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Wrapping in two bands

Topology has proven to be a crucial tool for studying conductance in materials. Topology manifests in the following way: metals and insulators are classified by the existence of an energy gap, as the latter possess a gap between valence and conduction bands while the former do not. The eigenstates and Hamiltonian of a crystal are indexed by momenta and thus give rise to a vector bundle structure over the Brillouin zone. Electronic properties of an insulator are then governed by the topological properties of the subbundle corresponding to valence bands. These bands can possess non-trivial topologies that can be realized as an obstruction to define wave functions over the entire Brillouin zone using a single phase convention. We show that in a two-band insulator this non-trivial topology manifests as a winding number. We explore the potential application of "abelianization" to the classification of topological materials.