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Bootstrap percolation and kinetically constrained models: universality results

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Recent years have seen a great deal of progress in understanding the behavior of bootstrap percolation (BP) models, a particular class of monotone cellular automata. In the initial configuration sites are occupied with probability p. The evolution of BP occurs at discrete times: empty sites stay empty and occupied sites are emptied iff a certain model dependent neighborhood is already empty. In the Euclidean lattice there is now a complete understanding of the large time evolution with a universality picture for the critical behavior. Much less is known for their non-monotone stochastic counterpart, namely kinetically constrained models (KCM). In KCM each vertex is updated independently at rate p (respectively 1-p) to occupied (respectively empty) iff it could be emptied in the next step by the bootstrap model. In the last two decades KCM have been the subject of intensive research both in physics and mathematics literature. The main motivation is that, for certain choices of the constraints, when p goes to zero KCM display some of the most striking features of the liquid/glass transition. Indeed, they were originally introduced in the 80's to support the free volume theories and later on used as the simplest lattice models reproducing the dynamical facilitation scenario. In this seminar I will discuss some recent rigorous results on the characteristic time scales of KCM as p goes to zero as well as the connection with the critical behavior of the corresponding BP models.

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