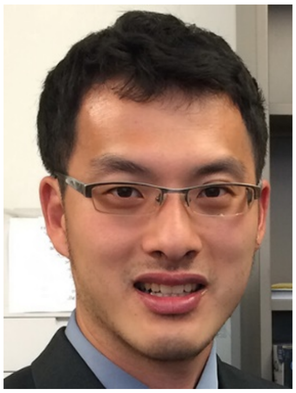
21 Dec Tuesday 1:30 – 2:15 Chair: WANG Qinghai (王清海)

Synthetic Topological and Non-Hermitian Systems

Professor LEE Ching Hua (李庆华), National University of Singapore, Singapore



Professor LEE Ching Hua obtained his PhD from Stanford University in 2015 under the tutelage of Prof. Xiaoliang Qi. His research interests revolve around non-equilibrium condensed matter systems, particularly non-Hermitian lattices. He also investigates how non-equilibrium and topological systems of current interest can be physically realized in synthetic platforms like electrical circuits and quantum computers. He publishes prolifically, with over 10 works in top journals like Nature Physics, Nature Communications and PRL over the past few years.

Abstract:

Robust boundary modes have been a central focus of condensed matter research for more than a decade. So far, there are two main mechanisms for robust boundary modes - topology and non-Hermiticity - with the latter leading to a variety of intriguing phenomena not known till recently. Besides gain or dissipation, open non-Hermitian systems exhibit a variety of interesting physical effects with no Hermitian analog. In particular, systems with asymmetric gain/loss experience the so-called non-Hermitian skin effect, where all eigenmodes localize at the boundaries. The resultant skin modes lead to modified topological invariants and, in higher dimensions, new families of skin-topological modes characterized by the spontaneous breaking of reciprocity. Their effective description implies an emergent non-locality that also leads to modified criticality, discontinuous Berry curvature, anomalous linear responses and unusual topological transitions that do not close the gap. My talk shall consist of two parts: 1) an introduction to recently discovered non-Hermitian phenomena and 2) an overview of synthetic realizations of topological and non-hermitian states via electrical circuits and quantum computers, particularly those from my group. These synthetic realizations form new avenues for bringing to reality various phenomena previously thought to only exist on paper.