by Alase, Cobanera, Ortiz and Viola Abstract Submitted
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Analytical characterization of bulk-boundary separation for non-interacting fermionic Hamiltonians EMILIO COBANERA, ABHIJEET ALASE, Dartmouth Coll, GERARDO ORTIZ, Indiana University, LORENZA VIOLA, Dartmouth Coll — In topological quantum matter the notions of bulk and boundary are closely intertwined by the Hamiltonian. For non-interacting systems, the bulk-boundary correspondence relates this phenomenon to topological properties of the single-particle Hamiltonian defined in momentum space, but, so far, no analytic, systematic approach has been put forward to investigate the edge modes themselves. We show how Schrodinger's equation for a confined system of independent fermions may be separated into a bulk and a boundary equation in a manner that depends critically on the nature of the Hamiltonian. The bulk equation may be solved in closed or near closed form, and the Brillouin zone associated to the infinitely extended system emerges naturally embedded in the full complex plane or higher dimensional analogue. The bulk equation determines uniquely all possible zero modes of the system, whereas the boundary equation selects those, if any, compatible with the prescribed boundary.

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