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Localization, negative temperatures and ensemble inequivalence in the discrete nonlinear Schrodinger equation: a large deviations approach.

Monday, 19 December 2022 15:00 (25 minutes)

We present a detailed account of a first-order localization transition in the discrete nonlinear Schrödinger equation, where the localized phase is associated with the high energy region in parameter space [1,2]. We show that, due to ensemble inequivalence, this phase is thermodynamically stable only in the microcanonical ensemble. In particular, we obtain an explicit expression of the microcanonical entropy close to the transition line, located at infinite temperature. This task is accomplished by making use of large-deviation techniques, that allow us to compute, in the limit of large system size, also the subleading corrections to the microcanonical entropy. These subleading terms are crucial ingredients to account for the first-order mechanism of the transition, to compute its order parameter and to predict the existence of negative temperatures in the localized phase.

[1] "Condensation transition and ensemble inequivalence in the discrete nonlinear Schrödinger equation", G. Gradenigo, S. Iubini, R. Livi, S. N. Majumdar, Eur. Phys. J. E 44, 1-6 (2021).
[2] "Localization transition in the discrete nonlinear Schrödinger equation: ensembles inequivalence and negative
temperatures", G. Gradenigo, S. Iubini, R. Livi, S. N. Majumdar, J. Stat. Mech. 023201 (2021).

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