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Renormalization group study of excitonic and superconducting order in doped honeycomb bilayer[1] JAMES MURRAY, OSKAR VAFEK, National High Magnetic Field Laboratory — We explore the competition between spin-charge order and unconventional superconductivity in the context of the AB stacked bilayer honeycomb lattice, realized experimentally as bilayer graphene, which features approximately parabolically touching electron bands. Using a weak-coupling renormalization group theory, we show that unconventional superconductivity arises generically for repulsively interacting fermions as excitonic order is suppressed by adding charge carriers to the system. We investigate the effects of finite temperature and further-neighbor hopping, the latter of which leads to so-called "trigonal warping" and destroys the perfect circular symmetry of the Fermi surfaces. We show that superconductivity survives for a finite range of trigonal warping, and that the nature of the superconducting phase may change as a function of further neighbor hopping. Depending on the range of interactions and the degree of trigonal warping, we find that the most likely superconducting instabilities are to f-wave, chiral d-wave, and pair density wave phases. It is shown that unconventional superconductivity is significantly enhanced by fluctuations in particle-hole channels, with the critical temperature reaching a maximum near the excitonic phase.

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