Virtual CombinaTexas 2021
Contributed Talks

Click on the number to see the title and abstract. We are in Central Standard Time zone.

Saturday Morning, Contributed Session I		
	Session A	Session B
	Chair: Byeongsu	Chair: Zhaobidan
09:30–09:50	H. Wang (25)	J. Schmidt (19)
09:50–10:10	P. Liscio (10)	L. Warnke (26)
10:10–10:30	L. Snider (21)	N. Saldanha (16)
10:30–10:50	A. Aderinan (1)	S. Zayat (32)
Saturday Afternoon, Contributed Session II		
	Session A	Session B
	Chair: Hannah	Chair: Zhaobidan
3:00–3:20	B. Yu (31)	C. Merino (11)
3:20–3:40	D. Villamizar (24)	C.H. Yip (29)
3:40–4:00	C. Wu (28)	S. Yoo (30)
4:00–4:20	J. Swanson (22)	N. Khan (9)
Sunday Morning, Contributed Session III		
	Session A	Session B
	Chair: Lauren	Chair: Kelly
8:20–8:40	A. Chandler (4)	S. Hayat (7)
840–9:00	J. Jung (8)	S. Chueluecha (5)
9:00–9:20	E. Ordog (14)	A. Trujillo (23)
9:20–9:40	Y. She (20)	H. Guo (6)
Sunday Afternoon, Contributed Session IV		
	Session A	Session B
	Chair: Hannah	Chair: Kelly
2:00–2:20	A. Bingham (3)	C. Alfaro (2)
2:20–2:40	M. Samuel (17)	J. Reynes (15)
2:40–3:00	C. Wolfe (27)	E. Nastas (13)
3:00–3:20	G. Nasr (12)	C. Schlortt (18)

1 Schedule

February 20, Contributed Session I 9:30–10:50am
[**Session A**]

- **09:30–09:50** Hua Wang (25), Combinatorics of colored compositions and spotted tilings
- **09:50–10:10** Patrick Liscio (10), The move poset in chip-firing
- **10:10–10:30** Lauren Snider (21), On 2-dimensional parking functions
- **10:30–10:50** Ayomikun Aderinan (1), Invariant parking sequences

[**Session B**]

- **09:30–09:50** James Schmidt (19), A cyclic variant of the Erdos-Szekeres theorem
- **09:50–10:10** Lutz Warnke (26), Prague dimension of random graphs
- **10:10–10:30** Nicolau Saldanha (16), Domino tilings in dimension 3 and higher
- **10:30–10:50** Soukaina Zayat (32), About the Erdös-Hajnal conjecture for seven-vertex tournaments.

February 20, Contributed Session II 3:00–4:20pm
[**Session A**]

- **03:00–03:20** Byeongsu Yu (31), Monomial ideals in an affine semigroup rings
- **03:20–03:40** Diego Villamizar Rubiano (24), On the generalized central factorial numbers
- **03:40–04:00** Christopher Wu (28), A bound on tableau stabilization using lattice paths
- **04:00–04:20** Joshua Swanson (22), DUSTPAN distributions as limit laws for Mahonian statistics on forests

[**Session B**]

- **03:00–03:20** Criel Merino (11), Polyimatroids and algebraic invariants in graphs
- **03:20–03:40** Chi Hoi Yip (29), On maximal cliques of Cayley graphs over fields
- **03:40–04:00** Semin Yoo (30), A combinatorial correspondence between finite Euclidean geometries and symmetric subsets of $\mathbb{Z}/\mathbf{n}\mathbb{Z}$
- **04:00–04:20** Noureen Khan (9), Topological conformation of DNA bound by virtual coloring

February 21, Contributed Session III 8:20–9:40am

[**Session A**]

- **08:20–08:40** Alex Chandler (4), On the strength of chromatic symmetric homology for graphs
- **08:40–09:00** Jaewoo Jung (8), Bounds on regularity of quadratic monomial ideals
- **09:00–09:20** Erica Ordog (14), Sylvan structures on near-cones
- **09:20–09:40** Yiyang She (20), Some multiplicity one theorems for wreath products

[**Session B**]

