



# Condensed Matter Theory Center Seminar

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University of Chicago  
Monday, November 24  
10:00 AM  
2202 Physics Building

## “Ultra-cold Fermions with Attractive Interactions in Optical Lattices and Implications for Correlated Systems”

Ultra-cold fermions with attraction in optical lattices provide opportunities to simulate correlated systems. For  $s$ -wave pairing, we show that smooth crossover behavior from weakly attractive regime to strongly attractive regime can only be observed at low fillings. Near half filling pairing fluctuations destroy superfluidity and the transition temperature  $T_c$  vanishes in the strongly attractive regime. This is very different from the smooth BCS - Bose-Einstein condensation crossover observed in attractive Fermi gases. A variational ground state with local pairs is shown to be a better ground state in the strongly attractive regime. We also study  $d$ -wave pairing in lattices and show that  $T_c$  vanishes at almost all fillings. I will present our phase diagram for  $d$ -wave pairing, which catches some features of experimental phase diagrams of cuprates.