Mean-field bound on the 1-arm exponent for Ising ferromagnets in high dimensions

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The Ising model is a statistical-mechanical model for magnets. It is now known that, if the spin-spin coupling is non-negative and reflection-positive (e.g., the nearest-neighbor model is reflection-positive), then it exhibits a continuous phase transition: the critical 1-spin expectation at the center of a ball of radius r vanishes as r goes to infinity. It is believed to decay in powers of r, with an exponent ρ called the 1-arm exponent. Presumably this exponent takes on the mean-field value 1 in high dimensions, but the best possible bound so far is $(d-2)/2$, due to a hyperscaling inequality.

I will show how we may achieve the mean-field bound on the Ising 1-arm exponent, i.e., $\rho \leq 1$. This is ongoing joint work with Satoshi Handa and Markus Heydenreich.