Fermionic phases of matter on unoriented spacetime

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Abstract:

We discuss a recipe to produce a lattice construction of fermionic phases of matter on unoriented manifolds. This is performed by extending the construction of spin TQFT via the Grassmann integral proposed by Gaiotto and Kapustin, to the unoriented pin± case. As an application, we construct gapped boundaries for time-reversal-invariant Gu-Wen fermionic SPT phases. In addition, we provide a lattice definition of (1+1)d pin− invertible theory whose partition function is the Arf-Brown-Kervaire invariant, which generates the Z8 classification of (1+1)d topological superconductors. We also compute the indicator formula of Z16 valued time-reversal anomaly for (2+1)d pin+ TQFT based on our construction.