USC Viterbi
School of Engineering
Ming Hsieh Department of Electrical and Computer Engineering

Ming Hsieh Institute **Seminar Series**

Photonics

Typical eigenstate entanglement entropy as a diagnostic of quantum chaos and integrability

Marcos Antonio Rigol
Physics, Penn State

Date: Tuesday, April 4, 2023
Time: 3:00pm – 4:30pm
In-person: EEB 248

Abstract: The typical entanglement entropy of subsystems of random pure states is known to be (nearly) maximal, while the typical entanglement entropy of random Gaussian pure states has been recently shown to exhibit a qualitatively different behavior, with a coefficient of the volume law that depends on the fraction of the system that is traced out. We review evidence that the typical entanglement entropy of eigenstates of quantum-chaotic Hamiltonians mirrors the behavior in random pure states, while that of integrable Hamiltonians mirrors the behavior in random Gaussian pure states. Based on these results, we conjecture that the typical entanglement entropy of Hamiltonian eigenstates can be used as a diagnostic of quantum chaos and integrability. We discuss subtleties that emerge as a consequence of conservation laws, such as particle number conservation, as well as of lattice translational invariance.

Dr. Rigol is a Professor of Physics at Penn State. Before joining Penn State, he was an Associate Professor of Physics at Georgetown University. Dr. Rigol completed his undergraduate (Summa Cum Laude) and M.Sc. studies at the Institute of Nuclear Sciences and Technology in Havana. He received his Ph.D. in Physics (Summa Cum Laude) from the University of Stuttgart, and did postdocs at the University of California Davis, the University of Southern California, and the University of California Santa Cruz.

Dr. Rigol research interest is in many-body quantum systems in and out of equilibrium, with a focus on the effect of strong correlations. His research is at the interface between condensed matter physics, ultracold atoms, and statistical mechanics. He is a Fellow of the American Physical Society and of the American Association for the Advancement of Science.

Hosted by: Mercedeh Khajavikhan; Michelle Povinelli, Constantine Sideris; Hossein Hashemi; Wade Hsu; Mengjie Yu; Wei Wu; Tony Levi; Alan E. Willner; Andrea Martin Armani