Doctoral Program Discrete Mathematics

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Discrete Mathematics Day 2021

Friday, December 10, 2021

Online via Webex & gather.town

Talks will take place on Webex:
https://tugraz.webex.com/tugraz/j.php?MTID=ma5713d4058da3fba43db01d3e709e4ff

The gather.town room for the lunch break can be reached via the following link:
https://gather.town/app/B6O2m96CQrju3Ku5/lunchroom

Schedule and abstracts

$10:00 - 10:10$ **Opening**

$10:10 - 11:00$ **Prof. Bojan Mohar (Simon Fraser University)**
Graph searching

Abstract: The speaker will discuss problems in the area of graph searching with special attention to the Game of Cops and Robber. This game that is played on a finite graph G asks for strategies of k cops, who move along the edges of G and want to catch the robber, who also moves on G with equal speed as the cops.

$11:10 - 11:40$ **Dr. Christian Lindorfer (TU Graz, former student in DK-Project 01)**
Pumping in multiple context-free languages

Abstract: In 1991 Seki et al. introduced m-multiple context-free grammars (m-MCFGs) as a generalisation of context-free grammars dealing with m-tuples of strings. He also proved a rather weak pumping lemma for multiple context-free languages. In this talk we introduce and compare context-free and multiple context-free grammars. In particular, we focus on the notion of pumpability and why there is no strong version of the pumping lemma for multiple context-free grammars. Finally, we discuss a recent result showing that m-MCFGs are capable of comparing the number of consecutive occurrences of at most $2m$ different letters.

$11:40 - 13:30$ **Lunch break** — Virtual joint lunch via gather.town from 12:00

$13:30 - 14:00$ **Lucía Rossi (MU Leoben, student in DK-Project 08)**
Rational self-affine tiles associated to standard and nonstandard digit systems

Abstract: In this short talk we will introduce the notion of rational self-affine tiles, which are fractal-like sets that arise as the solution of a set equation. They are associated to a digit system that consists of a base, given by an expanding rational matrix, and a digit set, given by vectors. They can be interpreted as the set of "fractional part" of this digit system. The challenge of this theory is that these sets do not live in a Euclidean space, but on more general spaces defined in terms of Laurent series, and we allow the digit sets to be nonstandard (meaning they are not a complete set of residues modulo the base). We state some topological properties of rational self-affine tiles, show the existance of a tiling and a multiple tiling, and give a criterion to guarantee positive measure in terms of the digit set.

$14:10 - 15:00$ **Prof. Michael Krivelevich (Tel Aviv University)**
Linearly sized induced odd subgraphs

Abstract: A classical result of Gallai from the sixties asserts that the vertex set V of every graph G can be partitioned into two parts V_1, V_2, each spanning an induced subgraph with all degrees even. It follows that every n-vertex graph contains an induced subgraph on at least $n/2$ vertices with even degrees.
What can be said about the odd case? It is quite easy to see that the odd analogue of Gallai's theorem cannot hold in full generality. Hence instead of an even-even partition we can ask for a large induced subgraph of G with all degree odd. Also, since an isolated vertex is never a part of any odd graph, we need to forbid isolated vertices.
A decades old conjecture suggested that every graph G on n vertices of positive minimum degree contains a subset V_0 of size linear in n, with all degrees in the induced subgraph $G[V_0]$ being odd.
Recently, in a joint work with Asaf Ferber we managed to prove this conjecture. In this talk I will discuss the problem, its background and main ingredients of the proof.

FWF

Der Wissenschaftsfonds.

Organizers: Joshua Erde, Florian Thomas, Wolfgang Woess