CANT 2026

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24th Annual Workshop on Combinatorial and Additive Number Theory

CUNY Graduate Center
365 Fifth Avenue, New York, NY

Monday, July 13, to Thursday, July 16 (in person and Zoom)

Friday, July 17, to Saturday, July 18 (Zoom only)

Abstracts (as of July 11, 2026)

Speaker: Sukumar Das Adhikari, School of Mathematical Sciences
Ramakrishna Mission Vivekananda Educational and Research Institute, India
Email: adhikarisukumar@gmail.com
Title: A pearl of number theory: Some old and new applications
Abstract: After stating the classical van der Waerden's theorem, and a brief discussion of its relation with some early Ramsey-type theorems, we go through some old and new applications of the theorem. We shall also see some open questions in Ramsey Theory.

Speaker: Chahat Ahuja, Indraprastha Institute of Information Technology, Delhi, India
Email: chahat22138@iiitd.ac.in
Title: Visibility of lattice points across polynomial curves
Abstract: The visibility of lattice points from the origin along a polynomial family of curves constitutes a significant generalization of visibility along straight lines. Following the classical notion, where the density of visible lattice points equals $1/\zeta(2)$, and its generalization to monomial curves of the form $y = ax^b$, where the density equals $1/(b+1)$, we study a family of polynomial curves defined by

$$y \;=\; q\big(a_n x^n + a_{n-1}x^{n-1} + \cdots + a_1 x\big),$$

where q is a positive rational number. We introduce a new criterion based on a *polynomial greatest common divisor condition* that provides a lower bound on the number of visible lattice points in $\mathbb{N}^2$. Conversely, we derive conditions under which a given lattice point becomes the next visible point along such a polynomial curve. Using the principle of inclusion-exclusion, we obtain an exact double-sum formula for the number of pairs $(a, b) \le N$ that are visible with respect to this polynomial family.
Finally, we extend the framework to related problems and pose several open questions concerning gap distributions and quantitative bounds for non-visible points. This work provides a broader theoretical foundation for lattice point visibility beyond linear and monomial settings.

Speaker: Krishnaswami Alladi, University of Florida
Email: alladik@ufl.edu
Title: Duality between prime factors and prime numbers in arithmetic progressions
Abstract: In 1977, I noticed a duality between the largest and smallest prime factors of the integers involving the Mobius function, and used this to establish the following result as a consequence of the Prime Number Theorem for Arithmetic Progressions:
If k and ℓ are positive integers, with $1 \leq \ell \leq k$ and $(\ell, k) = 1$, then

$$\sum_{n \geq 2,\, p(n) \equiv \ell (mod\, k)} \frac{\mu(n)}{n} = \frac{-1}{\phi(k)},$$

where $\mu(n)$ is the Mobius function, $p(n)$ is the smallest prime factor of n, and $\phi(k)$ is the Euler function.
In the last decade, several authors have obtained analogues of (1) in the setting of algebraic number fields by using the Chebotarev Density Theorem.
Also in 1977, I proved higher order duality identities involving the k-th largest and smallest prime factors, facilitated by the Mobius function and $\omega(n)$, the number of distinct prime factors of n. In this talk we will exploit the second order duality between the second largest prime factor and the smallest prime factor, to show that if ℓ and k are as above, then

$$\sum_{n \geq 2,\, p(n) \equiv \ell (mod\, k)} \frac{\mu(n)\omega(n)}{n} = 0.$$

The proof of (2) is more complicated owing to the weight $\omega(n)$, and also because it relies on the distribution of the second largest prime factor which is more subtle compared to the distribution of the largest prime factor. All results are established quantitatively. This is joint work with my PhD student Jason Johnson. Recently, another PhD student of mine, Sroyon Sengupta, has extended the Alladi-Johnson results to algebraic number fields using the Chebotarev Density Theorem.
Towards the end of the talk, we will briefly mention further joint work with Sengupta on consequences of such dualities involving the $k - th$ largest and smallest prime factors, when $k \geq 3$.

Speaker: George Andrews, Pennsylvania State University
Email: gea1@psu.edu
Title: The mystery of two-color partitions with distinct parts
Abstract: We shall present some old and some new results about two-color partitions with distinct parts. In the midst of our exploration, a power series arises that seems to be "semi-lacunary." What is going on anyway? The answers to this and other mysteries will be provided. Joint work with M. El Bachraoui.

Speaker: Daniel Baczkowski, University of Findlay
Email: baczkowski@findlay.edu
Title: Building off the ideas of Erdős, Sierpiński, Riesel, and more
Abstract: In 1950, Erdős proved there are infinitely many odd integers that are not of the form $2^k + p$, where p is a prime. In 1956, using similar methods, Riesel proved there are infinitely many odd integers k such that $k \cdot 2^n - 1$ is composite for all positive integers n.
Then, in 1960, Sierpiński proved that there are infinitely many odd integers ℓ such that $\ell \cdot 2^n + 1$ is composite for all positive integers n. We will discuss various other related results such as how some classical sequences like Fibonacci, triangular, and more intersect the set of all possible Reisel and/or Sierpiński numbers.

Speaker: Arindam Biswas, Polynom Research, Paris, France
Email: arin.math@gmail.com
Title: Asymptotic approximate groups in virtually nilpotent groups
Abstract: Let G be a group and let $A \subseteq G$ be a non-empty subset. For $r, l \in \mathbb{N}$, A is said to be an asymptotic (r, l)-approximate group if there exists $h_0 \in \mathbb{N}$ such that, for every $h \geq h_0$, there is a set $X_h \subseteq G$ with $|X_h| \leq l$ and $A^{rh} \subseteq X_h A^h$. We study this property for subsets of virtually nilpotent groups and show that every finite non-empty symmetric subset of a virtually nilpotent group is an asymptotic approximate group. More generally, the same conclusion holds for finite sets whose powers contain a symmetric word ball of radius comparable to h. In the setting of infinite sets, we show a restricted nonabelian analogue of the abelian semilinear-set theorem.

Speaker: Veronica Bitonti, University of Oxford, UK
Email: veronica.bitonti@merton.ox.ac.uk
Title: Gap sets of random generalized numerical semigroups
Abstract: For a fixed positive integer d and a small real $p > 0$, sample a p-random subset $A \subseteq \mathbb{Z}^d_{\geq 0}$, and let $S := \langle A \rangle$ be the generalized numerical semigroup generated by A. We show that, with high probability (as $p \to 0$), the gap set $\mathbb{Z}^d_{\geq 0} \setminus S$ is well approximated by the shifted hyperboloid region

$$\{(x_1, \ldots, x_d) \in \mathbb{R}^d_{\geq 0} : (x_1 + \log p^{-1}) \cdots (x_d + \log p^{-1}) \ll p^{-1} (\log p^{-1})^{d+1}\}.$$

This generalizes work of Kravitz, Morales, and Schildkraut on the 1-dimensional setting. We also obtain the same result with S replaced by the set of subset sums of A. This is a joint work with Noah Kravitz.

Speaker: Alexander Borisov, Binghamton University
Email: aborisov@binghamton.edu
Title: A structure sheaf for Kirch topology on $\mathbb{N}$
Abstract: Kirch topology on $\mathbb{N}$ goes back to a 1969 paper of Kirch. It can be defined by a basis of open sets that consists of all infinite arithmetic progressions $a + d\mathbb{N}_0$, such that $\gcd(a, d) = 1$ and d is square-free. It is Hausdorff, connected, and locally connected. One can hope that in the classical imperfect analogy between arithmetic and geometry this can serve as an arithmetic analog of the usual topology on $\mathbb{C}$. However, the usual topology on $\mathbb{C}$ comes with a structure sheaf of complex-analytic functions. As far as I know, no analog for Kirch topology has been proposed before me. I believe that I have stumbled upon just such a thing, more by accident than by a conscious effort: locally LIP functions. These are functions from Kirch-open sets to $\mathbb{Z}$ such that for every point in the domain there is a Kirch-open neighborhood on which the function is "locally integer polynomial" (LIP): its interpolation polynomial on every finite set has integer coefficients. I will explain why this seems to be a natural object, what I know about it, and what I hope to achieve.

Speaker: Glenn T. Bruda, University of Florida
Email: glenn.bruda@ufl.edu
Title: Generalized polygonal number representations
Abstract: For $k \geq 5$ and $n \geq 4$, let $r_n^{(k)}(N)$ be the number of representations of N as the sum of n generalized k-gonal numbers and $r_n^{\square}(N)$ be the number of representations of N as the sum of n squares. By modifying the Heath-Brown circle method, we prove a closed-form asymptotic relation between $r_n^{(k)}(N)$ and $r_n^{\square}(N)$ for $k \not\equiv 0 \bmod 4$ and any $n \geq 4$. Consequently, we relate the number of representations of N as the sum of four ordinary k-gonal numbers to $r_4^{\square}(N)$ via a result of Bringmann–Jang–Kane–Tse.

Speaker: Marco Cantarini, University of Perugia, Italy
Email: marco.cantarini@unipg.it
Title: Averages of diagonal Elliott-Halberstam problem twisted by Möbius function with Sobolev and Hölder-Zygmund weights
Abstract: Recalling that the so-called Elliott-Halberstam conjecture twisted by the Möbius function $\mu(n)$ claims that

$$\sum_{q\leq N^{\theta}} \max_{y\leq N} \max_{(a,q)=1} \left| \sum_{\substack{n\leq y \\ n\equiv a \bmod q}} \Lambda(n)\mu(N-n) - \frac{1}{\varphi(q)} \sum_{n\leq y} \Lambda(n)\mu(N-n) \right| \ll \frac{N}{\log(N)^A}$$

for every $A > 0$, where $0 < \theta < 1$ is fixed, and also recalling that the validity of this conjecture, in combination with the validity of the classical Elliott-Halberstam for suitable θ, proves the binary Goldbach conjecture, in this talk we analyze weighted average variants of this problem. We will show that, under Generalized Riemann Hypothesis, a weak version of the Gonek-Hejhal conjecture and working with weights belonging to the Sobolev space $W^{2,1}$ or in the Hölder-Zygmund spaces $\mathcal{C}^{\delta}$ for suitable range of δ, the bound of the average is consistent with the bound of the "diagonal versions" of this conjecture (that is, taking $y = N$ and taking $n \equiv N \mod q$). In particular, in the case of weights in Sobolev space, the consistent upper bound holds for the whole $0 < \theta < 1$ and, in the case of weights in the Hölder-Zygmund class $\mathcal{C}^{\delta}$, for θ that depends on the choice of δ but still not below the $1/2 - 2\varepsilon$ threshold.

