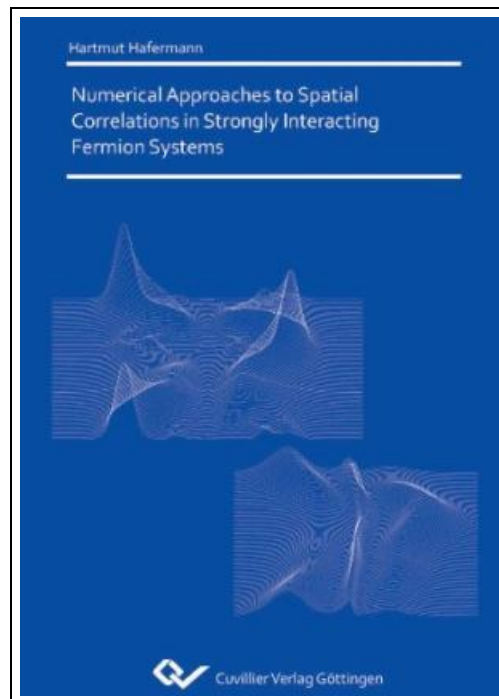# Numerical Approaches to Spatial Correlations in Strongly Interacting Fermion Systems

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Reviews

Completely essential study publication. Better then never, though i am quite late in start reading this one. I am very easily could get a delight of reading a composed publication.

(Marilyne Macejkovic)

NUMERICAL APPROACHES TO SPATIAL CORRELATIONS IN STRONGLY INTERACTING FERMION SYSTEMS

Cuvillier Verlag Jun 2010, 2010. Taschenbuch. Condition: Neu. Neuware - Spatial correlations are of fundamental importance for many fascinating aspects of solid state physics, such as non-Fermi-liquid behavior, spin fluctuations, high-temperature superconductivity and quantum criticality. The major part of this book is devoted to the dual fermion approach, which combines numerical and field theoretical diagrammatic methods to describe the effects of spatial correlations beyond dynamical mean-field theory (DMFT). The approach is generalized in various respects. It is shown that it has superior convergence properties compared to standard diagrammatic extensions of DMFT and its applicable even in presence of strong interactions. Numerical calculations employ the recently developed continuous-time quantum Monte Carlo methods, which are generalized to compute two-particle correlations functions. These techniques are used to study the two-plane Hubbard model on the Bethe lattice, the spatial correlations around a Kondo impurity and the Hubbard model in finite dimensions. Based on a ladder approximation to the dual-energy, a scheme is proposed which for the first time will allow a realistic and computationally feasible description of strongly correlated materials for which the correlations are manifestly long-ranged. In addition to the key scientific results, this book contains significant introductory materials to the models, methods and concepts used for the theoretical description of quantum many-particle systems. In particular the continuous-time quantum Monte Carlo methods are described in detail and on an elementary level. Providing technical details and complete derivations, this book is meant to help in the implementation of these novel approaches and to serve as an introduction and a reference for students beginning to work in this field. 298 pp. Englisch.

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