The phase boundary of the random site Ising model

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We introduce a new approach to disordered two-dimensional Ising models based on the extension of the combinatorial solution to randomized supercells. Applying it to the site-diluted Ising model on the square lattice, we resolve the full phase boundary $T_c(p)$ from the pure-Ising point to the percolation limit $T_c(p_c) = 0$ with, in principle, arbitrary precision. The critical eigenvalue governing the transition is found to follow a remarkably accurate linear interpolation between the Ising and percolation endpoints, whose small but systematic deviations reveal the nontrivial fine structure of the phase boundary. Near the percolation threshold, we confirm the crossover exponent $\phi_{\mathrm{RSIM}} = 1$ and extract the non-universal amplitude $\alpha_{\mathrm{RSIM}} \simeq 1.616$. Finally we outline work in progress on the Random Bond Ising model.