

Simis Seminar series on Quantum computing, Quantum simulation and Strongly-correlated systems

Dr. Gabriel Cardoso

Tsung-Dao Lee Institute, Shanghai Jiao Tong University, Shanghai, 201210, China

“Gapless Floquet Topology”

Abstract

Symmetry-protected topological (SPT) phases in insulators and superconductors are known for their robust edge modes, linked to topological invariants which are computed from the Berry connection defined in the bulk: the bulk-boundary correspondence. While this principle traditionally applies to gapped phases, recent advances have extended it to gapless systems, where topological edge states persist even in the absence of a bulk gap. We extend this framework to periodically driven chains with chiral symmetry, revealing the existence of topological edge zero- and pi-modes despite the lack of bulk gaps in the quasienergy spectrum. By examining the half-period decomposition of chiral evolutions, we construct topological invariants that circumvent the need to define the Floquet Hamiltonian, making them more suitable for generalization to the gapless regime. Geometrically, the generalization is equivalent to a definition of linking numbers between intersecting loops in the three-sphere. We provide explicit examples, including generalizations of the Kitaev chain and related spin models, where localized pi-modes emerge even when the bulk is gapless at the same quasi-energy as the edge modes, and study the effect of interactions.

Reference

[arXiv:2411.02526]

Biography of the speaker

Gabriel Cardoso received his PhD from Stony Brook University in 2022 and is now a joint postdoctoral scholar at the Tsung-Dao Lee Institute (TDLI) and the Nordic Institute for Theoretical Physics (Nordita). His research focuses on chiral and geometric response in topological materials such as fractional quantum Hall effect, chiral superfluids, and topological insulators.

Date and Place: 29th November 2024, 13:30h-14:30h. Room: 1410. Send comments or questions to: Miguel Tierz to tierz at simis.cn