Titles and abstracts

Plenary talks

A. Alex Lubotzky (Weizmann Institute) – Group approximation: challenges, successes, and failures

Abstract: An ongoing theme in mathematics, in general, and in group theory, in particular, is to study complicated objects by approximating them by simpler ones. In group theory, this led to notions like residually finite, sofic, hyper-linear, etc. We describe some of the major problems in this area. Some progress and some failures.

B. Ofer Zeitouni (Weizmann Institute) – Random matrices meet log-correlated fields

Abstract: The characteristic polynomial of a matrix contains much information concerning the spectrum of a matrix; for example, for Hermitian matrices, the imaginary part of the logarithm of the characteristic polynomial just above the real line contains information on fluctuations of the eigenvalue counting function and on extreme gaps. For a large natural family of random matrices, the logarithm of the characteristic polynomial is asymptotically a Gaussian random distribution belonging to the family of logarithmically correlated fields. I will review the progress obtained in the last decade on this topic.

C. Omri Solan (Princeton) - From billiard dynamics to infinite volume dynamics

Abstract: We have a polygonal billiard table. A periodic orbit on this table is a closed path a ball can take so that its momentum is reflected when hitting a wall. Those paths come in families of constant length (obtained by moving the segments in parallel). We will discuss a counting result, showing that the number of families with length bounded by N has quadratic asymptotics. The proof goes through four different dynamical systems. The talk will assume only basic understanding in probability.

Student talks

1. Tomer Bauer (Bar Ilan University) - Reciprocity of skew Hall–Littlewood–Schubert series

Abstract: Generalized Igusa functions were introduced by Carnevale, Schein and Voll, and Hall–Littlewood–Schubert series were later defined by Maglione and Voll. Both are multivariate rational functions that generalize previously studied combinatorial series. These functions have applications to enumerative problems in algebra, geometry, and number theory, in particular to zeta functions counting subgroups, subrings, ideals, and subrepresentations of quiver representations. They both exhibit a self-reciprocity property, that establishes a functional equation for many local factors of the aforementioned zeta functions.

The main purpose of the present work is to introduce a simultaneous generalization and refinement of these two rational functions, the *skew Hall–Littlewood–Schubert series*, and prove its self-reciprocity. This answers a problem posed by Maglione and Voll. Moreover, our method of proof is elementary, avoiding p-adic integration. The proof is a type of

combinatorial reciprocity modeled on properties of the Möbius function of a partially ordered set.

Joint work with Ron Adin.

2. Naomi Bazlov (Technion) - Squarefree polynomials with missing digits

Abstract: The Erdős-Mauduit-Sárközy conjecture asks whether there are infinitely many squarefree integers such that every digit in base g is 0 or 1. This is an example of a restricted digit problem; great progress has been made in this field recently, notably by James Maynard who proved infinitude of primes without a given digit in their base 10 expansion.

In this talk, we resolve a function field analogue of the E-M-S conjecture by determining the asymptotic distribution of squarefree polynomials in \mathbb{F}_q[t] under coefficient constraints. In particular, we will sample the coefficients independently according to probability measures on \mathbb{F}_q. In the special case when q is prime, we obtain strong results and resolve a "restricted digits conjecture for \mathbb{F}_p[t]."

3. Maor Ben Zaquen (Technion) - The domain of RSD characterization by Efficiency, Symmetry, and Strategy-proofness

Abstract: Given a set of n individuals with strict preferences over m indivisible objects, the Random Serial Dictatorship (RSD) mechanism is a method for allocating objects to individuals in a way that is efficient, fair, and incentive-compatible. A random order of individuals is first drawn, and each individual, following this order, selects their most preferred available object. The procedure continues until either all objects have been assigned or all individuals have received an object.