Speaker: Scott Chapman, Sam Houston State University
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Title: A surprising characterization of unique factorization domains
Abstract: We address some recent work on the generalization of the UFD propery which has pointed back to an open problem first mentioned in a paper by myself, Dan Anderson, Muhammad Zafrullah, and Franz Halter-Koch (*Criteria for unique factorization in integral domains*, *J. Pure Appl. Algebra* **127**(1998), 205–218), which we abbreviate as ACHKZ.
Fix a positive integer $n > 1$. Call an atomic integral domain D *quasi-n-factorial* if, for any irreducible elements $x_1, \ldots, x_n, y_1, \ldots, y_n$, the equality $x_1 \cdots x_n = y_1 \cdots y_n$ implies that $x_i = u_i y_{\sigma(i)}$ for some unit u_i and permutation σ of $\{1, \ldots, n\}$.
Further, D is *length-factorial* if it is quasi-n-factorial for all $n > 1$. Jim Coykendall and William W. Smith showed in 2011 the surprising result that an atomic monoid is a UFD if and only if it is length-factorial. This allows one to alter the classic definition of a UFD. in a surprising manner.
The authors in ACHKZ offer examples of monoids which are quasi-n-factorial for specific n, but are not factorial. They offer no such example of an integral domain. Hence, the Coykendall-Smith result makes the following problem explored in ACHKZ all the more relevant.
Open Problem: Does there exist an atomic integral domain D which is quasi-n-factorial for some $n > 1$, but not factorial?

Speaker: Austin Abraham Cramer, Penn State
Email: cramer@psu.edu
Title: Lattice points under polynomial curves
Abstract: This presentation is concerned with various analogs of the Gauss circle and Dirichlet divisor problems. For a given polynomial $f(x_1, \ldots, x_s)$ with integer coefficients, let $r_f(n) = \#\{(x_1, \ldots, x_s) \in \mathbb{N}^s : f(x_1, \ldots, x_s) = n\}$. Using van der Corput's method to control error terms, we obtain asymptotic formulas for averages of this function of the form $\sum_{n \leq N} r_f(n)$ with various choices of f. When $f(x_1, x_2)$ is a polynomial in two variables, this counts the lattice points in the first quadrant bounded by the curve $f(x_1, x_2) = N$. In this setting, we demonstrate how to obtain asymptotics for various curves of low degree as well as how the method can be extended to apply to some simple hypersurfaces bounding points in $\mathbb{N}^s$.

Speaker: Lindsay Dever, Millersville University
Email: Lindsay.Dever@millersville.edu
Title: Atoms in the semigroup of non-negative integer matrices
Abstract: In the semigroup of 2×2 matrices with non-negative integer entries and non-zero determinant, we study the factorization of matrices into atoms, or irreducible matrices. In 2022, Baeth et al. discovered classes of atoms in this semigroup; however, the factorability of most matrices remains unknown. As the result of joint work with Eva Goedhart, Gregory Heilbrunn, and Tony W. H. Wong, I will discuss additional classes of atoms: a class of atoms with determinant p, $2p$, or $4p$, where p is prime, and a class of atoms where the main diagonal is much "larger" than the off-diagonal (or vice-versa). In addition, we find that bisymmetric matrices with relatively prime entries are a divisor-closed subset and use a factor-search algorithm to classify bisymmetric atoms with minimum entry up to 4000.

Speaker: Dennis Eichhorn, University of California - Irvine
Email: deichhor@uci.edu
Title: The combinatorics of sequences that enjoy a curious self-convolutive property
Abstract: In 2002, Andrews, Lewis, and Lovejoy introduced the combinatorial objects called *partitions with designated summands*. If we restrict our attention to $\mathrm{PDO}(n)$, the number of partitions with designated summands in which all parts are odd, a very curious property emerges. The very unexpected identity

$$\sum_{n=0}^{\infty} \mathrm{PDO}(2n)q^n = \left(\sum_{n=0}^{\infty} \mathrm{PDO}(n)q^n\right)^2$$

holds. That is, the sequence $\{\mathrm{PDO}(2n)\}_{n=0}^{\infty}$ is the convolution of the sequence $\{\mathrm{PDO}(n)\}_{n=0}^{\infty}$ with itself! Sequences sharing this curious property are now called "2-convolutive," and a small handful of such sequences appear in the OEIS. Many authors have called for a combinatorial proof of the 2-convolutivity of $\mathrm{PDO}(n)$. After a nearly two-year-long collaboration with Chern, Fu, and Sellers, we are happy to announce that we have finally found the requested combinatorial proof. In this talk, we discuss this new proof, along with the combinatorial proofs of the 2-convolutivity of several other partition functions.

Speaker: Jinhui Fang, Nanjing Normal University, Nanjing, P.R. China
Email: fangjinhui1114@163.com
Title: Minimal asymptotic bases related to $\mathcal{G}$-adic sequences
Abstract: Let A be a set of nonnegative integers and $h \geq 2$. The set A is defined as *an asymptotic basis of order* h if all sufficiently large integers n can be expressed as the sum of h elements taken from A. Such A is further defined as *minimal* if no proper subset of A is an asymptotic basis of order h. In 1974, Nathanson explicitly constructed a minimal asymptotic basis of order 2 by using binary representations. In 2022, Nathanson constructed a new class of minimal asymptotic bases of order h based on the $\mathcal{G}$*-adic sequence*, where a $\mathcal{G}$-adic sequence $\mathcal{G} = \{g_i\}_{i=0}^{\infty}$ is a strictly increasing sequence of positive integers such that $g_0 = 1$ and g_{i-1} divides g_i for all $i \geq 1$. Recently, we improve the above result.

Speaker: Neranga Fernando, Knox College
Email: nfernando@knox.edu
Title: Contributions to the family of reversed Dickson polynomials
Abstract Let p be a prime, q a power of p, and $\mathbb{F}_q$ the finite field with q elements. A polynomial $f \in \mathbb{F}_q[\mathtt{X}]$ is called a *permutation polynomial* of $\mathbb{F}_q$ if the associated mapping $\mathtt{X} \mapsto \mathtt{f}(\mathtt{X})$ from $\mathbb{F}_q$ to $\mathbb{F}_q$ is a permutation of $\mathbb{F}_q$. Permutation polynomials have gained widespread attention due to their applications in cryptography, coding theory, and combinatorics. The nth reversed Dickson polynomial is given by the explicit expression

$$D_n(a, \mathtt{X}) = \sum_{\mathtt{i}=0}^{\lfloor \mathtt{n}/2 \rfloor} \frac{\mathtt{n}}{\mathtt{n}-\mathtt{i}} \binom{\mathtt{n}-\mathtt{i}}{\mathtt{i}} \mathtt{a}^{\mathtt{n}-2\mathtt{i}} (-\mathtt{X})^{\mathtt{i}}$$

where $a \in \mathbb{F}_q$ is a parameter. Reversed Dickson polynomials have played an important role in the area of permutation polynomials since their introduction in 2009. A self-reciprocal polynomial is a polynomial whose coefficients form a palindrome. Self-reciprocal polynomials have important applications in coding theory. In this talk, I will first speak about my contribution to the areas of permutation polynomials over finite fields and self-reciprocal polynomials via reversed Dickson polynomials. I will also speak about a recent REU project conducted with my students at College of the Holy Cross on reversed Dickson permutation polynomials. Moreover, I will present a list of research projects for students.

Speaker: Michael Filaseta, University of South Carolina
Email: filaseta@math.sc.edu
Title: On the factorization of a sum of cyclotomic polynomials
Abstract: In 2000, Charles Nicol conjectured that for n and m integers with $n > m > 1$, the sum $\Phi_n(x) + \Phi_m(x)$ is a product of distinct cyclotomic polynomials and either a constant or an irreducible non-cyclotomic polynomial. Little progress has been made on this conjecture since then. In this talk, we discuss recent joint work with Lilit Martirosyan and London Swan, where, in particular, we show that for primes p, q and ℓ with $p > q > \ell$ and a non-negative integer r, the sum $\Phi_{\ell^r p}(x) + \Phi_{\ell^r q}(x)$ has this property and determine precisely the cyclotomic polynomials dividing the sum.

Speaker: Mikhail Gabdullin, University of Illinois at Urbana-Champaign
Email: mikhail.gabdullin@gmail.com
Title: Moments of the shifted prime divisor function
Abstract: Let $\omega^*(n) = \{d|n : d = p - 1, p \text{ is a prime}\}$ denote the "shifted prime divisor" function. It is easy to see that $\sum_{n\le x} \omega^*(n) = x \log\log x + O(x)$, similar to the average value of $\omega(n)$, the number of prime divisors of n. We confirm a recent conjecture of Fan and Pomerance by proving that, for each integer $k \ge 2$,

$$\sum_{n\le x} \omega^*(n)^k \asymp x(\log x)^{2^k-k-1},$$

where the implied constant may depend only on k. The proof relies on a combinatorial identity for the least common multiple, viewed as a multiplicative analogue of the inclusion-exclusion principle, together with the theory of multiplicative functions.

Speaker: Krystian Gajdzica, Jagiellonian University, Poland
Email: krystian.gajdzica@uj.edu.pl
Title: On the Bessenrodt-Ono inequality for polynomials
Abstract: In 2016, Bessenrodt and Ono proved that the partition function satisfies the inequality $p(a)p(b) > p(a + b)$ for all $a, b \geqslant 2$ with $a + b > 9$. Since then, analogous properties have been investigated for many partition statistics. In this talk, following Gian-Carlo Rota's advice, we move from the discrete problem to the continuous one, and consider a family of recursively defined polynomials $P_n^g(x) := \frac{x}{n} \sum_{k=1}^{n} g(k) P_{n-k}^g(x)$ with the initial condition $P_0^g(x) := 1$, where $(g(n))_{n\in\mathbb{N}}$ is an arbitrary sequence of positive real numbers such that $g(1) = 1$. We derive an efficient criterion characterizing when the inequality $P_a^g(x)P_b^g(x) \geqslant P_{a+b}^g(x)$ is satisfied for all $x \geqslant x_0$ and $a, b \geqslant 1$, where x_0 is some real number depending on g. Moreover, we illustrate the usefulness of this criterion by applying it to various combinatorial sequences.

