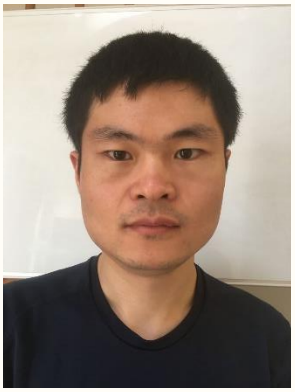
RICE QUANTUM GROUP MEETING SEMINAR SERIES



Presenter:	**Xinghai Zhang**
Research Group:	Prof. Matthew Foster's group
Date:	January 27, 2023, Friday
Time:	4PM - 5PM
Venue:	SST 300

Enhanced Amplitude for Superconductivity due to Spectrum-wide Quantum Critical Wave Functions

Abstract:

The shape of electron wave functions determines key properties of quantum materials. Disorder can play an outsized role, tuning materials from metallic to insulating, typically separated at a single special energy at which wave functions become fractal. Very recently, it was found that disorder can turn all wave functions into fractals ("spectrum-wide quantum criticality," SWQC) in models of topological and strongly correlated superconductors. The implications of SWQC for superconductivity itself remain largely unexplored. Here we study the interplay between superconductivity and SWQC in a simpler setting, in two one-dimensional (quasiperiodic and power-law hopping) models via self-consistent BCS theory. We find that SWQC survives the incorporation of attractive interactions at the Anderson localization transition, while the superconductivity pairing amplitude is maximized near this transition in both models. Our study highlights a new potential mechanism for achieving higher transition temperatures via random or structured inhomogeneity.

Short Bio:

Xinghai Zhang is a graduate student in Prof. Matthew Foster's group. His research focuses on the study of disorder, topology and interaction in condensed matter systems via field theoretical and numerical methods. He recently works on how superconducting and magnetic ordering affected by the quantum critical wave functions near the Anderson transition.

Note: *Snacks and Coffee will be served during the event Wine & cheese will be served after the talk. Everyone is welcome to stay around after the seminar for further informal discussions.*