- **08:20–08:40** Sakander Hayat (7), Co-Edge-regular graphs which are cospectral with the s-extension of the square grid graphs
- **08:40–09:00** Suchakree Chueluecha (5), The sunflower problem
- **09:00–09:20** Ana Laura Trujillo Negrete (23), Laplacian spectrum of token graphs
- **09:20–09:40** He Guo (6), On the power of random greedy algorithms

February 21, Contributed Session IV 2:00–3:20pm

[**Session A**]

- **02:00–02:20** Aram Bingham (3), DIII clan combinatorics for the orthogonal Grassmannian
- **02:20–02:40** Matthew Samuel (17), A positive formula for Schubert polynomial structure constants with certain descent restrictions
- **02:40–03:00** Corey Wolfe (27), The Borel submonoid of a symplectic monoid
- **03:00–03:20** George Nasr (12), A combinatorial formula for Kazhdan-Lusztig polynomials of sparse paving matroids

[**Session B**]

- **02:00–02:20** Carlos Alfaro (2), Enumeration of cospectral and coinvariant graphs
- **02:20–02:40** Josephine E Reynes (15), The integer matrix all-minors matrix-tree theorem via oriented hypergraphs
- **02:40–03:00** Evangelos Nastas (13), An elementary Dehn-Sydler theorem proof
- **03:00–03:20** Casey Schlortt (18), Minimum conditions for bootstrap percolation on the cubic graph

2 Abstract

Listed in alphabetical order.

1. **Ayomikun Aderinan, Pomona College**

   Title: Invariant Parking Sequences

   Abstract: The notion of parking sequences is a new generalization of parking functions introduced by Ehrenborg and Happ. In the parking process defining the classical parking functions, instead of each car only taking one parking space, the cars are allowed to have different sizes and each takes up a number of adjacent parking spaces after a trailer that was parked at the start of the street. A preference sequence in which all the cars are able to park is called a parking sequence. It is not difficult to see that parking functions are invariant under permutation but this is not true in general for parking sequences. In this talk, we will discuss two notions of invariance in parking sequences and present various characterizations and enumerative results. This is joint work with Catherine Yan.

   (Click the number to go back to Page 1.)

2. **Carlos Alfaro, Banco de Mexico**

   Title: Enumeration of cospectral and coinvariant graphs

   Abstract: We present enumeration results on the number of connected graphs up to 10 vertices for which there is at least one other graph with the same spectrum (cospectral mate), or at least one other graph with the same Smith normal form (coinvariant mate) with respect to several matrices associated to a graph. The presented numerical data give some indication that possibly the Smith normal form of the distance Laplacian and the signless distance Laplacian matrices could be a finer invariant than the spectrum to distinguish graphs.

   (Click the number to go back to Page 1.)

3. **Aram Bingham, Tulane University**

   Title: DIII clan combinatorics for the orthogonal Grassmannian

   Abstract: Borel subgroup orbits of the classical symmetric space SO_{2n}/GL_n are parametrized by objects called DIII (n, n)-clans, which provide a combinatorial model for studying questions related to Schubert calculus on symmetric spaces. These clans are grouped into "sects" corresponding to Schubert cells of the orthogonal Grassmannian, yielding a cell decomposition for SO_{2n}/GL_n, and facilitating a combinatorial description of the closure (Bruhat) order on the orbits. We also compute a recurrence for the rank polynomial of the weak/closure order poset on DIII clans, and then describe explicit bijections with several other combinatorial families of objects, including certain rook placements, set partitions, and weighted Delannoy paths.

   (Click the number to go back to Page 1.)

4. **Alex Chandler, University Of Vienna**

   Title: On the Strength of Chromatic Symmetric Homology for Graphs

   Abstract. We investigate the strength of chromatic symmetric homology as a graph invariant. Chromatic symmetric homology is a Khovanov-type categorification of the chromatic symmetric function for graphs. Its Frobenius characteristic is a q,t generalization of the chromatic symmetric function. We exhibit three pairs of graphs where each pair has the same chromatic symmetric function but distinct homology. We also show that integral chromatic symmetric homology contains torsion, and based on computations, conjecture that 2-torsion in bigrading (1,0) detects nonplanarity in the graph.

   (Click the number to go back to Page 1.)

