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A multi-critical point of strongly interacting itinerant fermions with supersymmetry LIZA HUIJSE, Harvard University, BELA BAUER, Station Q Microsoft Research , EREZ BERG, Weizmann Institute, MATTHIAS TROYER, ETH Zürich, KARELJAN SCHOUTENS, University of Amsterdam — A key challenge in theoretical condensed matter physics is the study of strongly interacting fermions, for which perturbative techniques do not work. In recent years a specific model has been put forward where exact results at intermediate densities can be obtained by incorporating supersymmetry. For 2D lattices the supersymmetric model exhibits superfrustration, a strong form of quantum charge frustration, characterized by an extensive ground state entropy. In 1D the model also shows a rich structure. In particular, we discuss the supersymmetric model on the square ladder and show that it describes a multi-critical point where an Ising and a KT transition coincide. The RG equations for the continuum theory reveal an intricate flow diagram with a marginal direction that preserves supersymmetry. We will argue that these results imply that there is a whole class of models with a U(1) and a Z2 symmetry, for which the multi-critical point has emergent supersymmetry.

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