Justin Wilson

Title: Measurement and Feedback Driven Adaptive Dynamics in the Classical and Quantum Kicked Top

This talk explores stochastic quantum control in the kicked top model, a model with rich chaotic dynamics, and its connection to the inverted harmonic oscillator. The kicked top provides an ideal testbed for studying quantum chaos, with well-defined classical, semiclassical, and quantum regimes controlled by the spin size parameter as an effective ħ.

 We demonstrate how probabilistic control protocols can tame both classical and quantum chaos, revealing a critical control probability above which dynamics collapse onto fixed points. A key finding is that quantum interference effects emerging beyond the Ehrenfest timescale can be effectively controlled despite the absence of simple trajectory interpretations. The quantum case exhibits intriguing differences from classical control, including evidence of a split transition where entanglement properties change at a different critical probability than other observables.

 Our approach analyzes how the semiclassical limit and decoherence effects compete, establishing connections between quantum information theory, measurement-induced phase transitions, and classical, stochastic control of chaos. These results demonstrate that quantum adaptive dynamics can effectively control complex quantum chaotic systems even in regimes dominated by quantum interference.

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