Speaker: Collier Gaiser, Community College of Aurora, Colorado
Email: collier.gaiser@ccaurora.edu
Title: On Rado numbers for equations with unit fractions
Abstract: Let $R_r(k)$ be the smallest n such that every r-coloring of $\{1, 2, ..., n\}$ has a monochromatic solution to $x_1 + x_2 + \cdots + x_k = y$, where $x_1, x_2, \ldots, x_k$ are not necessarily distinct. Beutelspacher and Brestovansky proved that $R_2(k) = k^2 + k - 1$ and, recently, Boza, Marín, Revuelta, and Sanz proved that $R_3(k) = k^3 + 2k^2 - 2$. Similarly, let $f_r(k)$ be the smallest n such that every r-coloring of $\{1, 2, ..., n\}$ has a monochromatic solution to the equation $1/x_1 + 1/x_2 + \cdots + 1/x_k = 1/y$, where $x_1, x_2, \ldots, x_k$ are not necessarily distinct. Brown and Rödl proved that $f_2(k) = O(k^6)$. In this talk, we show that $f_2(k) = O(k^3)$ and $f_3(k) = O(k^{43})$. The main ingredient in our proof is a finite set $A \subseteq \mathbb{N}$ such that every r-coloring of A has a monochromatic solution to the linear equation $x_1 + x_2 + \cdots + x_k = y$ and the least common multiple of A is sufficiently small. As for the lower bound, we show that $f_r(k) \geq k^r$ which leads to an interesting open question: Is $f_2(k) = \Theta(k^2)$?

Speaker: Alfred Geroldinger, University of Graz, Austria
Email: alfred.geroldinger@uni-graz.at
Title: On factorizations of zero-sum sequences over abelian torsion groups I
Abstract: Let G be an additive abelian group and let $G_0 \subseteq G$ be a subset. A zero-sum sequence over G_0 is an unordered string of terms from G_0 (repetition of terms allowed) such that the sum of terms is 0. The study of zero-sum sequences dates back over 60 years, and while they have often been studied for purely combinatorial interest, the original motivation was due to connections with factorization in rings of integers in algebraic number fields.
In the last few decades, the connection between factorizations of zero-sum sequences and factorization of elements in rings of integers was made more precise and extended into much more general algebraic settings. This then allows the algebraic structure of factorization to be studied via combinatorial properties of zero-sum sequences. We briefly review this connection, making all notions concrete, and then turn our focus to the combinatorial part.

In the past, there has been much focus on finite groups, and more recently, on subsets of finitely generated groups. However, very little was known in the case of non-finitely generated abelian groups. In part, this is because common invariants used to study factorization, such as the Davenport Constant, are no longer guaranteed to be finite. In order to better understand factorization in the setting of infinite abelian torsion groups, we introduce a new technique measuring the size of a sequence not by the number of its terms but rather by its cross number, $\sum_{i=1}^{\ell} \frac{1}{\mathrm{ord}(g_i)}$, where the $g_i \in G_0 \subseteq G$ are the terms in the sequence. Cross numbers have previously been used almost solely for finite groups. In order to adapt their use into the infinite torsion group setting, we need to introduce a new invariant, $\mathsf{K}_{\mathsf{inf}}(G_0)$, defined as the infimum of all cross numbers of nontrivial zero-sum sequences with terms from G_0. This then sets up dichotomy between when $\mathsf{K}_{\mathsf{inf}}(G_0) = 0$ and when $\mathsf{K}_{\mathsf{inf}}(G_0) > 0$. In this first part of two talks, we focus on when $\mathsf{K}_{\mathsf{inf}}(G_0) = 0$, and show that factorization of zero-sum sequences can be very ill-behaved under this assumption. In the follow-up talk, we then instead consider when $\mathsf{K}_{\mathsf{inf}}(G_0) > 0$ and see that this instead guarantees that factorization must be well-behaved, as measured by the finiteness of several commonly factorization metrics.
This is joint work with David J. Grynkiewicz and Guoqing Wang.

Speaker: Aradhya Goel, Indian Institute of Technology Kanpur, India
Email: aradhyag24@iitk.ac.in
Title: Sophie Germain primes and the totient of Fibonacci numbers
Abstract: We study the set $S(q)$ of residue classes r modulo the Pisano period $\pi(q)$ for which $q \mid \varphi(F_m)$ for every $m \equiv r \pmod{\pi(q)}$. We prove that if q is a Sophie Germain prime and $z(2q+1) \mid \pi(q)$, where z denotes the rank of apparition, then $S(q)$ is a nonempty arithmetic progression; for $q > 5$, its cardinality is odd and $q \equiv 8 \pmod{15}$. Conversely, if a prime $p \equiv 1 \pmod{q}$ has $z(p) \mid \pi(q)$, then necessarily $p = 2q+1$, so q is Sophie Germain. We conjecture that $S(q) \neq \emptyset$ forces the existence of such a prime p; this is verified for all $q \leq 50{,}000$. Assuming the divisibility $z(2q+1) \mid \pi(q)$ holds for infinitely many Sophie Germain primes (verified for approximately 23.9% of the 669 Sophie Germain primes $q \leq 50{,}000$), the Sophie Germain conjecture implies the existence of infinitely many primes $q \equiv 8 \pmod{15}$ with $(2q+1) \mid F_{\pi(q)}$ – a purely Fibonacci-theoretic condition. These results generalize to arbitrary Lucas sequences $U_n(P,Q)$ with non-square discriminant.

Speaker: Vivekanand Goswami, IIT Bhilai, India
Email: vivekanandg@iitbhilai.ac.in
Title: Restricted set addition in finite abelian groups
Abstract: Let A be a nonempty subset of a finite abelian group G of order n. For an integer $h \geq 2$, the restricted h-fold sumset $h^{\wedge}A$ is the set of all sums of h distinct elements of A. It is known that if G is a group of order n and A is a subset of G such that $|A| > \frac{n}{2}$, then $h^{\wedge}A = G$ under some conditions on h and n. While the constant $1/2$ is optimal for groups of even order, it is not optimal for groups of odd order. For an integer $h \geq 4$, let α_h be the unique positive root of the polynomial $3^{h-2}x^{h-1} + x - 1$. In this talk, we discuss that for any $\alpha > \alpha_h$, there exists a positive integer $M_h(\alpha)$, which is determined precisely, such that for all $n > M_h(\alpha)$ with n odd, if A is a subset of a finite abelian group G of order n and if $|A| \geq \alpha n$, then $h^{\wedge}A = G$. Moreover, $\alpha_h > \alpha_{h+1}$ for $h \geq 4$ and α_h approaches $\frac{1}{3}$ as h increases, and the constant $\frac{1}{3}$ is optimal when the smallest prime dividing n is 3.

Speaker: David J. Grynkiewicz, Memphis University
Email: diambri@hotmail.com
Title: On factorizations of zero-sum sequences over abelian torsion groups II
Abstract: Let G be an additive abelian torsion group and let $G_0 \subseteq G$ be a subset. A zero-sum sequence over G_0 is an unordered string of terms from G_0 (repetition of terms allowed) such that the sum of terms is 0. In the last few decades, the connection between factorizations of zero-sum sequences and factorization of elements in rings of integers has been made more precise and extended into much more general algebraic settings. The extent to which factorization are wild or well-behaved is often measured by the finiteness and size of various arithmetic factorization invariants. Some of the most common include the catenary degree $\mathsf{c}(G_0)$, the set of successive distances $\Delta(G_0)$, and the elastacities $\rho_k(G_0)$. We begin by introducing what these invariants are in purely combinatorial terms and explain how they measure constraint of factorization in algebraic settings.

n the past, there has been much focus on finite groups, and more recently, on subsets of finitely generated groups. However, very little was known in the case of non-finitely generated abelian groups. In part, this is because common invariants used to study factorization, such as the Davenport Constant, are no longer guaranteed to be finite. In order to better understand factorization in the setting of infinite abelian torsion groups, we introduce a new technique measuring the size of a sequence not by the number of its terms but rather by its cross number, $\sum_{i=1}^{\ell} \frac{1}{\mathrm{ord}(g_i)}$, where the $g_i \in G_0 \subseteq G$ are the terms in the sequence. The use of cross numbers allows us to define three constants, $\mathsf{K}(G_0)$, $\mathsf{k}(G_0)$ and $\mathsf{K}_{\mathsf{inf}}(G_0)$, defined as the supremum of all cross numbers of minimal (by inclusion) zero-sum sequences, the supremum of all cross numbers of zero-sum free sequences (sequences having no zero-sum subsequence), and the infimum of all cross numbers of nontrivial zero-sum sequences. The first two of these constants have appeared in the literature before, but the third is newly introduced here.

In the first part of this two part talk, it was shown that factorization of zero-sum sequences can be very ill-behaved when $\mathsf{K}_{\mathsf{inf}}(G_0) = 0$. In this second part, we consider what happens when $\mathsf{K}_{\mathsf{inf}}(G_0) > 0$, specifically in the setting of infinite abelian torsion groups with finite total rank. In this setting, the first two cross number constants $\mathsf{K}(G_0)$ and $\mathsf{k}(G_0)$ are always finite. Assuming $\delta := \mathsf{K}_{\mathsf{inf}}(G_0) > 0$, we then obtain a general upper bound for the catenary degree

$$\mathsf{c}(G_0) \le \max\{2\delta^{-1}\mathsf{k}(G_0) + 1, \quad 2\delta^{-1}\mathsf{K}(G_0)\}.$$

In particular, this implies that both the set of successive distances $\Delta(G_0)$ and catenary degree are always finite under these circumstances, with explicit concrete upper bounds. Moreover, our upper bound on the catenary degree is tight, meaning there are infinite families of subsets $G_0 \subseteq G$ for which equality holds above. In addition, for the special case of quasi-cyclic groups, we are able to partially characterize what subsets G_0 with $\mathsf{K}_{\mathsf{inf}}(G_0) > 0$ look like and use this to give a lower bound for the elasticities $\rho_k(G_0)$. Combined with the upper bound on the catenary degree, this yields a structural description of the possible refactorization lengths of a product of k irreducibles.

