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Geometric criticality in random Ising models ERICA CARLSON, SHUO LIU, Purdue University, KARIN DAHMEN, University of Illinois at Urbana-Champaign — We have recently pioneered the use of geometric cluster techniques from disordered statistical mechanics to analyze scanning probe data by mapping two-component image data to random Ising models. The method is capable of extracting information from the data about disorder, interactions, and dimension. We have already successfully applied this new technique to uncover a unification of the fundamental physics governing the multiscale pattern formation observed in two disparate strongly correlated electronic materials (cuprate superconductors and vanadium dioxide). However, because the geometric clusters which are directly accessible experimentally via scanning probes do not directly encode thermodynamic critical behavior, little is known about the general theoretical structure of geometric clusters in random Ising models, and the critical exponents associated with the geometric clusters are unknown for many of the fixed points which are key to interpreting experimental data. We discuss our recent progress on uncovering the geometric critical behavior at several fixed points in random Ising models.

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