RSD is widely recognized for its application in fair allocation problems involving indivisible goods, such as school placements and housing assignments. Despite its extensive use, a comprehensive axiomatic characterization has remained incomplete. For the balanced case n=m=3, Bogomolnaia and Moulin have shown that RSD is uniquely characterized by Ex-Post Efficiency, Equal Treatment of Equals, and Strategy-Proofness. The possibility of extending this characterization to larger markets had been a long-standing open question, which Basteck and Ehlers recently answered in the negative for all markets with n,m>=5.

This work completes the picture by identifying exactly for which pairs (n,m) these three axioms uniquely characterize the RSD mechanism and for which pairs they admit multiple mechanisms. In the latter cases, we construct explicit alternatives satisfying the axioms and examine whether augmenting the set of axioms could rule out these alternatives.

4. Avital Binyamin (Hebrew University) - From 2-Rigs to \lambda-Rigs

Abstract: We study the decategorification of higher algebraic structures encoded by algebraic monads on the \infinity-category of spaces. We prove that for any algebraic monad T, the 0-truncation inherits a finitary monad structure on Set, characterizing the discrete T-modules. We apply this framework to the theory of 2-rigs, showing that the decategorification of the monad for symmetric monoidal Cauchy-complete linear categories recovers Borger's notion

of \lambda-rigs. Specifically, we construct a natural lift of the equivalence-class functor \pi_0 core : Cat \to Set to a functor 2-Rig \to \lambda-Rig.

5. Tamar Cherno (Hebrew University) - Weighted mean and minimum of independent random variables

Abstract: Distribution free inequalities have been of interest since the 1980's. Amongst such results are the 1-2-3 inequality proved by Alon and Yuster, and small ball inequalities such as Tao-Vu Inverse Theorems. Another such result was proved by Feldheim & Feldheim, showing that for positive and unbounded independent random variables, the event in which their mean is large becomes arbitrarily more probable than their minimum being large.

In the talk, we show that the same holds for weighted means with rational coefficients. We briefly discuss the core ideas of the proof and look at log-concavity properties of random variables in order to understand the rationality role, suggesting that in fact the theorem holds for all weighted means.

The talk is based on joint work with Ohad Feldheim.

6. Lipaz Cohen (Ben Gurion University) – Bounded mean oscillation of sequences arising from a primitive substitution rule

Abstract: This talk explores sequences of interval endpoints (c_k)_{k in Z} generated by primitive substitution rules via the left Perron vector. For one-dimensional tilings, Solomon (2014) established that bounded displacement (BD) to Z requires |\lambda_t| < 1, where t >= 2 is the minimal index whose eigenspace W{\lambda_t} is not orthogonal to the all-ones vector 1. Instead of bounded displacement, we investigate whether (c_k)_{k in Z} satisfies Bounded Mean Oscillation (BMO) to Z. While we show that BD to Z implies BMO to Z in the |\lambda_t| < 1 case, our study establishes a classification for almost all the remaining scenarios. We present that if |\lambda_t| > 1, the sequence fails to be BMO to Z. Furthermore, we analyze the case where |\lambda_t| = 1, demonstrating that the BMO property also fails when \lambda_t possesses a non-trivial Jordan block with at least one generalized eigenvector not in 1^perp that is not the last one in the chain.

7. Tal Cohen (Weizmann Institute) – Redundancy in group generators

We show the following dichotomy for a connected Lie groups. In amenable groups, any subset that generates a dense subgroup of size larger than a fixed polynomial in the dimension must contain a proper subset that already generates a dense subgroup. In non-amenable groups, there are arbitrarily large generating sets that are irredundant, and remain irredundant even after applying Nielsen transformations.

The bound on amenable groups is obtained by reduction to groups of Lie type via strong approximation. This partially answers two conjectures by Gelander on generation in compact Lie groups and simple algebraic groups, and moreover shows that these conjectures are implied by the Wiegold conjecture. The construction of large Nielsen irredundant generating sets in non-amenable groups is done by extending Minsky's work to higher rank Lie groups.

