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Jastrow-Correlated Wavefunctions for Flat-Band Lattices HAO

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The electronic band structure of many compounds, e.g., carbon-based nanostructures, can exhibit essentially no dispersion. Models of electrons in such flat-band lattices define non-perturbative strongly correlated problems by default. We construct a set of Jastrow-correlated ansatz wavefunctions to capture the low energy physics of interacting particles in flat bands. We test the ansatz in an example honeycomb ribbon. The model Hamiltonian is projected on a flat band of the ribbon, thus containing only the Coulomb interaction term. The properties of the ground states are studied using numerical diagonalization. We find that the ansatz wavefunction accurately captures the ground state in a transition from a crystal to a uniform quantum liquid.

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