北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

Conserved quantities from entanglement Hamiltonian

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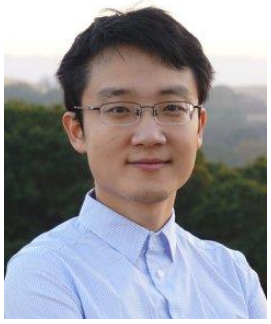

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Abstract

We show that the subregion entanglement Hamiltonians of excited eigenstates of a quantum many-body system are approximately linear combinations of subregionally (quasi)local approximate conserved quantities. By diagonalizing an entanglement Hamiltonian superdensity matrix (EHSM) for an ensemble of eigenstates, we can obtain these conserved quantities as the EHSM eigen-operators with nonzero eigenvalues. For free fermions, the number of nonzero EHSM eigenvalues is cut off around the order of subregion volume, and some of their EHSM eigen-operators can be rather nonlocal, although subregionally quasilocal. In the interacting XYZ model, we numerically find the nonzero EHSM eigenvalues decay roughly in power law if the system is integrable, with the exponent $s \approx 1$ ($s \approx 1.5 \sim 2$) if the eigenstates are extended (many-body localized). For fully chaotic systems, only two EHSM eigenvalues are significantly nonzero, corresponding to the identity and the subregion Hamiltonian.

About the speaker

Biao Lian is an assistant professor in Department of Physics, Princeton University. He earned his Ph.D. at Stanford University in 2017 and his B.S. at Tsinghua University in 2012. He then joined Princeton Center for Theoretical Science as a postdoctoral fellow. In 2020, Biao Lian started the tenure-track at Princeton University. He is a theorist in condensed matter physics and nonequilibrium many-body quantum systems. He has been selected by the Alfred P. Sloan Foundation for a 2021 Sloan Research Fellowship.