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Phase transitions in hyperbolic spaces

Many questions in probability theory concern the way the geometry of a space influences the behaviour of random processes on that space, and in particular how the geometry of a space is affected by random perturbations. One of the simplest models of such a random perturbation is *percolation*, in which the edges of a graph are either deleted or retained independently at random with retention probability p. We are particularly interested in *phase transitions*, in which the geometry of the percolated subgraph undergoes a qualitative change as p is varied through some special value. Although percolation has traditionally been studied primarily in the context of Euclidean lattices, the behaviour of percolation in more exotic settings has recently attracted a great deal of attention. In this talk, I will discuss conjectures and results concerning percolation on the Cayley graphs of nonamenable groups and hyperbolic spaces, and give the main ideas behind our recent result that percolation in any hyperbolic graph has a non-trivial phase in which there are infinitely many infinite clusters.