QuTe
Zentrum für Quantentechnologien

Quantum Information Science Talks

UNIVERSITÄT DES SAARLANDES

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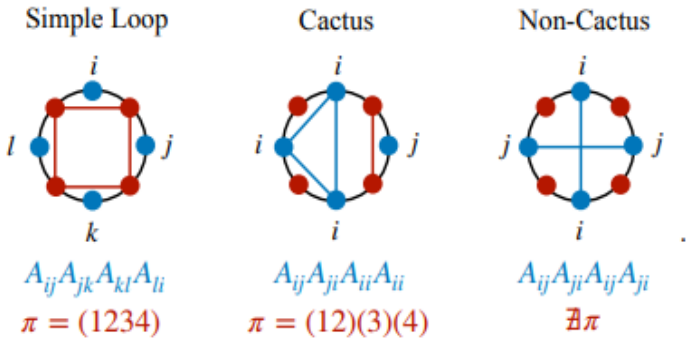
Local Rotational Invariance and Free Probability for refining the Eigenstate Thermalization Hypothesis

Understanding how isolated quantum many-body systems reach thermal equilibrium is a central question in nonequilibrium physics. The Eigenstate Thermalization Hypothesis (ETH) provides a powerful framework by linking thermalization to the statistical properties of matrix elements of physical observables in the energy eigenbasis.
In this talk I will present a recent work in which we revisit and clarify in detail the ideas that have led to the formulation of full ETH, a generalization of the ETH ansatz that captures multi-point correlation functions. Specifically, using tools from free probability, we explore the implications of local rotational invariance, a property that emerges from the statistical invariance of observables under random basis transformations induced by small perturbations of the Hamiltonian. This approach allows us to analytically characterize subleading corrections to matrix-element correlations, thereby refining the ETH ansatz. Our results open several promising directions for future research in many-body quantum dynamics as well as in quantum information theory.



From: https://arxiv.org/pdf/2511.23217

Tuesday, March 24th, 2026
12:00 PM
Building E2 6, **Room E.11**

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