

Taming correlated electrons: From the Green's function to phase space

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In the context of correlated materials, the propagator for many body systems of interacting particles is the Green's function, which captures long-range order parameters such as the superconducting gap and magnetization. As these materials are comprehensively displayed by the Fermi-Hubbard model [1], we present a route to solve such systems by means of the Green's function. Furthermore, we show how the variational cluster approach [2] – a conjunction of linear response theory and cluster perturbation theory – allows us to calculate the Green's function with arbitrary accuracy and thereby gain access to the phase diagram of correlated systems.

[1] J. Hubbard, Proceedings of the Royal Society of London. Series A, Mathematical and Physical Sciences **276**, 238-257 (1963).

[2] M. Potthoff, M. Aichhorn, C. Dahnken, Phys. Lett. **91**, 206402 (2003).