

Vortrag im Mathematischen Kolloquium

im Rahmen des Doktoratskollegs Discrete Mathematics

mit freundlicher Unterstützung der
Österreichischen Mathematischen Gesellschaft

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Cellular Automata

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A cellular automaton, introduced in the 1940s by von Neumann after a suggestion of Ulam, is an interacting particle system: a collection of sites of a grid or a grid-like graph, with each site in one of finitely many 'states'. Starting with a certain configuration (distribution of sites), at each time-step the system updates itself according to some fixed rules: each site goes into a state that depends only on the states of a few nearby sites. Examples include the Ising model of ferromagnetism, many simple models of the brain, and Conway's 'Game of Life'. Despite much effort over the last fifty years, a general theory of cellular automata still seems very far out of reach.

In my talk I shall give a brief introduction to some aspects of cellular automata, concentrating on bootstrap percolation. Although I shall consider extremal problems concerning bootstrap percolation, the emphasis will be on processes in random environments. I shall end with a number of very recent results on cellular automata with the most general *local, homogeneous and monotone* update rules. These general processes were introduced by Smith, Uzzell and me, and the results I shall present have been proved by Smith, Uzzell, Balister, Przykucki, Duminil-Copin, Morris, and me.

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