Infinite-noise criticality: Non-equilibrium phase transitions in fluctuating environments

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Abstract:
We study the effects of time-varying environmental noise on nonequilibrium phase transitions in spreading and growth processes. Using the examples of the logistic evolution equation as well as the Harris contact process, we show that such temporal disorder gives rise to a distinct type of critical points at which the effective noise amplitude diverges on long time scales. This leads to enormous density fluctuations characterized by an infinitely broad probability distribution at criticality. We develop a real-time renormalization-group theory that provides a general framework for the effects of temporal disorder on nonequilibrium processes. We also discuss how general this exotic critical behavior is and illustrate the results by computer simulations.