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Title: Thermalization dynamics of nonlinear non-Hermitian optical lattices

Abstract: We develop a rigorous theoretical framework based on principles from statistical mechanics that allows one to predict the equilibrium response of classical non-Hermitian arrangements in the weakly nonlinear regime. We demonstrate that a pseudo-Hermitian configuration can always be driven into thermal equilibrium when a proper nonlinear operator is paired with the linear Hamiltonian of the system. In this case, the system will thermodynamically settle into an irregular pattern that does not resemble any known statistical distribution. Interestingly, this stable equilibrium response is associated with a Rayleigh-Jeans law when viewed within an appropriately transformed space that displays unitary dynamics. By considering a non-Hermitian Su-Schrieffer-Heeger chain, our results indicate that the thermodynamic equilibrium will always favor the edge modes instead of the ground state, in stark contrast to conventional nonlinear Hermitian configurations.