This is joint work with Alfred Geroldinger and Guoqing Wang.

Speaker: Sinan Gunturk, NYU
Email: sinan.gunturk@nyu.edu
Title: Exponential sums and a conjecture involving quantization of bandlimited functions
Abstract: Sigma-delta modulation is a classical method for oversampled coarse quantization which enables approximation of bandlimited functions (e.g. audio signals) at high sampling rates despite using only two fixed levels to round each sample. In the basic form of this method (the "first order" case), the approximation rate is λ^{-1} in the uniform norm where λ denotes the oversampling ratio, but the pointwise error has been shown to decay at least at the rate $\lambda^{-4/3+\epsilon}$ under generic conditions. Meanwhile, a long-standing folklore conjecture based on numerical simulations predicts square-root cancellation "on average", i.e. approximation rate of order $\lambda^{-3/2+\epsilon}$. We disprove the conjecture for the Besicovitch norm, utilizing certain exponential sums of bandlimited phase.
Joint work with Maksym Radziwill.

Speaker: Katalin Gyarmati, Eötvös Loránd University, Hungary
Email: katalin.gyarmati@gmail.com
Title: The taxicab problem for polynomials and generalizations of Mason's theorem
Abstract: This talk is motivated by Ramanujan's famous taxicab problem and is concerned with the solvability of polynomial equations of the form $p^n + q^n = r^n + s^n$ and, more generally, $p_1^{k_1} + \cdots + p_m^{k_m} = 0$ over the complex numbers. Using Wronskian determinants and Mason's theorem, we obtain sharp upper bounds for the exponents. In particular, we will show that there are no relatively prime polynomials (with at least one non-constant) satisfying the generalised taxicab equation for $n \geq 16$. We also consider an extension of Mason's theorem to $f_0 + f_1 + \cdots + f_k = 0$ for several polynomial terms over the complex numbers and finite fields, obtaining the corresponding degree bounds. Finally, the talk points out interesting future cryptographic applications of these theoretical results, in particular, the construction of large families of pseudorandom binary sequences with small cross-correlation measures.

Speaker: Yasuaki Gyoda, Nagoya University, Japan
Email: yasuakigyoda@gmail.com
Title: Generalized discrete Lagrange–Markov spectra
Abstract: This talk concerns a discrete extension of the classical Lagrange and Markov spectra, motivated by generalized Markov equations. In the classical case, the discrete spectral values below 3 are organized by Markov numbers and are described through continued fractions, Christoffel words, and Cohn matrices. I will explain how an analogous picture can be developed for generalized Markov numbers arising from

$$x^2 + y^2 + z^2 + k_1yz + k_2zx + k_3xy = (3 + k_1 + k_2 + k_3)xyz.$$

For each generalized Markov number, one obtains an explicit spectral value which is realized both as the Lagrange constant of a quadratic irrational and as the Markov constant of an indefinite binary quadratic form with rational coefficients. The emphasis of the talk will be on the main idea of the construction: generalized Cohn matrices and symbolic sequences coming from straight-line codings play the role classically played by Christoffel words and Cohn matrices. The aim is to present a combinatorial and matrix-theoretic framework for viewing classical and generalized discrete Diophantine spectra in a unified way.

Speaker: Norbert Hegyvári, Eötvös University and Rényi Institute, Hungary
Email: hegyvari.norbert@renyi.hu
Title: Consecutive sums, Sidon sets, convex sequences: Old and new problems
Abstract: In the field of additive combinatorics, sum-difference sets and subset sums have been extensively investigated. However, the properties and behavior of the so-called consecutive sums of sequences represent a significantly less explored area. My talk addresses this gap by discussing both old results and recent developments concerning consecutive sums, highlighting their connections to Sidon sequences and convex sequences. Finally, we will conclude the talk by outlining several open questions and problems.

Speaker: Russell Hendel, Towson University
Email: DrRussellJayHendel@gmail.com
Title: Improvements in calculating the recursion satisfied by a family of determinants
Abstract: A variety of problems can be elegantly solved by identifying the recursion satisfied by the determinants of a family of matrices. In 2016, Jia, Yang, and Li provided a general 6-th order recursion for the family of arbitrary pentdiagonal Toeplitz matrices by using Laplace expansions. Recently, Evans and Hendel showed that this method is potentially generalizable and applied it to prove an outstanding conjecture on resistance distance in linear 3-trees. However, Evans and Hendel left as an open problem the convergence of their procedure in the general case. Hendel has recently proven convergence for such a Laplace-expansion approach for an arbitrary family of square, banded, Toeplitz matrices with k super and sub diagonals for any positive integer k. Hendel also eliminated the computational matrix methods of Evans and Hendel replacing them with a simpler algebraic manipulative system. This note supplements this procedure by showing an improved method to solve the resulting system of several simultaneous equations in families of determinants. This improved procedure, applied to explore an outstanding conjecture of Bareett, Evans, and Francis on the general k-linear tree, uncovers several interesting patterns which are presented.

Speaker: Philippa Holdridge, Alfréd Rényi institute, Hungary
Email: holdridge.philippa@renyi.hu
Title: The size of certain symmetric differences of sets of integers
Abstract: Consider a set $A \subseteq \mathbb{N}$ which is finite and nonempty. Letting Δ denote the symmetric difference of sets and $k \cdot A = \{ka : a \in A\}$, it can be shown that $A\Delta(2 \cdot A)$ always contains at least two elements. It also turns out that $A\Delta(2 \cdot A)\Delta(3 \cdot A)$ has at least three elements. Does $A\Delta(2 \cdot A)\Delta \cdots \Delta(n \cdot A)$ have at least n elements for all $n \in \mathbb{N}$? This question was posed by Pilz in an equivalent form involving the minimal distance of certain linear codes. If true, then this lower bound is best possible, as seen by considering $A = \{1\}$. The lower bound is also attained when $A = \{1, 2, \ldots, n\}$ and, in fact, for each n, there are arbitrarily large sets A such that $A\Delta(2 \cdot A)\Delta \cdots \Delta(n \cdot A)$ has exactly n elements.
Pilz proved the conjecture for $n \leq 6$, and it can also be proven for $n = 7$ and 8.
For larger n, Pach and Szabó proved a lower bound of the form $n/(\log n)^{\lambda}$ for $\lambda \approx 0.22$. Until recently, this was the strongest result known, but in a recent work, we have proven the conjecture for all sufficiently large n. More precisely, whenever $n \geq 3^{81}$.
In this talk we will outline the proof and discuss some related problems.
Joint work with P. Pach.

Speaker: Francis Atta Howard
Email: hfrancisatta@ymail.com
Title: Gertsch quotient living in the "poor man's adele ring" $\mathcal{A}$: Kurepa-Bell-Wilson congruence
Abstract: Wilson's theorem is related to left factorials, expressed as $K_p \equiv \mathbf{Bell}_{p-1} - 1 \pmod{p}$, for prime $p \geq 3$. This study examines a Kurepa-Bell-Wilson congruence (**KBW**), $\frac{K_p+1}{p} \equiv \frac{\mathbf{Bell}_{p-1}}{p} + W_p \pmod{p}$, and demonstrates that it naturally generates the non-zero "Gertsch quotient ($\mathbb{G}_p$)," which, for larger primes modulo p resides in the poor man's adele ring $\mathcal{A}$.

Speaker: Bobby Jacobs
Email: BobbyJacobs@email.com
Title: Fibonacci multiplication
Abstract: We will define an interesting product for generalized Fibonacci sequences, explore the consequences of this definition, extend this to a ring, define the notion of a prime among these sequences, and show that this ring contains infinitely many primes. This product can be viewed as sums of shifts of scalar multiples of the canonical Fibonacci sequence, and may provide new insight into sequences of continuing interest.

Speaker: Renling Jin, College of Charleston
Email: jinr@cofc.edu
Title: Three-in-one in Ramsey theory
Abstract: There are three fundamental theorems in Ramsey theory: Ramsey's theorem, van der Waerden's theorem, and Hindman's theorem. Milliken-Taylor proved a result that simultaneously generalizes Ramsey's theorem and Hindman's theorem. Later, Bergelson–Hindman and Samet–Tsaban established two distinct theorems, each providing a simultaneous generalization of Ramsey's theorem and van der Waerden's theorem in two different ways. Using a newly developed method of iterated extensions, we prove–pending verification–a theorem that simultaneously generalizes all three classical results–Ramsey's theorem, Hindman's theorem, and van der Waerden's theorem. Moreover, our theorem subsumes both the Bergelson–Hindman and the Samet–Tsaban generalizations.
Joint work with Mauro Di Nasso.

Speaker: Alexander Kalmynin, Higher School of Economics, Russia
Email: alkalb1995cd@gmail.com
Title: Sárközy's conjecture on quadratic residues
Abstract: For an odd prime number p, let $\mathcal{R}_p \subset \mathbb{F}_p$ be the set of all non-zero quadratic residues. A. Sárközy conjectured that the set $\mathcal{R}_p$ does not admit a non-trivial additive decomposition for large enough p, i.e. for $p > p_0$ the identity $A + B = \mathcal{R}_p$ implies $\min(|A|, |B|) = 1$. In this talk we present a complete resolution of Sárközy's conjecture. Further, we show that, for a subgroup $G \subset \mathbb{F}_p^*$, the equality $G \cup \{0\} = A - A$ for some A implies $|G| = 2$ or 6 and if $G = A + B$ non-trivially, then $|A| = |B| = \sqrt{|G|}$.

