the dynamics of snowdrift games characterized by a long-lived coexistence state followed by the fixation of one of the species. In the epidemiological framework, we analyze the SIS (susceptible-infected-susceptible) model characterized by a long-lived endemic state followed by the extinction of the disease. Using an effective diffusion theory valid in the weak-noise limit, we demonstrate how the scale-free topology affects the system's metastable state and leads to anomalous escape times. In particular, we analytically and numerically show that the probability and mean time to escape are characterized by stretched-exponential behaviors with exponents depending on the network's degree distribution.