

Universality for Monotone Cellular Automata

Robert Morris¹

¹ Instituto de Matemática Pura e Aplicada (IMPA)

The Universality Conjecture of Bollobás, Duminil-Copin, Morris and Smith states that every d -dimensional monotone cellular automaton is a member of one of $d+1$ universality classes, which are characterized by their behaviour on sparse random sets. More precisely, it states that if sites are initially infected independently with probability p , then the expected infection time of the origin is either infinite, or is a tower of height r for some $r \in 1, \dots, d$.

In this talk I will attempt to motivate this conjecture by discussing some relatively simple (but well-studied) special cases, and some applications to non-monotone models such as the Ising model of ferromagnetism, and kinetically constrained models of the liquid-glass transition. I will also state a theorem which proves the conjecture, and moreover determines the value of r for every model.

The talk is based on recent work with Paul Balister, Béla Bollobás and Paul Smith, and also on older joint work with the same authors as well as Jozsi Balogh, Hugo Duminil-Copin, Ivailo Hartarsky, Fabio Martinelli and Cristina Toninelli.