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Circuit dynamics of free fermions in disguise

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The models known as “free fermions in disguise” are a class of Hamiltonians with very peculiar properties: while they are directly solvable by any Jordan-Wigner (JW) transformation, they display a free-fermionic spectrum. Indeed, the mapping to free fermionic modes involves a complicated non-linear and highly non-local map. Because of this, contrary to standard JW-solvable spin chains, it is a non-trivial and partially open question to compute the dynamics in such models, or whether this can be done efficiently at all. In this talk, I will focus on a family of quantum circuits which are the discrete version of the dynamics of free fermions in disguise and present recent results pertaining to their time evolution. I will discuss the implications of our results for the classical simulability of this class of circuits, and the quantum simulation of “free-fermions in disguise” on a quantum computer.

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