Computing Correlations in the 2D Hubbard Model

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ABSTRACT: Superconductivity and the pseudogap in the high transition-temperature cuprates can be understood at the qualitative level through the application of phenomenological theories which act as extensions of otherwise standard BCS theory. For reasons of analyticity these phenomenologies often stem from a strong coupling limit, rather than the intermediate coupling region from which the physics of the cuprates is thought to emerge.

In this talk, I will outline these phenomenologies and show that their successes in the superconducting phase are restricted by knowledge of the underlying pseudogapped normal phase thought to emerge from correlation physics. To this end, I will present the results of recent numerical simulations which implement continuous-time methods to produce numerically exact result for the equation of state of the two dimensional Hubbard model. Finally, I will discuss how the development of new techniques based on two particle correlations combined with cluster-methods should help to eliminate some of the pitfalls of such calculations.

ALL ARE WELCOME!!!