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Does the 2D Hubbard model describe high-temperature superconductors?[1]

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With more than a thousand publications yearly over the past ten years, the 2D Hubbard model has been widely used as a theoretical tool to investigate the physics of the high-temperature superconducting cuprates. Here we present the first numerically exact solution of the conventional 2D Hubbard model. We systematically study the cluster size dependence of superconductivity in the doped model using the dynamical cluster approximation and quantum Monte Carlo as a cluster solver. Due to the non-locality of the d-wave superconducting order parameter, the results on small clusters show large size and geometry effects. These become weaker as the cluster size increases and finite transition temperatures are found in large enough clusters. The extrapolation to infinite cluster size will be discussed.

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