5. **Suchakree Chueluecha, Lehigh University**

   Title: The Sunflower Problem

   Abstract: A sunflower with p petals consists of p sets whose pairwise intersections are identical. The goal of the sunflower problem is to find the smallest $r = r(p, k)$ such that every family of at least r^k k-element sets must contain a sunflower with p petals. Major breakthroughs by Alweiss-Lovett-Wu-Zhang and others show that $r = O(p \log(pk))$ suffices. In this talk, we present our improvement to $r = O(p \log(k))$.

   (Click the number to go back to Page 1.)

6. **He Guo, Georgia Institute of Technology**

   Title: On the power of random greedy algorithms

   Abstract: In recent years, as part of the maturation of the probabilistic method, random greedy algorithms have been successfully used to show the existence of hard-to-construct combinatorial objects. In particular, some of the best-known Ramsey and Turan bounds are obtained via the graphs produced by the H-free process. In this talk we explore the random greedy paradigm in the context of additive combinatorics. We improve the best-known lower bound on the van der Waerden numbers W(r, t), by analyzing the r-term arithmetic progression free process (which proceeds by step-by-step adding random integers from [n] that avoid the creation of r-term arithmetic progressions).

   Based on joint work with Lutz Warnke.

   (Click the number to go back to Page 1.)

7. **Sakander Hayat, GuangZhou University**

   Title: Co-Edge-regular graphs which are cospectral with the s-extension of the square grid graphs

   Abstract: In this talk, I will discuss our recent result which asserts that for integers $s \geq 2$, $t \geq 1$, any co-edge-regular graph which is cospectral with the s-clique extension of the t*t- grid is the s-clique extension of the t*t-grid, if t is large enough. Gavrilyuk and Koolen used a weaker version of this result to show that the Grassmann graph

$J_q(2D, D)$ is characterized by its intersection array as a distance-regular graph, if D is large enough.

(Click the number to go back to Page 1.)

8. **Jaewoo Jung, Georgia Institute of Technology**

   Title: Bounds on regularity of quadratic monomial ideals

   Abstract: Castelnuovo-Mumford regularity of an ideal is a measure of its algebraic complexity. The regularity of (square-free) monomial ideals can be investigated combinatorically. We focus on quadratic square-free monomial ideals and associate the ideals with clique complex of graphs. Then, by combining a simple graph decomposition and results from structural graph theory, we can prove, improve, and generalize many known bounds on regularity of quadratic monomial ideals.

   (Click the number to go back to Page 1.)

9. **Noureen Khan, University of North Texas**

   Title: Topological conformation of DNA bound by virtual coloring

   Abstract: We discuss a combinatorial method for finding the topological conformation of DNA bound within a protein complex. We use generalized invariants called virtual colorability and search for possible DNA conformations. We apply this method to generalize the classical knot theory cases discussed in [5] of Darcy et al and the experimental results of Pathania, Jayaram, and Harshey [6] in order to determine the topological conformation of DNA bound within a stable protein-DNA complex.

   (Click the number to go back to Page 1.)

10. **Patrick Liscio, Brown University**

    Title: The Move Poset in Chip-Firing

    Abstract. The poset of reachable configurations in a chip-firing process has been frequently studied. We introduce the poset of firing moves, in which firing moves at certain sites are compared based on certain moves necessarily taking place before others. This poset forms the join-irreducibles of the configuration poset, and is thus much smaller and easier to analyze. Applications include a novel proof of sorting in labeled chip-firing, in which a small collection of moves near the end of the process provide global confluence over the entire process.

    (Click the number to go back to Page 1.)

11. **Criel Merino, UNAM**

    Title: Polyimatroids and algebraic invariants in graphs

    Abstract: The independence polynomial of a graph G, $I(G; x)$, and the Tutte polynomial $T(G; x, y)$ are two algebraic invariants in Graphs Theory that have been widely studied, but would not appear to be related. Recently Zhang and Dong proved that both $I(G; x)$ and $T(G; 1-t^2, (1-t)/t)$ can be seen as the polynomial of weak colorations of two types of related hypergraphs to G.

In this talk we will show that the two previous results can be explained in the theory of polymatroids. After motivating the definition of polymatroid, we will give the fundamental result due to Helgason (and independently of Whittle) that links the invariant that enumerates the weak colorations of a hypergraph with an invariant in polymatroids. Finally, we will propose a generalization of the latter invariant to a Tutte polynomial type invariant for polymatroids.

