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Seminar Room, Ground floor, Department of Physics
Via Sommarive 14

Unraveling the emergence of quantum state designs in systems with symmetry

Abstract

Quantum protocols often require preparing random quantum states. Quantum state designs address this pertinent question: `How can one efficiently sample a Haar-distributed quantum state?' The recently introduced projected ensemble framework generates approximate state designs by hinging on projective measurements over a subsystem of a single chaotic generator state. In this talk, I shall discuss the emergence of state designs from generator states exhibiting symmetries. The presence of symmetries constrains randomness, influencing both the dynamics and the state, thereby limiting suitable measurement bases. Focusing initially on translation-symmetric states, we establish a sufficient condition for a measurement basis to guarantee the emergence of state designs. A careful examination of the violations of this condition pinpoints bases that fail to produce designs. To contextualize in a physical setting, the dynamical generation of designs in a chaotic Ising model with periodic boundary conditions will be discussed. The talk will also touch upon extensions to other discrete symmetries, broadening the scope of the results.

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