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Deep Learning for Topological Materials

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Fascination in topological materials originates from their remarkable response properties and exotic quasiparticles which can be utilized in quantum technologies. In particular, large-scale efforts are currently focused on realizing topological superconductors and their Majorana excitations. However, determining the topological nature of superconductors with current experimental probes is an outstanding challenge. This shortcoming has become increasingly pressing due to rapidly developing designer platforms which are theorized to display very rich topology and are better accessed by local probes rather than transport experiments. We introduce a robust machine-learning protocol for classifying the topological states of two-dimensional (2D) chiral superconductors and insulators from the local density of states (LDOS) data. Since the LDOS can be measured with standard experimental techniques, our protocol overcomes the almost three decades standing problem of identifying the topological invariants of 2D superconductors [1].

[1] Paul Baireuther, Marcin Płodzień, Teemu Ojanen, Jakub Tworzydło, Timo Hyart, "Identifying Chern numbers of superconductors from local measurements" arXiv:2112.06777

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