Special Seminar

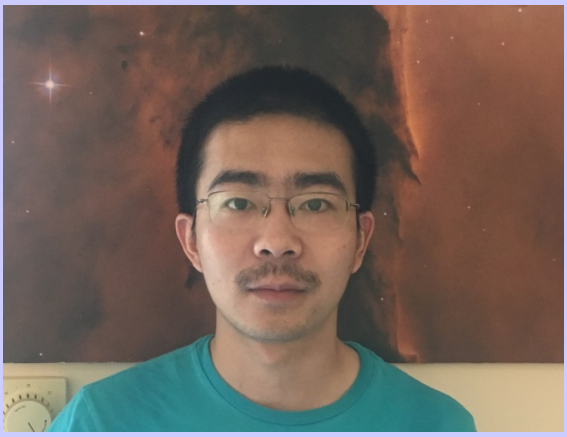
Theoretical Condensed Matter Physics

Wednesday, February 24, 2021 → Zoom → 12:30 PM

“The information transport in quantum dynamics”

Chaotic quantum evolution in many-body quantum systems is largely an open challenge. A conventional paradigm is the semi-classical picture. However there are recent key developments proposing new universal behaviors far away from the semi-classical limit. This talk will discuss the coarse grained dynamics of quantum information transport in this aspect. Part One will focus on the propagation of the quantum butterfly effect in the long-range interacting systems. We model the dynamics with an exactly soluble stochastic model known as the“long-range dispersal”and obtain an exact phase diagram for the "butterfly" light cone. We check it with a large-scale 1d simulation and propose measurements in nuclear magnetic resonance experiments. Part Two will introduce a generic entanglement structure -- a membrane like object -- in understanding the entanglement in a quantum quench. The membrane was proposed in effective models obtained by taking random average over the evolution. Here we show how to make sense of the membrane in more realistic models without randomness. Our approach relies on introducing effective degrees of freedom that pairs the forward and backward trajectories in spacetime. We show that a consistent line tension may be defined for the entanglement membrane in a chaotic quantum quench without disorder.

Tianci Zhou,
UC Santa Barbara



CUPhysics