# BCS regime of the two-dimensional fermionic Hubbard model: ground-state phase diagram

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A significant part of the phase diagram of the two-dimensional fermionic Hubbard model—at least for moderate interactions and fillings ($U < 4$, $n < 0.7$)—is controlled by Fermi liquid physics with the microscopic interaction renormalized into weak BCS-type effective coupling. We access this regime in a controlled way by a combination of bold-line diagrammatic Monte Carlo with a peculiar ladder-diagram summation trick and semi-analytic treatment of the weak instability in the Cooper channel. We obtain the corresponding ground-state phase diagram in the $(n, U)$ plane, describing the competition between the $p-$ and $d-$wave superfluid states. We also claim the values of the dimensionless BCS coupling constants—controlling the superfluid $T_c$—at the phase boundaries, which prove to be very small up to $U = 4, n = 0.6$.

[1] Youjin Deng, Evgeny Kozik, Nikolay Prokof'ev, and Boris Svistunov, arXiv:1408.2088.