Speaker: Sandra Kingan, Brooklyn College and the Graduate Center, CUNY
Email: skingan@brooklyn.cuny.edu
Title: Deletable edges in 3-connected graphs and their applications
Abstract: I will analyze 3-connected graphs that contain a fixed 3-connected graph H as a minor, but in which no edge can be deleted while preserving 3-connectivity and an H-minor. Let G and H be simple 3-connected graph such that G has an H-minor. An edge e in G is called H-deletable if $G\backslash e$ is 3-connected and has an H-minor. If G has no H-deletable edge, then G can be reduced to H using three specific local operations. This gives a framework for studying extremal graphs with no H-deletable edges and yields applications to excluded-minor questions.
This talk is based on a paper in Discrete Mathematics (Vol 349, Issue 6).

Speaker: Gergely Kiss, Rényi Alfréd Institute of Mathematics and Corvinus University, Hungary
Email: kigergo57@gmail.com
Title: Lower bounds for mask polynomials with many cyclotomic divisors
Abstract: We study finite subsets and multisets of cyclic groups $\mathbb{Z}_M$ whose mask polynomials have prescribed cyclotomic divisors. More precisely, if $A \subseteq \mathbb{Z}_M$, we consider its mask polynomial
$$A(X) = \sum_{a\in A} X^a \qquad \text{in } \mathbb{Z}[X]/(X^M - 1),$$
and ask how divisibility by selected cyclotomic polynomials constrains the size and structure of A. This question is motivated by its connections with translational tilings, the Coven–Meyerowitz conjecture, and one-dimensional Fuglede-type problems. We prove new lower bounds for the cardinality of such sets and develop several structural tools, including a truncation method and a multiscale extension of the de Bruijn–Rédei–Schoenberg theorem. These results show that the expected fibre-type extremal configurations do not always give the correct minimum once the prescribed cyclotomic divisors become sufficiently complicated. At the same time, in the two-dimensional case and in several further special situations, the lower bounds agree with the natural fibre constructions.
This is joint work with I. Łaba, C. Marshall, and G. Somlai.

Speaker: Sándor Kiss, Budapest University of Technology and Economics, Hungary
Email: ksandor@math.bme.hu
Title: Monotone increasing representation functions
Abstract: Let $k \geq 2$ be an integer and let A be a set of nonnegative integers. The representation function $R_{A,k}(n)$ for the set A is the number of representations of a nonnegative integer n as the sum of k terms from A. A few years ago, Bell and Shallit constructed a set A of natural numbers such that $\mathbb{N} \setminus A$ is infinite, but the corresponding representation function is strictly increasing. Later, together with Csaba Sándor and Yang Quan-Hui, we improved their result. Furthermore, we constructed a dense set such that the corresponding representation function is not strictly increasing.
In my talk I will also give an overview of the recent progress on this topic.

Speaker: Jonah Klein, University of South Carolina
Email: jonah.klein@sc.edu
Title: The distortion method and its applications
Abstract: A *covering system* is a finite set of arithmetic progressions, with the property that every integer belongs to at least one of them. Covering systems were introduced by Erős in 1950. In the same article where he introduced them, he asked if there was a uniform upper bound on the smallest modulus of covering systems with distinct moduli. This problem was resolved by Hough in 2015, showing that the smallest modulus is always smaller than 10^{16}. Expanding upon his work, Balister, Bollobás, Morris, Sahasrabudhe, and Tiba reduced this bound to 616000, with a method that they coined the distortion method. The aim of this talk is to give a brief overview of the distortion method and its applications, with a particular focus on showing that it is impossible to construct 10 disjoint distinct covering systems. This is work in progress with Michael Filaseta and Alexandros Kalogirou.

Speaker: Sergei Konyagin, Russia
Email: konyagin@mi-ras.ru
Title: On Sidon sets with squares, cubes and quartics in short intervals
Abstract: For any positive integer N, the equation
$$x^3+y^3=z^3+t^3, \quad x,y,z,t\in\mathbb{N}, \quad \{x,y\}\neq\{z,t\}$$
has no solution satisfying
$$N\le x,y,z,t<N+\left(\tfrac{38}{3}N+\tfrac{1297}{36}\right)^{1/2}+\tfrac{19}{6}.$$
The strict inequality "$<$" can not be substituted by "$\le$", that is, there exist infinitely many positive integers N such that the equation has a solution with
$$N\le x,y,z,t\le N+\left(\tfrac{38}{3}N+\tfrac{1297}{36}\right)^{1/2}+\tfrac{19}{6}.$$
There is an absolute constant $c>0$ such that for any positive integer N the equation has a solution satisfying
$$N\le x,y,z,t\le N+cN^{2/3}.$$
For any $\varepsilon>0$ there exist infinitely many positive integers N such that the equation has no solution satisfying
$$N\le x,y,z,t\le N+N^{4/7-\varepsilon}.$$
There is an absolute constant $c>0$ such that for any positive integer N the equation
$$x^4+y^4=z^4+t^4, \quad x,y,z,t\in\mathbb{N}, \quad \{x,y\}\neq\{z,t\},$$
has no solution satisfying
$$N\le x,y,z,t\le N+cN^{3/5}.$$
There is an absolute constant $c>0$ such that for any positive integer N this equation has a solution satisfying
$$N\le x,y,z,t\le N+cN^{12/13}.$$
The talk is based on a joint paper of the speaker with M. Z. Garaev and F. M. Garayev.

Speaker: Noah Kravitz, Oxford University, UK
Email: noah.kravitz@maths.ox.ac.uk
Title: Sets with few subset sums
Abstract: A classical result of Nathanson shows that every n-element set of positive reals has at least $\binom{n+1}{2}+1$ distinct subset sums, with equality exactly for homogeneous arithmetic progressions. We establish stability versions of this inverse theorem in two regimes. First, for any parameter $0 \leq M \leq n-4$, we precisely characterize the n-element sets of positive reals with at most $\binom{n+1}{2}+1+M$ subset sums. Second, for any constant C, we provide a characterization, sharp up to constants, of the n-element sets of positive reals with at most Cn^2 distinct subset sums.
Joint work with Ruben Carpenter and Colin Defant.

Speaker: Gaurav Kumar, Indian Institute of Technology Gandhinagar, India
Email: kumargaurav@iitgn.ac.in
Title: Some identities of the sums-of-tails type
Abstract: A new sums-of-tails identity involving two parameters b and d is obtained and is used to derive more results of similar type. One of Ramanujan's sums-of-tails identities from the Lost Notebook is shown to be a special case of our result. In the course of deriving Ramanujan's identity, we obtain a new result of combinatorial significance. Two new representations for an infinite series associated to a mock theta function are derived. Also, we give an application of an identity of Andrews and Onofri.
This talk is based on joint work with Prof. Atul Dixit and Aviral Srivastava.

Speaker: Jeffrey C. Lagarias, University of MIchigan
Email: lagarias@umich.edu
Title: The Collatz problem: Progress and perspectives
Abstract: The Collatz problem concerns the iteration of the map $C(n) = n/2$ if n is even; $C(n) = 3n+1$ if n is odd, on the positive integers. It asks whether the integer 1 is reached for all starting values n. This talk surveys some history and recent progress towards the Collatz Problem. It offers some perspectives on its difficulty.

Speaker: Paolo Leonetti, Università degli Studi dell'Insubria and Università Bocconi, Italy
Email: leonettipaolo@gmail.com
Title: Independent families and asymptotic density
Abstract: Let $\mathcal{D}$ be the family of sets $S \subseteq \mathbb{N}$ for which the asymptotic density $d(S) := \lim_{n\to\infty} \frac{|S\cap[1,n]|}{n}$ exists. Treating d as a finitely additive probability measure on $\mathcal{D}$, we study structural properties of families of sets $\mathcal{A} \subseteq \mathcal{P}(\mathbb{N})$ which are independent (in its classical statistical meaning). We conclude with several open questions.
Reference: J. Keith and P. Leonetti, On maximal families of independent sets with respect to asymptotic density , https://arxiv.org/abs/2603.28922

Speaker: Jared Duker Lichtman, Stanford University
Email: jared.d.lichtman@gmail.com
Title: Primitive sets and von Mangoldt chains: Erdős #1196 and beyond
Abstract: A set of integers is primitive if no number in the set divides another. We introduce a new method for bounding Erdős sums of primitive sets, suggested from output of GPT-5.4 Pro, based on Markov chains with von Mangoldt weights. The method leads to a host of applications, yet seems to have been overlooked by the prior literature since Erdős' seminal 1935 paper. As applications, we prove two 1966 conjectures of Erdős-Sárközy-Szemerédi, on primitive sets of large numbers (#1196) and on divisibility chains (#1217). The method also provides a short proof of the Erdős Primitive Set Conjecture (#164), as well as the related claim that 2 is an "Erdős-strong" prime. Moreover, the method resolves a revised form of the Banks-Martin conjecture, which has long been viewed as a unifying "master theorem" for the area. Joint work with B. Alexeev, K. Barreto, Y. Li, L. Price, J. I. Shah, Q. Tang, and T. Tao.

Speaker: Florian Luca, Stellenbosch University, South Africa
Email: fluca@sun.ac.za
Title: Multiply gleeful numbers
Abstract: For positive integers k and n let $f_k(n)$ be the number of ways of representing n as a sum of k powers of consecutive primes. A number is called *k-gleeful* if $f_k(n) > 0$ and *multiply gleeful* if $f_k(n) > 1$ or $f_k(n)f_{k'}(n) > 0$ for some positive integers $k < k'$. Under Schinzel's hypothesis H, we show that there are infinitely many positive integers n such that $f_2(n)f_4(n) > 0$. Under the same assumption we show that $\limsup_{n\to\infty} f_2(n) = \infty$. This gives a conditional proof of a stronger version of a conjecture of Moore and Sorenson from the preprint arXiv:2507.09012v1, July 2025.

Speaker: Jose Ramon Madrid Padilla, Virginia Tech
Email: josematrid@vt.edu
Title: Convolution inequalities and applications
Abstract: In this talk we will discuss a collection of optimal convolution inequalities for real-valued functions on the hypercube, motivated by combinatorial applications. In particular, as a consequence we obtain sharp bounds for sumsets and additive energies of subsets of the hypercube.

