USC Dornsife
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Department of Physics and Astronomy

Ming Hsieh Institute - Physics

Joint Seminar Series

USC Viterbi
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Ming Hsieh Department of Electrical and Computer Engineering

Non-Hermitian quantum dynamics: super quantum correlations and breaking the quantum speed limit*

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Date: Friday, November 1, 2024
Time: 2:00pm – 3:30pm
In-person: SSL 202

Abstract: Quantum theory provides rules governing much of the microscopic world. It dictates unitarity for isolated systems that when coupled to an environment, undergo decoherence. Among its counter-intuitive consequences are temporal (Leggett-Garg) correlations that exceed the bounds from local, classical theories. In the simplest system — a single qubit — LG correlations are bounded below 1.5 for unitary and decohering dynamics, with excess over 1 indicating "quantumness". Fundamentally, these bounds arise due to limits on the speed at which a quantum state can evolve into an orthogonal one.

In recent years, quantum systems undergoing coherent but non-unitary evolution have emerged. They are governed by non-Hermitian, parity-time (PT) symmetric Hamiltonians with exceptional point degeneracies. After a short review of such systems, I will present results for PT-symmetry breaking, temporal correlations that exceed the LG bound of 1.5, and quantum state-transfers that exceed the quantum speed limit in a single trapped ion (arXiv:2304.12413, PRA 108, 032202 (2023)).

*Work done with David Allcock group (University of Oregon) and Sourin Das group (IISER, Kolkata).

Biography: Yogesh Joglekar is an experimentally-minded theoretical physicist. After initial training and some time in condensed matter physics, he started moonlighting in the area of PT symmetry with the help of high-school students. They have helped him see how PT symmetry emerges in disparate platforms such as a single LC circuit or a vibrating tank of water. His primary area of research is open classical and quantum systems. He usually has far more questions than answers.

Hosted by: Mercedeh Khajavikhan & Demetri Christodoulides