Scaling, Universality, and Supersymmetry in the Random-Field Ising Model

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Abstract:

In theoretical physics, the behaviour of a strongly disordered system cannot be inferred from its clean, homogeneous counterpart. In fact, disordered systems are prototypical examples of complex entities in many aspects, mainly in the rough free-energy landscape profile [1]. In the current talk, I will present new results [2-8] that settle down some of the most ambiguous but still fundamental questions in the theory of critical phenomena of disordered systems. The platform will be the random-field Ising model, which is unique among other models due to the existence of very fast algorithms that make the study of these questions numerically feasible and whose applications in hard and soft condensed matter physics are numerous [9]. A small part of the talk will be devoted to the ideas stemming from the pools of theoretical computer science and the phenomenological renormalisation group that led to the development of novel computational and finite-size scaling schemes, allowing us to account and finally tame the notoriously difficult role of scaling corrections.

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