(Click the number to go back to Page 1.)

12. **George Nasr, University of Nebraska-Lincoln**

Title: A Combinatorial Formula for Kazhdan-Lusztig Polynomials of Sparse Paving Matroids

Abstract: Recently, it was proven that the coefficients for the Kazhdan-Lusztig polynomial are positive for every matroid. However, there are still no combinatorial interpretations for the coefficients. We provide a combinatorial formula involving skew young tableaux for the Kazhdan-Lusztig polynomial for sparse paving matroids, which are known to be logarithmically almost all matroids, but are conjectured to be almost all matroids. In special cases, such as uniform matroids, our formula has a nice combinatorial interpretation.

(Click the number to go back to Page 1.)

13. **Evangelos Nastas, SUNY-Albany**

Title: An Elementary Dehn-Sydler Theorem Proof

Abstract. Since ancient times, humankind has been slicing things. Can one dissect a specific shape into other ones e.g. in squares? Create other given shapes, such as an equilateral triangle from a set of shapes? This presentation provides an elementary proof of one of the standard results in this area of mathematics, the Dehn-Sydler Theorem.

(Click the number to go back to Page 1.)

14. **Erica Ordog, Texas A&M University**

Title: Sylvan structures on near-cones

Abstract: Sylvan resolutions are minimal resolutions of monomial ideals whose differentials are sums over lattice paths of weights associated to higher dimensional analogues of spanning trees. The differentials arise from splitting the boundary maps of the simplicial complexes that record the local structure of the ideal near each lattice point. When resolving stable ideals, these simplicial complexes are near-cones. By selecting certain splittings of the boundary maps of near-cones, the resulting sylvan resolution is the Eliahou-Kervaire resolution. Joint work with John Eagon and Ezra Miller.

(Click the number to go back to Page 1.)

15. **Josephine E Reynes, Texas State University**

Title: The Integer Matrix All-minors Matrix-tree Theorem via Oriented Hypergraphs

Abstract: Sachs showed that coefficient of the characteristic polynomial of the adjacency matrix of a graph are calculated using cycle covers. We extend this notion to weak cycle covers via closed walk embeddings into the underlying incidence structure and obtain a universal characterization of the all-minors matrix-tree theorem for integer matrices using oriented hypergraphs. In addition, a characterization of the coefficients for the multivariate determinantal and permanental polynomials for both the adjacency and Laplacian matrices is established via the finest possible collection of locally graphic submonic embeddings into the injective closure induced by the subobject classifier. When specialized to degree-k monomials of bidirected graphs, we demonstrate that the trivial activation classes are in one-to-one correspondence with Tutte's k-arborescences.

(Click the number to go back to Page 1.)

16. **Nicolau Saldanha, PUC-Rio**

Title: Domino tilings in dimension 3 and higher

Abstract: Domino tilings in dimension 2 have been extensively studied and there are several deep and remarkable theorems. Almost without exception, similar problems in dimension 3 or higher are much harder.

In this talk we consider the simplest local move among domino tilings of a given compact region: a flip consists of removing two dominoes and placing them back in a different position. In dimension 2, Thurston proved that any two tilings of a simply connected region can be joined by a finite sequence of flips.

In higher dimension, the question is far subtler. There exists an invariant under flips known as the twist. In dimension 3, the twist assumes integer values. In dimension at least 4, the twist assumes values in Z/(2). For many regions, there are explicit examples of tilings which admit no flip, and these give us examples of pairs of tilings with the same twist but in different connected components under flips.

A cylinder of dimension n is the cartesian product of a contractible region of dimension n-1 (the base) and an interval. Given a base D, we construct a CW complex, the domino complex, and study its fundamental group, the domino group. The base D is called regular if the domino group has a certain structure. We prove that many bases are regular. For instance, tileable rectangles of sides at least 3 are regular. If D is regular it follows that it is almost always true that, if two tilings have the same twist then they are in the same connected component.

For dimension 3, if D is regular then the sizes of flip connected components follow a normal distribution. For higher dimensions, the numbers of tilings with each value of the twist are almost equal. For each value of the twist, there is a giant component. Thus, there are two twin giant components of almost equal size.

This includes joint work with C. Klivans, J. Freire and P. Milet.

