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Antiferomagnetic transition of trapped fermions in a two-dimensional optical lattice KENSUKE INABA, MAKOTO YAMASHITA, NTT Basic Res. Labs., JST-CREST — We study the finite temperature properties of two-component fermionic atoms trapped in a two-dimensional (2D) optical lattice. We apply the self-energy functional approach to the 2D Hubbard model with a harmonic trapping potential. This powerful approach allows us to investigate both antiferromagnetic (AF) and Mott transitions in this system. We first evaluate experimentally observed quantities such as a renormalized cloud size and a fraction of atoms on doubly occupied sites. The results show the reasonable agreement with the recent experimental observations. We further investigate thermodynamic quantities of entropy and grand potential which are sensitive to the transitions. We find that these quantities provide evidence of a crossover between the Mott insulating and metallic phases at certain temperatures. In addition, at lower temperature, we find that entropy exhibits a cusp-like anomaly, suggesting a second or higher order AF transition. We estimate the AF transition temperatures and clarify how the trapping potential affects this magnetic transition.

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