TEXAS TECH
UNIVERSITY

Quantum Information and Computing (QIC) Seminar

Marcos Rigol (Penn State)

3:00 pm, Wednesday, February 15, 2023

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

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 [1]. We review evidence that the typical entanglement entropy of eigenstates of quantum-chaotic Hamiltonians mirrors the behavior in random pure states [2], while that of integrable Hamiltonians mirrors the behavior in random Gaussian pure states [3]. 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 [3]. We discuss subtleties that emerge as a result of conservation laws, such as particle number conservation [1,2], as well as of lattice translational invariance [4].

[1] E. Bianchi, L. Hackl, M. Kieburg, MR, and L. Vidmar, PRX Quantum 3, 030201 (2022).
[2] L. Vidmar and MR, PRL 119 220603 (2017).
[3] T. LeBlond, K. Mallayya, L. Vidmar, and MR, PRE 100 062134 (2019).
[4] L. Vidmar, L. Hackl, E. Bianchi, and MR, PRL 119 020601 (2017).

The speaker: Dr. Rigol is a Professor of Physics at Penn State. His 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.

Zoom link:
`https://texastech.zoom.us/j/94544758927?pwd=em83K2ZrTG1tMVZGaTZaQnVnVmxZUT09`

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