References:

arXiv:2007.09500, arXiv:2007.08474, arXiv:1912.12102, arXiv:1702.00798, arXiv:1410.7693.

(Click the number to go back to Page 1.)

17. **Matthew Samuel, Prudential Financial**

Title: A positive formula for Schubert polynomial structure constants with certain descent restrictions

Abstract: We present a positive formula for multiplying Schubert polynomials with certain descent restrictions on the indexing permutations. We outline the proof of the formula in the context of a hierarchy of potential formulas first introduced by Bergeron and Sottile and show that the "next" formula in the hierarchy would encompass all known positive formulas for Schubert polynomial structure constants, including as a very special case a Littlewood-Richardson rule for the two-step flag variety.

(Click the number to go back to Page 1.)

18. **Casey Schlortt, University of Denver**

Title: Minimum Conditions for Bootstrap Percolation on the Cubic Graph

Abstract: Bootstrap percolation is an iterative process on the vertices of a graph. Initially, a proper, non-empty set of vertices is infected, and all other vertices are uninfected. At each iteration, every uninfected vertex with a certain number of infected neighbors becomes infected, and all infected vertices remain so permanently. At the end of the process, if all vertices are infected, percolation occurs. In this case, the initial set of infected vertices percolates the graph. Necessary and sufficient conditions for the minimum size of a percolating set and the minimum number of rounds to achieve percolation on a cubic graph are presented.

(Click the number to go back to Page 1.)

19. **James Schmidt, Michigan State University.**

Title: A Cyclic Variant of the Erdos-Szekeres Theorem

Abstract: I will discuss the Erdos-Szekeres Theorem, which states that every linear permutation of size at least rs+1 contains either an increasing subsequence of length r+1 or a decreasing subsequence of length s+1 or both. Then, I will give a proof of a cyclic variant of this theorem, which states that every cyclic permutation of size at least rs+2 contains either an increasing subsequence of length r+2 or a decreasing subsequence of length s+2 or both.

(Click the number to go back to Page 1.)

20. **Yiyang She, Tulane University**

Title: Some multiplicity one theorems for wreath products

Abstract: Let G be a group and let H be a subgroup. If all irreducible representations of G restrict to multiplicity free H representations, then (G,H) is said to be a strong Gelfand pair. In this talk we will present our recent results on the strong Gelfand pairs of finite wreath products. This is a joint work with Mahir Bilen Can and Liron Speyer.

(Click the number to go back to Page 1.)

21. **Lauren Snider, Texas A&M University**

Title: On 2-dimensional parking functions

Abstract: A 2-dimensional U-parking function is a pair of integer sequences whose order statistics are bounded by certain weights along lattice paths in the plane. U-parking functions are one of many higher-dimensional generalizations of classical parking functions, including Cori and Poulalhon's (p,q)-parking functions. In this talk, we will examine the connection between these two generalized parking functions by considering an equivalent interpretation of (p,q)-parking functions in terms of non-crossing lattice paths. We will also discuss some results regarding the enumeration of increasing U-parking functions and, time permitting, define a generating function associated with increasing (p,q)-parking functions which gives rise to a q-analog of the Narayana numbers. This is based on joint work with Catherine Yan.

(Click the number to go back to Page 1.)

22. **Joshua Swanson, University of California, San Diego**

Title: DUSTPAN distributions as limit laws for Mahonian statistics on forests

Abstract: Building on work of Stanley and Björner–Wachs, we study the distribution of certain Mahonian statistics on several families of posets, including the major index on linear extensions of forests. We show that the resulting standardized distributions are often asymptotically normal. However, in certain regimes, we must introduce a new, closed family of continuous probability distributions called DUSTPAN distributions which simultaneously generalize the Irwin–Hall and normal distributions. In the case of forests, we use graph-theoretic statistics like height and elevation to completely determine the precise limit laws. This leads to some natural open questions about the distribution of the height of such forests.

Joint work with Sara Billey (`https://arxiv.org/abs/2010.12701`) building on earlier joint work with Sara Billey and Matjaž Konvalinka (`https://arxiv.org/abs/1905.00975`).

(Click the number to go back to Page 1.)

