

# Inn'formal Probability Seminar

**Lyuben Lichev (ISTA Klosterneuburg)**

“Explosive appearance of cores  
and bootstrap percolation on lattices”

**Abstract:**

*In many dynamical probabilistic systems exhibiting a sharp threshold, the first time when a particular substructure appears can be pinned down to a single time step when a simple necessary condition becomes satisfied. Classical examples include connectivity in the random graph process (which typically holds when the last isolated vertex disappears) and the existence of a Hamilton cycle (which typically holds when all vertices have degree at least two).*

*In this talk, we will explain another hitting time result. Consider the process where the  $n^2$  vertices of a square 2-dimensional torus appear consecutively in a random order. We will see that the size of the 3-core of the corresponding induced unit-distance graph (that is, the maximum subgraph of minimum degree 3) transitions from 0 to  $n^2 - o(n^2)$  within a single step. Equivalently, by infecting the vertices of the torus in a random order under 2-neighbour bootstrap percolation, the size of the infected set transitions instantaneously from  $o(n^2)$  to  $n^2$ . While this result follows from already classical tools in bootstrap percolation, we will see why the proof is fragile and only applies to a small number of models. Finally, we will propose an approach towards recovering the same phenomenon for a much more general class of bootstrap percolation rules.*

Tuesday | 03.12.2024 | 13:45  
SR 609 Civil Engineering Building