Speaker: Akos Magyar, University of Georgia
Email: amagyar@uga.edu
Title: Almost primes solutions to forms of odd degrees in many variables
Abstract: Let $\mathcal{F} = \{f_1, \dots, f_R\}$ be a family of forms of odd degrees at most d in s variables. We study the solutions to the diophantine system: $f_1(\mathbf{x}) = \dots = f_R(\mathbf{x}) = 0$ of the form $x_i = y_i p_i$ with $|y_i| \leq Y_{\mathcal{F}}$ and p_i being a prime for all $i \in [s]$ inside the box $[-N, N]^s$, for large N. We show that if the number of variables s is sufficiently large with respect to the parameters R and d, then there are at least $C_{\mathcal{F}} N^{s-D}/(\log N)^s$ such solutions for some constants $C_{\mathcal{F}} > 0$ and $D \in \mathbb{N}$, with D depending only on the initial parameters R and d.

Speaker: Amita Malik, Pennsylvania State University
Email: malik@psu.edu
Title: Lehmer-type partition statistics
Abstract: Motivated by Lehmer's work on weighted partitions, we discuss generalized (super)norms of various classes of partitions and overpartitions.
This is joint work with A. Dhar.

Speaker: Debyani Manna, Indian Institute of Technology Roorkee, India
Email: debyani97@gmail.com
Title: Extended Inverse results for restricted h-fold sumset in integer
Abstract: Let A be a finite set of k integers. For $2 \leq h \leq k$, the *restricted h-fold sumset* $h^\wedge A$ is the set of all sums of h distinct elements of the set A. In additive combinatorics, much of the focus has traditionally been on finite integer sets whose sumsets are unusually small (cf. Freiman's theorem and its extensions). More recently, Nathanson posed the inverse problem for the restricted sumset $h^\wedge A$ when $|h^\wedge A|$ is small. For $h \in \{2, 3, 4\}$, this question has already been studied by Mohan and Pandey. In this article, we study the inverse problems for $h^\wedge A$ with arbitrary $h \geq 3$ and characterize all possible sets A for certain cardinalities of $h^\wedge A$.
Joint work with Mohan and Ram Krishna Pandey.

Speaker: Eshita Mazumdar, Ahmedabad University, Ahmedabad, India
Email: eshita.mazumdar@ahduni.edu.in
Title: Extending zero-sum theory from abelian to non-abelian groups
Abstract: Zero-sum theory is a central topic in additive combinatorics that studies the structure of sequences over finite groups and the conditions guaranteeing the existence of zero-sum subsequences. Fundamental parameters in this area include the Davenport constant and the Erdős–Ginzburg–Ziv constant, which measure the threshold lengths forcing zero-sum behavior. These invariants originated in the study of non-unique factorizations in algebraic number theory, but determining their exact values remains a challenging problem even for many finite abelian groups.
In this talk, I will discuss recent progress on zero-sum problems in finite non-abelian groups. In particular, I will highlight how combinatorial techniques developed for abelian groups can be adapted—or fail—to extend to the non-abelian setting, and how new phenomena arise due to the lack of commutativity. I will also present several results that reveal surprising connections between classical zero-sum invariants of abelian groups and their analogues for non-abelian groups, pointing toward a broader combinatorial framework for zero-sum theory.

Speaker: Nathan McNew, Towson University
Email: nmcnew@towson.edu
Title: Matchable numbers
Abstract: We say a natural number is matchable if there is a bijection from the set of $\tau(n)$ divisors of n to the set $[1, 2, \ldots, \tau(n)]$, where corresponding numbers are relatively prime. We show that the set of matchable numbers has an asymptotic density, which we compute, and we show that every squarefree number is matchable.
We also present some related unsolved problems.
This is joint work with Carl Pomerance.

Speaker: Steven J. Miller, Williams College
and PANTHers (Steven Miller's REU: Probability And Number THeory)
Email: sjm1@williams.edu
Title: Recent advances in generalized MSTD problems and Zeckendorf games
Abstract: We report on two areas studied this summer in Miller's REU:

Generalized MSTD Problems and Zeckendorf Games.

1. A finite integer subset $A \subset \mathbb{Z}$ is classified as a More Sums Than Differences (MSTD, or sum-dominant) set when it produces strictly more pairwise sums than differences, satisfying $|A+A| > |A-A|$. Motivated by the structural density of these integer sets, we generalize this phenomenon to subsets A of a finite group G by comparing the cardinality of the product set AA against the quotient set AA^{-1}. To evaluate global group behavior, we analyze the weighted difference across all possible subsets, defined as $W(G) = \sum_{A \subset G}(|AA| - |AA^{-1}|)$. Using a combination of combinatorial techniques, graph theory, and representation theory, we prove that $W(G)$ is strictly negative for all finite abelian groups—establishing them as inherently quotient-dominant—and we successfully extend these structural findings to characterize select non-abelian groups.

2. Zeckendorf proved every integer can be written uniquely as a sum of non-adjacent Fibonacci numbers $\{F_n\}$. Using the Fibonacci recurrence, Miller created the Zeckendorf game. Starting with n copies of F_1, a player either replaces a copy of F_i and F_{i-1} with F_{i+1}, or splits two copies of F_i into F_{i+1} and F_{i-1} (with F_2 splitting to F_3 and F_1). All games terminate in the Zeckendorf decomposition of n; whomever moves last wins. A non-constructive proof exists that Player Two has a winning strategy for all $n > 2$. We discuss current work on a variety of generalizations, including binary decompositions, first to reach the largest summand wins, and higher dimensional analogues.

Speaker: Mohan, BK Birla Institute of Engineering and Technology, Pilani, India
Email: mohan98math@gmail.com
Title: Lehmer-type conjectures and open problems for Nathanson's totient functions
Abstract: Nathanson's totient functions $\Phi(n)$ and $\Phi_k(n)$, where $\Phi(n)$ counts the number of nonempty sets $A \subseteq \{1, 2, \ldots, n\}$ for which $\gcd(A)$ is relatively prime to n, and $\Phi_k(n)$ restricts those of size k. We formulate and analyze some analogue of Lehmer's conjecture in the setting of Nathanson's totient functions $\Phi(n)$ and $\Phi_k(n)$. We further discuss divisibility phenomena for $\Phi(n)$. We conclude with several conjectures and open problems concerning density, arithmetic progressions, and further structural properties of these functions.

Speaker: Amanda Montejano, Mexico
Email: amandamontejano@ciencias.unam.mx
Title: Discrete Brunn–Minkowski inequalities
Abstract: The Brunn–Minkowski inequality is a cornerstone of convex geometry, with deep connections to several areas of mathematics. In recent years, there has been growing interest in developing discrete versions of this inequality. Attempts to formulate a discrete version of the Brunn–Minkowski inequality naturally lead to problems in additive combinatorics, particularly those involving lower bounds and structural aspects of finite sumsets in $\mathbb{R}^d$ or $\mathbb{Z}^d$. In the continuous setting, a refinement due to Bonnesen incorporates the $(d-1)$-dimensional volume of projections onto a hyperplane, yielding sharper bounds that capture geometric structure. A discrete counterpart of this refinement is currently known only in dimension two, due to Grynkiewicz and Serra. In this paper, we explore extensions of this result to higher dimensions. In particular, we introduce a framework for deriving discrete Brunn–Minkowski-type inequalities in arbitrary dimension that incorporate projection data of the underlying sets.
This is a joint work with Oriol Serra and Luis Montejano.

Speaker: Ivan V. Morozov, City College (CUNY)
Email: imorozo000@citymail.cuny.edu
Title: On quotients of a more general theorem of Wilson
Abstract: The basis of this work is a corollary and generalization of Wilson's theorem, $(-1)^k k!(n-k-1)! \equiv -1 \pmod{n}$ iff n is non-composite, for $0 \leq k \leq n-1$. This corollary generates many more quotients than those already generated by Wilson's theorem, and we derive how they relate to each other and build on the established properties of the original quotients. The main results are expressions for sums of these quotients, modular congruences that extend the results of Lehmer, and generating functions. In addition, a solution will be provided for an open problem raised in CANT 2025 by Brian Hopkins regarding a combinatorial proof for the partition identity $p(a,3) + p(b,3) = p(c,3)$, where a, b, and c comprise a Pythgagorean triple.

Speaker: C. J. Mozzochi, Connecticut
Email: cjm@ix.netcom.com
Title: A new approach to the circle method attack on the m-prime conjecture
Abstract: Hardy and Littlewood, c. 1921, under the assumption of GRH, attacked the twin-prime conjecture with a very non-intuitive sufficiency condition involving the minor arcs. We subsequently removed the assumption of GRH from their approach. Here we present a more plausible sufficiency condition involving the minor arcs and extend it to the m-prime conjecture for every even m.

Speaker: Akshat Mudgal, University of Warwick, UK
Email: Akshat.Mudgal@warwick.ac.uk
Title: A structure theorem for sets with doubling $4 + \delta$
Abstract: A question of Ben Green asks whether every finite set A of integers with doubling constant K must contain a subset A' of comparable size whose doubling is at most $K + o(1)$ due to some explicit algebraic structure on A'. This was previously understood in the regime $K < 4 - o(1)$ by work of Eberhard, Green, and Manners, who showed that one can find such a subset A' with density at least $1/2 + o(1)$ inside a long arithmetic progression. In this talk, I will provide a brief survey of this question as well as mention some new progress towards this.
This is joint work with Yifan Jing.

Speaker: Augustine O. Munagi, University of the Witwatersrand, South Africa
Email: Augustine.Munagi@wits.ac.za
Title: A Bessenrodt-Ono inspired inequality for compositions proved constructively
Abstract: In 2016 Bessenrodt-Ono published an analytic proof of the inequality $p(a + b) \leq p(a)p(b)$, where $p(n)$ is the partition function and a, b are positive integers with $a + b > 8$.
In this talk we consider a similar result for $c(n)$, the number of integer compositions of n, and show that $c(a + b) > c(a)c(b)$ for all positive integers a, b. Besides numerical verifications, we provide a constructive bijective proof based on the inherent symmetry of compositions. It is known that such a proof is still elusive in the partitions case.
We also give an application of our machinery to efficient generation of compositions.