23. **Ana Laura Trujillo Negrete, Mathematics at Cinvestav, Mexico**

Title: Laplacian spectrum of token graphs

Abstract: Let G be a graph of order n and let k be an integer with $1 \leq k \leq n-1$. The *k-token graph $F_k(G)$ of G* is the graph whose vertices are the k-subsets of $V(G)$, and two of such k-subsets are adjacent if their symmetric difference is a pair of adjacent vertices of G. Token graphs have been defined, independently, at least four times since 1988. So far, several applications of token graphs have been discovered, for example, in Quantum Mechanics and Coding theory. We are interested in the Laplacian spectrum of k-token graphs, for any value of k.

The Laplacian matrix $L(G)$ of a graph G is $L(G) = D(G) - A(G)$, where $A(G)$ is the adjacency matrix of G and $D(G)$ is the diagonal matrix whose diagonal entries are the vertex degrees of G. When considering the adjacency spectrum, there exist graphs

G whose spectrum is not contained in the spectrum of $F_k(G)$. In this work we show that the Laplacian spectrum of G is contained in the Laplacian spectrum of $F_k(G)$. More generally, for any integers h and k such that $1 \leq h \leq k \leq n/2$, the Laplacian spectrum of $F_h(G)$ is contained in the Laplacian spectrum of $F_k(G)$. This implies particularly that the algebraic connectivity of $F_k(G)$ is smaller than or equal to the algebraic connectivity of G. We provide three infinite families of graphs for which the algebraic connectivities of G and $F_k(G)$ are equal. Finally, we obtain a relationship between the Laplacian spectrum of the k-token graph of G and the Laplacian spectrum of the k-token graph of its complement $\overline{G}$.

This is a joint work with C. Dalfó, F. Duque, R. Fabila-Monroy, M. A. Fiol, C. Huemer and F. J. Zaragoza Martínez.

(Click the number to go back to Page 1.)

24. **Diego Villamizar Rubiano, Tulane University**

Title: On the Generalized Central Factorial Numbers

Abstract: We will make use of the set partitions and the generating functions to give new combinatorial relations for the generalized central factorial numbers. We will present relationships between the Bernoulli polynomials and the so-called Stirling numbers with higher level. This is a joint work with T. Komatsu and J. L. Ramirez

(Click the number to go back to Page 1.)

25. **Hua Wang, Georgia Southern University**

Title: Combinatorics of colored compositions and spotted tilings

Abstract: A composition of a given positive integer n is an ordered sequence of positive integers with sum n. In n-color compositions a part k has one of k possible colors. Using spotted tilings to represent such colored compositions we consider those with restrictions on colors. With general results on the enumeration of color restricted n-color compositions in terms of allowed or prohibited colors, we introduce many particular combinatorial observations related to various integer sequences and identities. This is joint work with Brian Hopkins.

(Click the number to go back to Page 1.)

26. **Lutz Warnke, Georgia Institute of Technology**

Title: Prague dimension of random graphs

Abstract: The Prague dimension of graphs was introduced by Nesetril, Pultr and Rodl in the 1970s: as a combinatorial measure of complexity, it is closely related to clique edges coverings and partitions. Proving a conjecture of Furedi and Kantor, we show that the Prague dimension of the binomial random graph is typically of order $n/(logn)$ for constant edge-probabilities. The main new proof ingredient is a Pippenger-Spencer type edge-coloring result for random hypergraphs with large uniformities, i.e., edges of size O(log n).

Based on joint work with He Guo and Kalen Patton, see
https://arxiv.org/abs/2011.09459

(Click the number to go back to Page 1.)

27. **Corey Wolfe, Tulane University**

Title: The Borel Submonoid of a Symplectic Monoid

Abstract. This talk will discuss the combinatorial properties of the complex symplectic monoid MSp_n. In particular, we will show the Bruhat-Chevalley-Renner order on the algebraic monoid of $n \times n$ matrices M_n completely determines the the Bruhat-Chevalley-Renner order on MSp_n. We will then focus on the Borel submonoid of MSp_n to introduce a new kind of type B set partitions. Finally, we introduce "folding" and "unfolding" operators to determine the count of the Borel submonoid. This is joint work with Mahir Bilen Can and Hayden Houser.

(Click the number to go back to Page 1.)

