Abstract Submitted
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**Complex network description of phase transitions in the classical and quantum disordered Ising Model**[1] MINA FASIHI, HALEY COLE, LINCOLN CARR, Colorado School of Mines, GUILLERMO GARCIA PEREZ, SABRINA MANISCALCO, University of Turku — Complex network analysis is a powerful tool to describe and characterize classical systems such as the Ising model in a transverse magnetic field. Measuring spin-spin correlations gives rise to the adjacency matrix, representing a weighted network. In this study, the spin-spin correlations at different temperatures are analytically calculated, yielding phase-dependent complex networks, from simple networks in the low temperature ferromagnetic limit to random ones at high temperature. The network structure varies as the transverse field and temperature change, recovering the phase diagram and providing initial insight into correlations in the critical region. Analyzing the resulting complex network using a variety of network measures such as the degree histogram, average clustering, betweenness centrality and the graph entropy, the complexity is characterized. This method is applied for both the disordered classical Ising and quantum Ising lattice, demonstrating the role of finite temperature and disorder in generation of complexity.

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