
BERN-FRIBOURG GRADUATE SEMINAR

a seminar for Master and PhD students

Thursday 23rd May, 2024: 17:15 - 18:00

Room B7, Exakte Wissenschaften, Bern

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The Bunkbed conjecture

Abstract

When water enters a porous medium as a porous stone, it can circulate through the cavities of the medium. We would like to understand how the water propagates depending on the porosity of the material. A good way to formulate this question in mathematical terms is to use a percolation model: take a finite graph G , i.e. a network constituted of vertices and links between some of them that we call edges. Now fix a parameter $p \in (0, 1)$. Each edge of G is chosen to be "open" with probability p and closed with probability $1 - p$. The main quantity we look at in this random model is the probability that two fixed nodes x and y are connected by a sequence of adjacent open edges. This quantity is interpreted as the probability that the water can circulate from x to y .

The Bunkbed conjecture is a good example of the kind of problems arising in percolation; a problem that is easy to state but that seems incredibly hard to solve. However, this conjecture is solved for the FK percolation (with parameter $q = 2$), which is an alternative model to percolation. This is very surprising, since this model is a priori more complicated to study because it has not the independence property of classical percolation. The talk requires no prior knowledge of percolation. The main results of the talk can be found in "Probability on bunkbed graphs, Olle Häggström".