Speaker: Mel Nathanson, Lehman College and CUNY Graduate Center
Email: melvyn.nathanson@lehman.cuny.edu
Title: Three problems in additive number theory
Abstract: This will be an introduction to three (possibly new) problems in additive number theory.
The first concerns the range and frequencies of the sizes of sumsets of finite sets of integers.
The second considers the sets H of integers such that there exists an increasing sequence $(A_i)_{i=1}^{\infty} A_i$ of sets of integers such that $h \in H$ if and only if $h \bigcap_{i=1}^{\infty} A_i = \bigcap_{i=1}^{\infty} hA_i$.
The third asks about the possible sizes of h-bases for n for finite sets of integers that contain at least one negative integer.

Speaker: Neetu, National Institute of Technology Karnataka, India
Email: chananianeetu@gmail.com
Title: Small doubling in right-ordered groups
Abstract: Freiman conjectured that if S is a finite subset of a torsion-free group G with $k \geq 3$ elements and $|S^2| \leq 3k - 4$, then S is a subset of a small geometric progression of length at most $2k - 3$. In 2014, Freiman et al. settled this conjecture when S is a finite subset of an ordered group. In this talk, we study this problem in the broader framework of right-ordered groups. Under suitable structural conditions on the subset S, we discuss results that extend aspects of Freiman's conjecture to this setting. We further focus on the right-ordered Baumslag–Solitar group $\mathrm{BS}(1, q) = \langle a, b \mid ab = b^q a \rangle, \quad q \in \mathbb{Z}$.
We show that for $q \neq -1$, if S is a finite subset of $\mathrm{BS}(1, q)$ with the identity element as its minimum and satisfying $|S^2| \leq 3|S| - 4$, then the subgroup generated by S is abelian.
This is joint work with Mohan and B. R. Shankar. The results are based on our recent paper: https://link.springer.com/article/10.1007/s00025-025-02576-2.

Speaker: Kevin O'Bryant, College of Staten Island and CUNY Graduate Center
Email: obryant@gmail.com
Title: The Sidon error term
Abstract: A Sidon set is a set $\mathcal{A}$ of integers that has no nontrivial solutions to $a+b=c+d$. It has been known since 1941 (Erdős and Turán) that if $\mathcal{A}$ is a finite Sidon set, then $\operatorname{diam}(\mathcal{A}) \geq k^2 - 2k^{3/2} + O(k)$, and since 1939 (Singer) that the k^2 term cannot be improved. Only in the last 5 years has the error term $-2k^{3/2}$ been sharpened (Balogh, Füredi, and Roy, then O'Bryant, then Carter, Hunter, O'Bryant). In this talk, I will relay the latest improvements and applications, and the use of AI (AlphaEvolve) in their discovery. Joint work with D. Carter, B. Georgiev, Z. Hunter, J. G. Serrano, T. Tao, and A. Zs. Wagner.

Speaker: Péter Pál Pach, HUN-REN Alfréd Rényi Institute of Mathematics and BME, Hungary
Email: p.p.pach@gmail.com
Title: On the density of Kravitz sets
Abstract: We show that for a subset A of the cyclic group of prime order $p > 3$, if the sumset
$$A + A - 2A = \{a_1 + a_2 - 2a_3 : \ a_1, a_2, a_3 \in A\}$$
is not the whole group, then $|A| \leq \frac{2}{7}\, p$. Besides combinatorial arguments, we utilize a general technique involving linear programming, which may find further applications in additive combinatorics in the future. Joint work with Vsevolod Lev, Máté Matolcsi, Dániel Varga.

Speaker: Cosmin Pohoata, Emory University
Email: cosmin.pohoata@emory.edu
Title: Sidon sets in the squares, repeated distances, and the Elekes-Ronyai problem
Abstract: We discuss a new combinatorial large-sieve method that uses algebraic splitting modulo many small primes to turn local congruence restrictions into global constraints on repeated values. This has various applications, for example:
(i) every Sidon subset of $\{1^2, 2^2, \ldots, N^2\}$ has size at most $N \cdot \exp(-c \log N / \log\log N)$, the first super-polylogarithmic saving for a classical problem of Alon and Erdős;
(ii) a new upper bound on the largest subset of $[N]^2$ with no repeated distances, a problem of Erdős and Guy; and
(iii) a new upper bound on the largest subset of $[N]^2$ with no isosceles triangle, a problem recently popularized by Charton, Ellenberg, Wagner, and Williamson.
Based on recent joint work with Ernie Croot, Junzhe Mao, Adam Sheffer, and Kyle Yip. We will also discuss how these ideas recently led to a counterexample for the Elekes–Rónyai problem (and to a few other constructions).

Speaker: Carl Pomerance, Dartmouth College
Date: Tuesday, July 14, 2026
Email: carlp@math.dartmouth.edu
Title: Two topics in combinatorial number theory
Abstract: The first topic: In a paper with Erdős from 40 years ago, we considered the set of residues $a \bmod n$ where $a^{n-1} \equiv 1 \pmod{n}$. If n is composite, these are the bases for which n is a pseudoprime. Recently, Lenstra asked me about the set of residues $a \bmod n$ where $a^n \equiv 1 \pmod{n}$, which is related to a problem he is working on about conditions that ensure a ring is commutative. Some of the methods from the old paper were useful in the new problem, but not all. I will discuss the more general problem of subgroups of the multiplicative group mod n.

The second topic: I will discuss some old and new problems on coprime matchings: These are perfect matchings between two equally numerous sets of integers, where each matched pair is relatively prime. Some examples: Given two intervals of n consecutive integers is there a coprime matching between them? If both intervals are $\{1, 2, \ldots, n\}$, how many such matchings are there? For a positive integer n, is there a coprime matching between the set $D(n)$ of divisors of n and an interval of $D(n)$ consecutive integers? This last problem reflects joint work with Nathan McNew.

Speaker: Wladimir Pribitkin, College of Staten Island and CUNY Graduate Center
Email: Wladimir.Pribitkin@csi.cuny.edu
Title: Simple upper bound for the power partition function
Abstract: Reimagining Siegel's method, we shall produce a rather easy proof of a surprisingly good upper bound on the number of partitions of a positive integer into perfect rth powers, where $r \geq 1$. If time permits, we shall present a generalization pertaining to partitions into perfect powers of terms in an arithmetic progression.

Speaker: Maksym Radziwill, New York University
Email: maksym.radziwill@gmail.com
Title: Exponential sums over primes
Abstract: A classical result of Vinogradov shows that, for any α with

$$\left|\alpha - \tfrac{a}{q}\right| \leq \tfrac{1}{q^2}\ ,\ q \leq x^{1/2},$$

and for any $\varepsilon > 0$, we have,

$$\left|\sum_{p \leq x} e^{2\pi i \alpha p}\right| \leq C(\varepsilon) x^{\varepsilon} \cdot \left(\tfrac{x}{\sqrt{q}} + x^{4/5}\right).$$

with $C(\varepsilon) > 0$ a constant depending only on ε. This has resisted improvements for the past 80 years, beyond refinements to the x^{ε} term. The $x/\sqrt{q}$ term cannot be improved without eliminating the existence of a Siegel zero. I'll discuss joint work with James Maynard and Mayank Pandey, in which we reduce the exponent $4/5$ appearing in $x^{4/5}$ to $19/24$, which should have various applications to additive problems related to primes.

Speaker: Isaac Rajagopal, MIT
Email: isaacraj@mit.edu
Title: Possible sizes of sumsets
Abstract: Nathanson introduced the *range of cardinalities of h-fold sumsets*

$$\mathcal{R}(h,k) = \{|hA| : A \subset \mathbb{Z} \text{ and } |A| = k\}.$$

Following a remark of Erdős and Szemerédi that determined the form of $\mathcal{R}(h,k)$ when $h = 2$, Nathanson asked what the form of $\mathcal{R}(h,k)$ is for arbitrary $h, k \in \mathbb{N}$. For $h \in \mathbb{N}$, we prove there is some constant $k_h \in \mathbb{N}$ such that if $k > k_h$, then $\mathcal{R}(h,k)$ is the entire interval $\left[hk - h + 1, \binom{h+k-1}{h}\right]$ except for a specified set of $\binom{h-1}{2}$ numbers. Moreover, we show that one can take $k_3 = 2$. We also discuss recent work with Tim Gowers and ChatGPT to optimize the diameter of the sets in these constructions.

Speaker: Manjil P. Saikia, Ahmedabad, University, Ahmedabad, India
Email: manjil.saikia@ahduni.edu.in
Title: Hook length biases in t-regular and t-core partitions
Abstract: Recently, the theory of hook length biases has emerged as a prominent research topic. Led by Ballantine, Burson, Craig, Folsom, and Wen, hook length biases are being explored for ordinary partitions, odd versus distinct partitions, self-conjugate versus distinct odd partitions. Recently, Singh and Barman opened the door to hook length biases in t-regular partitions as well.

The objective of this talk is two fold. First, we present a previously unobserved connection of hook-lengths in t-regular partitions with certain distinct parts partitions. Second, we extend the theory of hook length biases to t-core partitions. For example, let $a_{t,k}(n)$ denote the number of hooks of length k in all t-core partitions of n, then we find that $a_{3,1}(n) \geq a_{3,2}(n) \geq a_{3,4}(n)$ and $a_{4,1}(n) \geq a_{4,3}(n)$ for all n. Most of the methods employed in this work are combinatorial.

Joint work with Talukdar; and Baruah, Das, and Mahanta.

