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New Dynamical Scaling Universality for Quantum Networks Across Adiabatic Quantum Phase Transitions OSCAR L. ACEVEDO, FERNEY J. RODRIGUEZ, LUIS QUIROGA, Universidad de los Andes, NEIL F. JOHNSON, University of Miami, Coral Gables, ANA M. REY, JILA, Colorado University at Boulder — We reveal universal dynamical scaling behavior across adiabatic quantum phase transitions in networks ranging from traditional spatial systems (Ising model) to fully connected ones (Dicke and Lipkin-Meshkov-Glick models). Our findings, which lie beyond traditional critical exponent analysis and adiabatic perturbation approximations, are applicable even where excitations have not yet stabilized and, hence, provide a time-resolved understanding of quantum phase transitions encompassing a wide range of adiabatic regimes. We show explicitly that even though two systems may traditionally belong to the same universality class, they can have very different adiabatic evolutions. This implies that more stringent conditions need to be imposed than at present, both for quantum simulations where one system is used to simulate the other and for adiabatic quantum computing schemes.

Oscar L. Acevedo
Universidad de los Andes

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