Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"Topological invariants for symmetry protected topological phases of fermions"

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Abstract: Topological materials are distinct from conventional ones for having topologically protected gapless boundary modes. An important question is which bulk characteristics in topological materials lead to such exotic boundary modes. In this talk, I present our recent attempts to address this question in the case of topological superconductors and insulators. I will introduce quantities to diagnose non-trivial topology within the bulk by applying a proper set of deformations to the system, which effectively trigger a topological response. These quantities are related to the topological invariants of partition functions on suitable spacetime manifolds. I will show how these partition functions can be written in the canonical formalism in terms of expectation values of some operators, where the role of the operator can be viewed as twisting by symmetry. Surprisingly, in the case of time-reversal, the process of twisting by symmetry is obtained via the partial transpose, a well-known operation in quantum information theory which is applied to density matrices to determine whether a state is entangled or not. Throughout my talk, I use topological superconductors (class BDI) in 1D and topological insulators (class AII) in 2D as explicit examples to explain how the above ideas work.

12:00pm noon
Tuesday, December 4, 2018
Duboc Room (4-331)

Host: Max Metlitski