Speaker: Pramana Saldin, University of California, Berkeley
Email: saldin@berkeley.edu
Title: Left and right quotient sets in non-abelian groups
Abstract: For a group G, we define the right quotient set and the left quotient set as follows:

$$AA^{-1} := \{a_1 a_2^{-1} : a_1, a_2 \in A\}$$
$$A^{-1}A := \{a_1^{-1} a_2 : a_1, a_2 \in A\}.$$

We examine the relationships between the left and right quotient sets.
If G is an abelian group, then these sets are equal, but subtleties arise in non-abelian settings, as these sets may not have the same cardinality. Tao remarked that the cardinality difference $|AA^{-1}| - |A^{-1}A|$ may be arbitrarily large for certain groups.
We first give explicit constructions of sets A where this difference attains every possible integer, proving that the difference can be any possible value if G has elements of order 2.
We also find the minimum cardinality of A so that the difference between the cardinalities of the left and right quotient sets is nonzero, depending on the existence of order 2 elements in G.
To prove these results, we construct a graph called the difference graph D_A that encodes equality in the right quotient set. Similarly, $D_{A^{-1}}$ encodes equality in the left quotient set. By observing an isomorphism of edges in D_A and $D_{A^{-1}}$ and counting connected components, we are able to prove the results above.
In the free group on two generators, we can prove that the difference $|AA^{-1}| - |A^{-1}A|$ is always even. We explicitly construct subsets of F_2 that achieve every even integer.
In the infinite dihedral group $D_\infty \cong \mathbb{Z} \rtimes \mathbb{Z}/2$, we prove that every integer difference is achievable, using the results of Martin and O'Bryant on the cardinality differences of sum sets and difference sets in $\mathbb{Z}$.
Joint work with June Duvivier, Xiaoyao Huang, Ava Kennon, Say-yeon Kwon, Steven J. Miller, Arman Rysmakhanov, and Ren Watson

Speaker: Alisa Sedunova,
Email: alisa.sedunova@gmail.com
Title: Euler-Kronecker constants of maximal real cyclotomic subfields and Kummer's conjecture
Abstract: The Euler–Kronecker constant of a number field K is the ratio of the constant and the residue of the Laurent series of the Dedekind zeta function at $s = 1$. We study the distribution of the Euler–Kronecker constant γ_q^+ of the maximal real subfield $\mathbb{Q}(\zeta_q)^+$ as q ranges over the primes. Further, we consider the distribution of $\gamma_q^+ - \gamma_q$, with γ_q the Euler–Kronecker constant of $\mathbb{Q}(\zeta_q)$ and show how it is connected with Kummer's conjecture, which predicts the asymptotic growth of the relative class number of $\mathbb{Q}(\zeta_q)$. We improve, for example, the known results on the bounds on average for the Kummer ratio and we prove analogous sharp bounds for $\gamma_q^+ - \gamma_q$. The methods employed are partly inspired by those used by Granville (1990) and Croot and Granville (2002) to investigate Kummer's conjecture, that predicts the asymptotic growth of the relative class number of prime cyclotomic fields. We substantially improve the known bounds of Kummer's ratio under three scenarios: no Siegel zero, presence of Siegel zero and assuming the Riemann Hypothesis for the Dirichlet L-series attached to odd characters only.
The talk is based on joint papers with A. Languasco, P. Moree, N. Kandhil and S. Saad Eddin.

Speaker: Steven Senger, Missouri State University
Email: stevensenger@gmail.com
Title: Nathanson's triangular gap question
Abstract: Mel Nathanson recorded the size distribution of iterated sumsets of four natural numbers chosen from a large interval of integers. He observed that the most frequent sizes were not evenly distributed, but had gaps between them, and that these gaps were consecutive triangular numbers. We explain this phenomenon in full detail.

Speaker: Ilya Shkredov, Purdue University
Email: ilya.shkredov@gmail.com
Title: On Korobov's optimal coefficients
Abstract: Let p be a prime number, d be a positive integer, and $M \geq 1$ be a real parameter. A tuple $(a_1, \dots, a_d) \in \mathbf{F}_p^d$ is called a tuple of (Korobov) *optimal coefficients* if, for any nonzero $x \in \mathbf{F}_p$, the inequality

$$x|a_1 x| \dots |a_d x| \geq \frac{p^d}{M}$$

holds. These famous coefficients arise naturally in numerical integration problems. Namely, if a tuple $(a_1, \dots, a_d)$ satisfying the inequality is found, then any function $f : [0,1]^d \to \mathbf{R}$ can be integrated using the formula

$$\left| \int_{[0,1]^d} f(x)\, dx - \frac{1}{p} \sum_{x=1}^{p} f\left(\frac{a_1 x}{p}, \dots, \frac{a_d x}{p} \right) \right| \ll \frac{M \cdot \mathrm{V}(f)}{p},$$

where $\mathrm{V}(f)$ is the Hardy–Krause variation of the function f. Korobov proved that the case $M = O((\log p)^{d-1})$ is always realizable, whereas the special case $d = 1$, $M = O(1)$ is equivalent to the well-known Zaremba conjecture. For $d > 1$ and arbitrary M, only a few results are known.
In our talk, we will provide an overview of the problems in this area and describe recent advances and connections to other topics in number theory.

Speaker: Aviral Srivastava, IIT Gandhinagar, India
Email: aviral.srivastava@iitgn.ac.in
Title: Non-Rascoe partitions and a rank parity function associated to the Rogers–Ramanujan partitions
Abstract: The rank-parity function associated with a class of partitions gives rise to objects with rich analytical and combinatorial properties. In this talk, we will discuss the rank-parity function associated with Rogers-Ramanujan partitions and show their close correspondence with an interesting class of restricted partitions, namely, partitions into distinct parts where the number of parts is not a part. We will show some interesting congruences related to these functions.
This talk is based on joint work with Gaurav Kumar and Prof. Atul Dixit.

Speaker: Johann Thiel, New York College of Technology (CUNY)
Email: jthiel@citytech.cuny.edu
Title: Generating functions for maximally expanded α-trees
Abstract: We construct generating functions whose coefficients enumerate certain directed planar trees known as maximally expanded α-trees. We show that the number of such trees can be expressed as an integer linear combination of Catalan numbers.
This is joint work with David M. Bradley.

Speaker: Salvatore Tringali
Email: salvo.tringali@gmail.com
Title: Power semigroups and two rigidity theorems for groups
Abstract: Let $\mathcal{P}(H)$ be the semigroup obtained by endowing the family of all non-empty subsets of a semigroup H with the setwise operation naturally induced by H on its power set, and denote by $\mathcal{P}_{\mathrm{fin}}(H)$ the subsemigroup of $\mathcal{P}(H)$ consisting of all non-empty finite subsets of H. We call $\mathcal{P}(H)$ and $\mathcal{P}_{\mathrm{fin}}(H)$ the large power semigroup and the finitary power semigroup of H, respectively.
We prove that if H is a group and K is an arbitrary semigroup, then for $\mathcal{P}(H)$ to be isomorphic to $\mathcal{P}(K)$ it is necessary (and sufficient) that H is isomorphic to K (and hence K is itself a group). The finitary analogue of the same statement appears to be considerably more difficult, and we establish it only when H is an additive subgroup of the rationals. The proof of this second result relies, in a circuitous way, on a special case of the Evertse–Schlickewei–Schmidt theorem.
The talk is based on joint work with Shuolin Liu.

Speaker: Laurence P. Wijaya, University of Kentucky
Email: laurence.wijaya@uky.edu
Title: Polynomial corners over finite fields
Abstract: We study the size of subset $\mathbf{F}_p$ with p primes goes to infinity not containing a configuration of the form $(x, y), (x + P(z), y), (x, y + P(z))$ for some polynomial P of degree at least 3. Similar result was found by Kravitz, Kuca, and Leng for the integer setting under some conditions. Our result provides better bound in the $\mathbf{F}_p$ setting.

Speaker: Trevor Dion Wooley, Purdue University
Email: twooley@purdue.edu
Title: Strong paucity in systems of diagonal equations
Abstract: Let k be a natural number with $k \geq 2$, and let $\varepsilon > 0$. We consider the number $V_k^*(P)$ of integral solutions of the system of simultaneous Diophantine equations
$$x_1^{2j-1} + \ldots + x_{k+1}^{2j-1} = y_1^{2j-1} + \ldots + y_{k+1}^{2j-1} \quad (1 \leq j \leq k).$$
with $1 \leq x_i, y_i \leq P$ $(1 \leq i \leq k+1)$. Writing $L_k^*(P)$ for the number of diagonal solutions with $\{x_1, \ldots, x_{k+1}\} = \{y_1, \ldots, y_{k+1}\}$, so that $L_k^*(P) \sim (k+1)!P^{k+1}$, we prove that
$$V_k^*(P) - L_k^*(P) \ll P^{\sqrt{8k+9}-1+\varepsilon}.$$
This establishes a strong paucity result improving on earlier work of Brüdern and Robert. Time permitting, we describe analogous results for related problems.

Speaker: Kiseok Yeon, University of California - Davis
Email: kyeon@ucdavis.edu
Title: On the density of rational lines on cubic diagonal hypersurfaces
Abstract: In this paper, we establish the asymptotic estimates for the rational lines on diagonal cubic hypersurfaces defined by $\sum_{i=1}^{s} c_i x_i^3 = 0$ with $c_i \in \mathbb{Z} \setminus \{0\}$, provided that $s \geq 19$. This improves the previously known bound $s \geq 21$ required to obtain such asymptotic estimates. Our approach develops a multidimensional shifting variables argument together with a pruning argument, and exploits the recent progress on the Parsell-Vinogradov system.

Speaker: Chi Hoi Yip, Hong Kong University of Science and Technology, Hong Kong
Email: cyip30@gatech.edu
Title: Additive properties of multiplicatively defined sets
Abstract: Understanding the additive structure of multiplicatively defined sets, including the primes, perfect squares, perfect powers, powerful numbers, and smooth numbers, remains a fundamental open challenge. In this talk, I will talk about some recent progress on related results. In particular, I will discuss arithmetic progressions, sumsets, and Hilbert cubes in some well-studied multiplicatively defined sets, as well as their interactions.
Joint work with Ernie Croot and Junzhe Mao.

Speaker: Semin Yoo, Institute for Basic Science, Korea
Email: syoo19@kias.re.kr
Title: Multiplicative irreducibility of shifted multiplicative subgroups
Abstract: A central theme in additive combinatorics is the interplay between addition and multiplication. Roughly speaking, sets with strong multiplicative structure are not expected to exhibit rich additive structure, and vice versa. In a recent breakthrough, Kalmynin resolved a conjecture of Lev–Sonn and Sárközy on additive decompositions of multiplicative subgroups in prime fields and quadratic residues. Motivated by this work, we study multiplicative analogues of these questions. We show that, under a certain additional condition, a shifted multiplicative subgroup cannot be written as a product set, and that it also cannot be written as a ratio set unconditionally. In this talk, I will discuss these results and the main ideas of the proofs.
This talk is based on joint work with Seoyoung Kim (University of Basel) and Chi Hoi Yip (Georgia Institute of Technology).