8. Gilad Derfner (Hebrew University) - Non-density in the space of isometric immersions, and the shape of Kale leaves.

Abstract: Many materials, such as Kale leaves and torn nylon, may be modeled as negatively curved Riemannian manifolds isometrically immersed in Euclidean space. In many cases these materials exhibit frilly, fractal like shapes near their boundaries. Explaining why these shapes occur has been a long standing problem in elasticity theory. Venkataramani and collaborators conjectured - and gave some numerical evidence - that the shapes occur because of a type of singularity known as "branch points". They argue that, under certain conditions, such singularities are a mechanism for lowering the bending energy of the immersion. Since branch points cannot exist in smooth immersions, this suggests that the energetic infimum taken over all isometric immersions is strictly less than that taken over only smooth isometric immersions.
In this talk we present a result which is a necessary condition for this claim to hold: The space of smooth isometric immersions of a given negatively curved manifold, is not dense in the space of all isometric immersions.

Joint work with Raz Kupferman and Cy Maor.

9. Hilel Garmi (Hebrew University) - Galois Groups of trinomials with small coefficients

Abstract: Hilbert's Irreducibility Theorem (1892) implies that the Galois group over the rationals of "almost" any polynomial f with rational coefficients is S_n. However, it is very difficult to find explicit examples of polynomials with Galois group S_n. To our knowledge, the only previously known explicit example with bounded integer coefficients is the family of trinomials {x^n - x – 1}, which was proven by Nart and Vila (1979). We proved a few new families of polynomials with bounded integer coefficients to have Galois group S_n for any n.

In this talk, I will sketch the proof of the known result of Nart and Vila, before presenting the approach we used to prove our new results. To illustrate our method, I will use the example of the family {x^n - 2x + 1}, which factors as the product of (x-1) and the generalized Fibonacci polynomial x^{n-1} + x^{n-2} + \cdots + x - 1, which was shown to have Galois group S_{n-1} for odd values of n by Martin (2004) and for even values of n by us (2026). Along the way, I will define inertia groups, use properties of the p-adic numbers, and give a taste of Grothendieck's Galois theory.

10. Michael Glasner (Weizmann Institute) - Character rigidity and the Stuck-Zimmer conjecture for nonuniform lattices

Abstract: The theory of characters of infinite groups, is a generalization of the representation theory of finite groups. More explicitly, a character of a group is an extremal conjugation invariant positive definite function. A group is said to be character rigid if every character of the group is either supported on the center or comes from a finite dimensional representation. Connes conjectured that any irreducible lattice in a higher rank semisimple Lie group is character rigid. Surprisingly, this conjecture generalizes the celebrated Margulis normal subgroup theorem and the Stuck-Zimmer conjecture on IRS rigidity. I will discuss a joint work with Alon Dogon, Yuval Gorfine, Liam Hanany, and Arie Levit showing that any

nonuniform higher rank lattice is character rigid, proving the Stuck-Zimmer conjecture for such lattices.

11. Borys Holikov (Bar Ilan University) - Counting polynomial progressions with structured steps

Abstract: Suppose that we are given integer-valued polynomials p_1(n),...,p_k(n), with p_i(0) = 0, and some subset of the natural numbers S of positive density. In case of p_i(n) = i*n, Furstenberg showed that S always contains "a lot" of configurations of the form d,d+p_1(n),..., d+p_k(n) (that is, "a lot" of arithmetic progressions). In this talk, we focus on the (in some sense opposite) case where the polynomials are rationally independent and non-linear. Frantzikinakis and Kra showed that S always contains "a lot" of such polynomial progressions. We are interested in counting the number of such polynomial progressions when the step n itself has some structure, for example if the decimal expansion of n uses only the digits 0 and 1, or more generally if n belongs to an Infinite Parallelepiped (IP) with a rational spectrum.

Our work develops techniques for computing pointwise limits of polynomial ergodic averages along such IPs with a rational spectrum. For example, we prove pointwise convergence for continuous functions on nilmanifolds. This allows us to show that for each IP with a rational spectrum, S always has "a lot" of polynomial progressions whose step n belongs to this IP.

This talk is based on joint work with Or Shalom.

