Low-Dimensional Chiral Physics: Gross-Neveu Universality and Magnetic Catalysis

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Abstract:

The functional renormalization group (fRG) is a convenient tool to study in a non-perturbative way the physical properties of many-body systems and quantum field theories. The starting point is a formally exact flow equation with 1-loop structure. Within a gradient expansion we study the strong-coupling fixed point of the 3d Gross-Neveu model that controls a 2nd order quantum phase transition from a massless phase to a phase with massive Dirac fermions beyond the limit of infinite flavor number. This universality class describes the low-energy phsyics of condensed matter models with nodal fermions and emergent discrete chiral symmetry. I will present our results obtained for the universal critical exponents and non-universal quantities at finite temperature and under the influence of an external magnetic field.