Data Driven Approximations of Topological Insulators Systems

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Abstract

Electromagnetic wave propagation in a wave guide can be described by the onedimensional time independent Schrodinger equation, which, in the deep lattice limit, can be sufficiently approximated by an SSH type model through constant coefficients interaction terms. A numerical program has been developed to compute the interaction coefficients based on user input potential or spectral band data. A nonlinear least squares approximation method (Levenberg-Marquardt) is utilized to minimize an objective function. The discrete models generated by the algorithm are capable of reproducing the expected physical and topological properties of a given system.