28. **Christopher Wu, Westlake High School, TX**

Title: A Bound on Tableau Stabilization Using Lattice Paths

Abstract: A standard Young tableau is obtained when the cells of a Young diagram are filled with integers so that the entries are increasing along each row and column. Rectification is a transformation on a skew-shape standard tableau that, by sliding the cells around like the pieces of a 15-puzzle, results in a straight-shape standard tableau. If one attaches copies of a skew tableau to the right of itself by concatenating corresponding rows, after some point the entries only experience horizontal displacement under rectification, a phenomenon called tableau stabilization. Our purpose is to improve the original upper bound on the stabilization function to the number of rows of the skew tableau. To prove this bound, we use Greene's Theorem, which provides the shape of a rectified tableau in terms of increasing subsequences. We then encode increasing subsequences as lattice paths and show that various properties of these lattice paths force them into an optimal configuration. This arrangement, within the context of Greene's Theorem, proves the desired result

(Click the number to go back to Page 1.)

29. **Chi Hoi Yip, University of British Columbia**

Title: On maximal cliques of Cayley graphs over fields

Abstract: We describe a new class of maximal cliques, with a vector space structure, of Cayley graphs defined on the additive group of a field. In particular, we show that in the cubic Paley graph with order q^3, the subfield with q elements forms a maximal clique. Similar statements also hold for quadruple Paley graphs and Peisert graphs with quartic order.

(Click the number to go back to Page 1.)

30. **Semin Yoo, University if Rochester**

Title: A combinatorial correspondence between finite Euclidean geometries and symmetric subsets of $\mathbb{Z}/\mathbf{n}\mathbb{Z}$

Abstract: q-analogues of quantities in mathematics involve perturbations of classical quantities using the parameter q, and revert to the original quantities when q goes to 1. An important example is the q-analogues of binomial coefficients which give the number of k-dimensional subspaces in $\mathbb{F}_q^n$. When q goes to 1, this reverts to the binomial coefficients which measure the number of k-sets in $[n]$. Dot-analogues of q-binomial coefficients were studied by Yoo (2019) in order to investigate combinatorics of quadratic spaces over finite fields. The number of k-dimensional quadratic spaces of $(\mathbb{F}_q^n, x_1^2 + x_2^2 + \cdots + x_n^2)$ which are isometrically isomorphic to $(\mathbb{F}_q^k, x_1^2 + x_2^2 + \cdots + x_k^2)$ can be also described as analogous to binomial coefficients, called the dot-binomial coefficients, $\binom{n}{k}_d$.

In this talk, we introduce a combinatorial correspondence between this finite Euclidean geometries and symmetric subsets of $\mathbb{Z}/n\mathbb{Z}$. In addition, we prove that dot-binomial coefficients are polynomials in q. Furthermore, we discuss the properties of the polynomials given by the dot binomial coefficients $\binom{n}{k}_d$.

(Click the number to go back to Page 1.)

31. **Byeongsu Yu, Texas A&M Univerrsity**

Title: Monomial ideals in an affine semigroup rings

Abstract: Both monomial ideals and affine semigroup rings are the rich subject of combinatorics. We showed that algebraic characterizations of a monomial ideal in affine semigroup rings are completely determined by standard pairs, which "combinatorially" decompose the set of all standard monomials of the given monomial ideal along "faces" of the ambient affine semigroup ring. Moreover, if time allows, we introduce the SageMath package "StdPairs" for computing these algebraic characteristics of a monomial ideal.

(Click the number to go back to Page 1.)

32. **Soukaina Zayat, Lebanese University**

Title: About the Erdös-Hajnal Conjecture for seven-vertex tournaments.

Abstract: Erdös-Hajnal conjecture states that for every undirected graph H there exists $\epsilon(H) > 0$ such that every undirected graph on n vertices that does not contain H as an induced subgraph contains a clique or a stable set of size at least $n^{\epsilon(H)}$. This conjecture has a directed equivalent version stating that for every tournament H there exists $\epsilon(H) > 0$ such that every $H-$free $n-$vertex tournament T contains a transitive subtournament of size at least $n^{\epsilon(H)}$. Recently the conjecture was proved for all six-vertex tournaments, except K_6, but the question about the correctness of the conjecture for all seven$-$vertex tournaments remained open. We prove the correctness of the conjecture for several seven$-$vertex tournaments.

(Click the number to go back to Page 1.)