12. Noor Kezil (Haifa University) – Sum of elements preceding records in set partitions

Abstract: A record in the canonical sequential form of a set partition is an element that is larger than all preceding elements. Motivated by previous work on statistics related to records in set partitions, we introduce a new statistic, called the sum of elements preceding records, which measures the total contribution of elements preceding each record.

In this talk, we derive explicit generating functions that enumerate set partitions according to this statistic. As an application, we obtain an explicit formula for the total value of the statistic over all set partitions of [n] with exactly k blocks. We also derive a formula for the total value of the statistic over all set partitions of [n], expressed in terms of Bell numbers, together with an asymptotic estimate.

13. Jonatan Kogan (Hebrew University) - Combinatorial aspects in collapsing the Upper Model

Abstract: We derive several local criteria for the collapsibility of a simplicial complex. We then apply these to prove that the upper multiparametric model of random complexes collapses to its critical dimension.

14. Polina Leonchik (Technion) - Two-dimensional discrete operators and finite-gap Schrödinger operators

Abstract: This talk is devoted to the algebro-geometric construction of two-dimensional integrable difference operators and their continuous limits. Starting from the classical theory of finite-gap Schrödinger operators, I will introduce the Baker--Akhiezer function, a

meromorphic function on a compact Riemann surface characterized by prescribed poles and singularities, which plays a central role in encoding the spectral data. I will then explain how analogous spectral data give rise to a discrete Baker--Akhiezer function satisfying a four-point difference equation. The main result discussed in the talk is that, under a suitable deformation of the spectral data and an appropriate continuous limit of the lattice parameters, these two-dimensional integrable difference operators converge to finite-gap Schrödinger operators at a fixed energy level. This construction shows that the spectral data of a two-dimensional finite-gap Schrödinger operator admits a discrete extension that preserves the main integrable features of the original differential operator.

Joint work with Gulnara S. Mauleshova and Andrey E. Mironov.

15. Amit Levinson-Sela (Ben Gurion University) - Redundant generation of groups acting on trees

Abstract: Gaussian elimination iteratively applies row operations (i.e. generators of GL(F^n)) to move from some n-tuple S generating an m-dimensional vector subspace V of F^k (n > m) to another generating tuple, S', which contains m distinguished vectors that are guaranteed to generate V. Thus, one can always read the dimension off of a row-equivalent generating tuple, regardless of the starting point. A natural next step is to generalize this from vector spaces to groups: given a generating tuple g of size n for a group G with d(G) = m, n > m, can one apply Nielsen transformations (i.e. generators of Aut(F_n), where F_n is a free group on n generators) to arrive at a generating set h which admits a generating subset of size m? A tuple g for which we can do so is called redundant. For G = PSL_2(Q_p) (which acts on its Bruhat-Tits tree), we prove redundancy for large classes of generating sets. In order to do so, we will characterize the obstacles to g generating a dense subgroup of G, describe “typical” dense subgroups, and demonstrate a method to find such subgroups via Nielsen transformations.

16. Niv Levhari (Tel Aviv University) - Aldous-type spectral gaps in wreath products

Abstract: I will describe Aldous' spectral gap theorem, stating that the interchange process, a large Markov chain on labelled particles, has the same spectral gap as the much smaller random walk on the underlying vertices. I will then rephrase this phenomenon through Cayley and Schreier graphs, which suggests analogous questions for other groups. Then I will present our wreath-product transfer theorem: adding labels from any finite group does not create a slower mode.

17. Michael Oren-Perlstein (Weizmann Institute) - The BCFW tiling of the ABJM amplituhedron

Abstract: The orthogonal momentum amplituhedron is a geometric model for tree-level scattering amplitudes in ABJM theory. It was conjectured to admit a decomposition into BCFW cells, analogous to the BCFW triangulation of the amplituhedron in planar N = 4 super Yang–Mills theory.

