Analysis Session Schedule

- 14:00-14:45 Barak Weiss (Tel Aviv University)
- 14:55-15:40 Vladimir Kadets (Holon Institute of Technology)
- 16:00-16:45 Ariel Rapaport (Technion)
- 16:55-17:40 Mikhail Sodin (Tel Aviv University)

Analysis Session Abstracts

Barak Weiss
New bounds on lattice covering volumes, and nearly uniform covers

Let L be a lattice in $\mathbb{R}^n$ and let K be a convex body. The covering volume of L with respect to K is the minimal volume of a dilate rK, such that $L + rK = \mathbb{R}^n$, normalized by the covolume of L. Pairs (L, K) with small covering volume correspond to efficient coverings of space by translates of K, where the translates lie in a lattice. Finding upper bounds on the covering volume as the dimension n grows is a well studied problem in the so-called "Geometry of Numbers", with connections to practical questions arising in computer science and electrical engineering. In a recent paper with Or Ordentlich (EE, Hebrew University) and Oded Regev (CS, NYU) we obtain substantial improvements to bounds of Rogers from the 1950s. In another recent paper, we obtain bounds on the minimal volume of nearly uniform covers (to be defined in the talk). The key to these results are recent breakthroughs by Dvir and others regarding the discrete Kakeya problem. I will give an overview of the questions and results.

Vladimir Kadets

Measurable selectors of multifunctions in non-separable spaces

Below (Ω, Σ, μ) is a complete finite measure space, X is a Banach space. A *multifunction* is a map

$$F : \Omega \to 2^X \setminus \{\emptyset\};$$

a *selector* of F is a function $f : \Omega \to X$ with $f(t) \in F(t)$ for all $t \in \Omega$.

A multi-function $F : \Omega \to 2^X$ is said to be *scalarly measurable*, if for every $x^* \in X^*$ the function

$$t \mapsto \sup x^*(F(t))$$

is measurable. In particular, a single valued function $f : \Omega \to X$ is scalarly measurable if the composition $x^* \circ f$ is measurable for every $x^* \in X^*$.

I am going to advertise our joint with Cascales and Rodríguez results about scalarly measurable selectors which, unlike the previously known ones, remain valid for non-separable spaces. In particular, the idea of the proof of the following main theorem will be discussed:

Theorem (Cascales, Kadets, Rodríguez, 2010). If all the values of a scalarly measurable multifunction F are weakly compact, then F admits a scalarly measurable selector.

Ariel Rapaport

Dimension of diagonal self-affine sets

Given a finite set Φ of contracting affine maps of $\mathbb{R}^d$, there exists a unique nonempty compact subset K of $\mathbb{R}^d$ which is equal to the union of its own images under the maps in Φ. It is called the self-affine set corresponding to Φ Many mathematical problems surround self-affine sets, but perhaps the most natural one is to determine their dimension. It has been studied by many authors, and its computation is one of the major open problems in fractal geometry. I'll present a new result regarding the dimension of self-affine sets generated by systems Φ with diagonal linear parts.

Mikhail Sodin

Fourier uniqueness and non-uniqueness pairs

Motivated by a discovery by Radchenko and Viazovska and by a work by Ramos and Sousa, we find conditions sufficient for a pair of discrete subsets of the real axis to be a uniqueness or a non-uniqueness pair for the Fourier transform. These conditions are not too far from each other. The uniqueness theorem can be upgraded to the frame bound and an interpolation formula, which in turn produce an abundance of Poisson-like formulas (a.k.a. "crystalline measures"). The talk is based on a joint work with A. Kulikov and F. Nazarov arXiv:2306.14013