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Predicted itinerant ferromagnetism with cold fermions in optical lattices SHIZHONG ZHANG, Department of Physics, University of Illinois at Urbana-Champaign, CONGJUN WU, Department of Physics, University of California, San Diego — Itinerant ferromagnetism is one of the central topics in condensed matter physics. Ferromagnetism is intrinsically strong coupling physics which does not have a weak coupling limit, i.e., spontaneous spin polarization requires strong interactions to overcome the kinetic energy cost. In spite of its importance, ferromagnetism has not received enough attention in the cold atom community because the system is unstable to molecular formation if the interaction is tuned close to resonance from the positive side of the Feshbach Resonance. To overcome this difficulty, we instead propose to realize the ferromagnetic state in the p-orbital honeycomb lattice by taking advantage of its flat band structure. Due to the divergent density of states, even weak repulsions can drive the ferromagnetic transition while ensure the stability of the system. This will open up a new opportunity to investigate ferromagnetism with precise controllability and to realize spin transport and even spintronics applications with cold atoms.

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