I will review the nonnegative orthogonal Grassmannian and its decomposition into orthitroid cells and present the outline of a proof of this conjecture. The proof introduces a promotion

operation for orthitroid cells, establishes properties of the amplituhedron map, and characterizes the boundary structure of orthitroid cells and the orthogonal momentum amplituhedron. Together, these results show that the BCFW orthitroid cells tile the orthogonal momentum amplituhedron.

18. Hillel Raz (Technion) - Algorithmically adjusting subgraph counts of randomly sampled graphs

Abstract: A result of Janson and Spencer (1992) establishes, via a greedy probabilistic construction, the existence of graphs whose 3-vertex subgraph counts match exactly the expected counts in the Erdos–Renyi random graph G(n,p). In this talk, I will present a general algorithmic framework extending this construction to any graphon bounded away from 0 and 1. Graphons arise as limit objects of dense graphs and encode their subgraph densities. By extending the original method – here referred to as the Janson-Spencer algorithm – we construct finite graphs whose 3-vertex subgraph counts agree exactly with the averages prescribed by the random graph model induced by a given graphon. I will then discuss further applications of this approach to extremal problems: when a graphon is close to optimizing certain subgraph counts, the algorithm produces quantitative degeneracy and structural rigidity results. These results provide finite, explicit analogues of variational principles on graphons, connecting algorithmic constructions with analytic extremal methods.

19. Lior Sasson (Technion) – Robust network formation

Abstract: The standard network formation literature assumes that agents make strategic linking decisions based on complete knowledge of the global network structure. However, this assumption is often unrealistic in most real-world situations. In this paper, we focus on agents who base their link formation decisions solely on local knowledge. Specifically, their own degree and the degree of a potential peer. Under this severe informational limitation, agents do not form Bayesian beliefs about the network topology. Instead, they adopt a robust (maxmin) approach, aiming to maximize their guaranteed payoff under the worst-case network structure compatible with their local observations. We show that such maxmin-optimal behavior is often randomized.

By analyzing the long-run behavior of the Markov chain induced by these robust local decisions, we uncover a profound macroscopic property: the network endogenously evolves into a core-periphery architecture. We characterize the minimal closed sets of these dynamics, demonstrating that agents organically break symmetry to form stable networks consisting of highly connected hubs (the core) and loosely connected nodes (the periphery). This finding provides a novel micro-foundation for network formation, proving that neither global knowledge nor agent heterogeneity is required for core-periphery topologies to emerge and stabilize.

20. Andrey Yurkov (Bar Ilan University) - The Cullis’ determinant as Pfaffian

Abstract: The Cullis' determinant is a generalization of the notion of the classical determinant to the set of rectangular matrices. It could be defined as an alternating sum of maximal minors of a given matrix and has several properties similar to the classical

determinant. For instance, the Cullis' determinant is multilinear with respect to matrix columns and satisfies the Laplace expansion theorem along every column.

In this talk, we discuss the formula expressing the Cullis' determinant through the Pfaffian obtained recently by the speaker and coauthors. This formula allows to present a polynomial-time algorithm for computing the Cullis determinant which improves the existing exponential-time algorithms. This algorithm will also be discussed in the talk together with other consequences of the obtained formula. No prior knowledge on the subject is required. The talk is based on the joint work with Alexander Guterman.

21. Shai Zucker (Tel Aviv University) – Minimax rates for learning pairwise interactions in attention-style models

Abstract: In this talk we study the statistical complexity of learning pairwise interaction functions arising in single-layer attention-style models. In this setting, interactions between tokens are determined by a weight matrix and a nonlinear activation function, leading to a nonparametric estimation problem with a nonlocal structure.

We establish minimax convergence rates for estimating the interaction function and show that the optimal rate is M^{-2\beta/(2\beta+1)}, where M is the sample size and \beta denotes the smoothness of the activation function. Remarkably, the exponent is independent of the embedding dimension, despite the high-dimensional nature of the model.

Our analysis further shows that these rates remain achievable even though the weight matrix and activation function are not separately identifiable. The results provide a theoretical characterization of the statistical efficiency of attention-style interaction mechanisms.