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Understanding 2D critical percolation: from Harris to Smirnov and beyond

There are numerous predictions from statistical physics regarding random systems in the plane which were until recently beyond the reach of mathematical understanding. Some of the better-known examples include percolation and the Ising model. We will focus on percolation and describe our growing understanding of it through a sequence of insights (which are simple in hindsight) from 1960 through today.