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A computational approach to the inverse problem of unconventional superconductivity ELI CHERTKOV, BRYAN CLARK, University of Illinois at Urbana-Champaign — Condensed matter physics is concerned with the relationship between microscopic interactions, encoded by the Hamiltonian, and macroscopic emergent properties, encoded by the ground state. In this work, we tackle the following inverse problem: given a desired macroscopic property, what microscopic interactions produce that property? As a first step towards tackling this problem, we developed a new computational approach we call inverse variational Monte Carlo (IVMC). IVMC takes as input a desired wave function and outputs the interaction parameters of a variational Hamiltonian that produces the target wave function as a ground state. We apply the IVMC method to study unconventional superconductivity in the cuprates by searching for the Hamiltonian parameters that most closely produce a superconducting wave function as the ground state.

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