

Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

“Jordan-Wigner Dualities for Translation-Invariant Hamiltonians in Any Dimension: Emergent Fractons that are Fermions”

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Abstract: Inspired by recent constructions of Jordan-Wigner transformations in higher dimensions by Kapustin et. al., I will present a framework for an exact bosonization, which locally maps a translation-invariant model of spinless fermions to gauge theory of Pauli spins. I will show that the duality exists for a fermion system with arbitrary interaction terms (i.e. generalized "hopping" operators) in any dimension and provide an explicit construction.

I will then present two interesting applications. First, bosonizing fermionic systems where fermion parity is conserved on individual submanifolds. This can give rise to fracton models where emergent particles are immobile, but yet can behave in certain ways like fermions. These models may be examples of new non-relativistic 't Hooft anomalies. Second, bosonizing Majorana stabilizer codes — such as the Majorana color code or the checkerboard model — into new Pauli stabilizer codes distinct from their doubled CSS codes.

(based on arXiv:2002.11345)

12:00pm noon
Tuesday, March 10, 2020
Duboc Seminar Room (4-331)