Dror Orgad
Racah Institute of Physics, The Hebrew University, Israel

Title: Enhanced pairing in the plaquette Hubbard model

Abstract:

There is a large body of experimental evidence that points to the existence of nano-scale electronic structures in the cuprate high-temperature superconductors. However, the role that they play in the phenomenon of high-temperature superconductivity is hotly debated. In an effort to elucidate aspects of the interplay between electronic inhomogeneity and Copper pairing in systems with repulsive interactions we studied the Hubbard model on various finite-size clusters constructed from coupled plaquettes. To this end, we implemented the contractor-renormalization method, which I will briefly describe. We find that various signatures of pairing such as the pair-binding energy and the spin-gap exhibit a pronounced maximum at intermediate values of the inter-plaquette hopping t' and the on-site repulsion U. Our results hence demonstrate that moderate inhomogeneity of the type considered here substantially enhances the formation of hole pairs.
I will discuss the origin of the enhancement and give evidence that it is correlated with the magnetic nature of the ground state.
Finally, I will ask whether a similar maximum occurs in the superconducting transition temperature.