Classification of topological insulators and superconductors

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I will give an introductory review of classification of topological insulators and superconductors. Hamiltonians of non-interacting fermions are known to be classified into 10 Altland-Zirnbauer symmetry classes, according to the presence or absence of time-reversal and particle-hole symmetries. It has recently been shown that in every spatial dimension there exist 5 (out of the 10 AZ classes) distinct classes of topological insulators or superconductors which can be distinguished by an integer (Z) or binary (Z_2) topological invariant. I will try to explain the classification theory in a few different ways, by considering stability of gapless boundary states against perturbations including disorder, by studying possible mass terms for representative Dirac Hamiltonians (Clifford algebras), etc. A generalization to systems with reflection symmetry will be briefly discussed as well.