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**Unbalanced fermion mixtures on an optical lattice** CHUNTAI SHI,  
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Austria, SHAN-WEN TSAI, University of California Riverside — We study a two  
component fermion mixture on a square lattice. We describe such system by a Hub-  
bard model wherein there is only on-site interaction between fermions of different  
species. Such a model can be realized by loading ultra cold fermions onto an op-  
tical lattice and by tuning the interaction strength via Feshbach resonance. We  
investigate the phase diagram of this system near half filling using the functional  
renormalization group approach for interacting fermions[1]. We focus on the inter-  
esting case where one species is at half filling so that their Fermi surface is nested  
while the other species is slightly doped so that their Fermi surface is not perfectly  
nested. We study both the cases with repulsive interaction and the cases with at-  
tractive interaction. For the attractive interaction, triplet pairing BCS instability  
among majority species compete with the singlet s-wave inter-species BCS pairing  
instability when the populations of two species are different. For the repulsive in-  
teraction, fermions with equal population are known to display d-wave singlet BCS  
pairing when both species are slightly doped away from half filling. When only one  
species of fermions is doped away from half filling, such d-wave instability is weak-  
ened while triplet pairing among majority species becomes possible.  
[1]. R. Shankar, Rev. Mod. Phys. 66, 129 (1994).

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