



Seminar

Entanglement of Many-Body Mixed States

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Time: 3:00 pm, April. 29, 2024 (Monday)

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Venue: Room w563, Physics building, Peking University

地点: 北京大学物理楼, 西563会议室

Abstract

Many-body entanglement unveils additional aspects of quantum matter and offers insights into strongly correlated physics. While ground-state entanglement has received much attention in the past decade, the study of mixed-state quantum entanglement using negativity in interacting fermionic systems remains less explored. We demonstrate that the partially transposed density matrix of interacting fermions, similar to the reduced density matrix, can be expressed as a weighted sum of Gaussian states describing free fermions, enabling the calculation of rank- n Rényi negativity within the determinantal quantum Monte Carlo framework. We conduct the first calculation of rank-two Rényi negativity for the half-filled Hubbard model and the spinless t - V model and find that the area law coefficient of the Rényi negativity has a singularity at the finite-temperature transition point. Our work contributes to the calculation of entanglement and sets the stage for future studies on quantum entanglement in various fermionic many-body mixed states.

About the speaker

Xiao Yan Xu (许霄琰) graduated with a Ph.D. from the Institute of Physics, Chinese Academy of Sciences in 2017. He has conducted postdoctoral research at the Hong Kong University of Science and Technology and the University of California, San Diego. In 2021, he joined the School of Physics and Astronomy at Shanghai Jiao Tong University. His main research interests include the theory and computation of strongly correlated electron systems, including quantum spin liquids, non-Fermi liquids, the sign problem, quantum criticality, quantum entanglement, and the interdisciplinary intersections of quantum many-body physics with machine learning, quantum information, and ultracold atomic physics.