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Bosonic Hubbard-Holstein model and its realization in optical lattices MAN-HONG YUNG, Harvard University, KUEI SUN, U. of Cincinnati & U. of Illinois at Urbana-Champaign, ALAN ASPURU-GUZI, Harvard University — The Hubbard-Holstein (HH) model describes the interplay between the Coulomb interaction and the electron-phonon coupling for fermionic systems. Motivated by the recent experimental progresses in optical lattices, we investigate a bosonic version of the HH model, where the two competing many-body interactions of the HH model become a bosonic two-body interaction and a boson-phonon coupling. In the regime of weak boson-phonon coupling, the mean-field phase diagram shows that overall effects of the phonons is to expand the domain of superfluidity. This bosonic Hubbard-Holstein (BHH) model can be realized in a pair of overlapping optical lattices, where bosonic particles trapped in one optical lattice are perturbed by more massive particles trapped in the other lattice.

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