CombinaTexas 2018
February 10–11, 2018

Sunday Morning, Contributed Session III

February 11, Morning, Contributed Session III		
	Session A, BLOC 166	Session B, BLOC 164
8:30–8:50	Suho Oh	
8:50–9:10	Robert McAlmon	Boris Brimkov
9:10–9:30	Art Duval	Mustafa Gezek
9:30–9:50	Jacob White	Pani Seneviratne
9:50–10:10	Kassie Archer	Criel Merino

[A. 8:30–8:50] Suho Oh, Texas State University

Title: *Positroids, rank function and non-crossing partitions*

Abstract: Positroids are matroids encoding the totally nonnegative part of the Grassmannian. Positroids are in bijection with decorated permutations. In this talk, we present a new method obtaining the rank function of a positroid directly from the associated permutation (joint work with R. McAlmon). As a by-product, we can describe explicitly the facets of the matroid polytope and the independent set polytope of a positroid, and also present a conjecture on flag positroids.

[A. 8:50–9:10] Robert McAlmon, Texas State University

Title: *Bruhat Order and Hyperplane Arrangements*

Abstract:

[A. 9:10–9:30] Art Duval, University of Texas at El Paso

Title: *Matroids and statistical dependency*

Abstract: What does it mean for a set of more than two variables to be statistically dependent, even if no two of them are pairwise dependent? We compare different ways of determining this dependency and show they are consistent. We show that, if we make common statistical assumptions on data, then the resulting structure of dependencies may be described by a matroid. We use real examples from biology to demonstrate how the description with matroids helps simplify the presentation of complex variable dependency. This is joint work with Amy Wagler.

[A. 9:30–9:50] Jacob White, UTRGV

Title: *Introduction to megagreedoids*

Abstract: Many polynomials in combinatorics, such as the chromatic polynomial of a graph, or order polynomial of a poset, have nonnegative h-vectors. These polynomials are special cases of polynomial invariants associated to generalized permutohedra, which Aguiar and Ardila showed satisfy a combinatorial reciprocity law. We introduce the notion of megagreedoid, which generalizes graphs, posets, matroids, greedoids, and generalized permutohedra. We also introduce a polynomial invariant, and show that it has a nonnegative h-vector. The proof relies on using the greedy algorithm to show that a related relative simplicial complex is shellable.

[A. 9:50–11:10] Kassie Archer, University of Texas at Typer

Title: *On λ-unimodal permutations*

Abstract: A permutation is called λ-unimodal if it comprised of unimodal segments whose lengths are determined by the composition λ. These permutations first appeared in the formulas for different characters of the symmetric group. In this talk, we enumerate λ-unimodal permutations with certain important properties.

[B. 8:50–9:10] Boris Brimkov, Rice University

Title: *Connected power domination in graphs*

Abstract: Power domination in graphs arises from the problem of placing a minimum number of measurement devices in an electrical network while monitoring the entire network. A power dominating set of a graph is a set of vertices from which every vertex in the graph can be observed, following a set of rules for power system monitoring. This talk focuses on the problem of finding a minimum power dominating set which is connected; the cardinality of such a set is called the connected power domination number of the graph. We show that this parameter is NP-hard to compute in general, but can be computed in linear time in cactus graphs and block graphs. We also characterize the effects of local modifications of a graph on its connected power domination number, and give various structural results. Finally, we present novel integer programming formulations for power domination and connected power domination, and give computational results.

[A. 9:10–9:30] Mustafa Gezek, Namik Kemal University

Title: *New Maximal arcs in the projective planes of order 16 and related designs*

Abstract: The resolutions and maximal sets of compatible resolutions of all 2-(52,4,1) designs arising from previously known maximal (52,4)-arcs, as well as some newly discovered maximal (52,4)-arcs in the known projective planes of order 16, are computed. The computations of the maximal sets of compatible resolutions of the 2-(52,4,1) designs associated with maximal (52,4)-arcs show that five of the known projective planes of order 16 contain maximal arcs whose associated designs are embeddable in two non-isomorphic planes of order 16. Previously the number of pairwise non-isomorphic resolutions of 2-(52,4,1) designs was > 29, with our results, this bound is improved as well.

[A. 9:30–9:50] Pani Seveviratne, Texas A&M University-Commerce

Title: *Linear codes from Paley-Type bipartite graphs*

Abstract: In this work we derive classes of self-dual, self-orthogonal and linear complementary dual codes from neighborhood designs of Paley-type bipartite graphs P(q, k). Further, we determine the structure of the automorphism group of P(q, k) and use this information to find partial permutation decoding sets. This is a join work with Kenza Guenda (University of Victoria, Canada) and Fellah Nazahet (UMMB, Algeria).

[A. 9:50–11:10] Criel Merino, UNAM

Title: *Counting spanning trees on the complement graph*

Abstract: Counting spanning trees in connected graphs is a classic theme in Combinatorics. There are many techniques to compute this number, and while some of these are very much in use today, some have been forgotten. For this talk, I want to recover one technique and place it in the language of a very general algebraic invariant associated to a graph. The invariant is the U-polynomial which was introduced in 1999 by Noble and Welsh. I exemplify the technique with stars, the disjoint union of q edges, and paths. In this latter case, there is a relation to Chebyshev polynomials.