

Helyszín: Rényi Intézet nagyterme (1053 Budapest, Reáltanoda u. 13-15.)

Ideje: június 14, kedd, 14:15 és június 16. csütörtök, 14:15

Lecture 2: (június 14) : Thresholds

Lecture 3: (június 16) : Algebraic shifting

Abstract for lecture 2:

Consider a random graph in the Erdős-Rényi  $G(n,p)$  model. Given monotone graph properties like

P1= "G is connected"

P2= "G contains a hamiltonian cycle"

P3= "The vertices of G can be covered by vertex disjoint triangles"

P4= "In every 2-coloring of the edges of G there is a monochromatic triangle,"

we would like to understand

1) What is the critical probability?

2) How large is the threshold interval?

For the case of connectivity, Erdős and Rényi pioneered this study and answered these two questions. In the lecture I will discuss general theorems for these questions and connections with extremal combinatorics, isoperimetric inequalities and Fourier methods, starting with the Bollobás-Thomason theorem on the threshold intervals, results on sharp thresholds by Friedgut and others, and the recent proof by Park and Pham of the expectation threshold conjecture posed by Jeff Kahn and me.

Abstract for lecture 3:

Shifting is a combinatorial operation introduced (implicitly) in Erdős, Ko and Rado's famous paper and later studied and developed by Kleitman, Frankl, Füredi and others. In the lecture I will talk about algebraic versions of shifting that I introduced in the mid 80s, mention the connections to early works of Stanley and Lovász, discuss some applications and connections in several areas of combinatorics, and if time allows mention a speculative connection to Turán's famous (4,3) problem.