2019 Spring SJTU Workshop on Combinatorics

Shanghai Jiao Tong University

April 27 - 28, 2019

Contents

Abstracts

Non-pseudo-geometric distance-regular graphs

27 Apr
09:30pm
R437
Mikhail Volkov

Jack Koolen
University of Science and Technology of China

Neumaier (1980) showed that there are finitely many connected and coconnected strongly regular graphs with fixed smallest eigenvalue that are not Latin square of Steiner graphs. This was partly generalized by Bang and Koolen (2000's) to the class of distance-regular graphs. They showed that there are finitely many distance-regular graphs with valency at least three with fixed eigenvalue at least $-$m that are not geometric. In this talk we will generalize both results.

Joint work with G. Markowsky and J. Park.

Sparse partition system and perfect phylogeny

27 Apr
10:40am
R437
Jack Koolen

Yanzhen Xiong
Shanghai Jiao Tong University

Let X be a finite set. A character on X is a set of disjoint nonempty subsets of X. A character on X of which the union of all elements equals X is known as a partition of X. We say that a character on X can be displayed on a tree T if the leaf set of T contains X and that the convex hulls of those parts of the character in T are pairwise disjoint. A character system has a perfect phylogeny if they can be displayed on a common tree. Each family of characters on X, say $\pi_1, \ldots, \pi_n$, naturally corresponds to an n-dimensional $(0,1)$ array of size $a_1 \times \cdots \times a_n$, where a_i is the number of parts of π_i, of which the $(t_1, \ldots, t_n)$-entry is 1 if and only if there is an element of X lying in the t_ith part of π_i for all $i = 1, \ldots, n$. For each $(0,1)$ array, we propose an algorithm to associate with it a set of graphs. We show that a partition system of size n has a perfect phylogeny if and only if its corresponding $(0,1)$ n-dimensional array is sparse in certain sense. When the partition system fulfils some special requirements, we demonstrate that our algorithm applied to the $(0,1)$ array corresponding to the partition system produces all "minimum" trees which can display the partition system. In the course of this research, we define a series of sparsity measures for $(0,1)$ arrays and investigate their mutual relations.

This is joint work with Yaokun Wu.

Identities of Kauffman monoids: finite axiomatization and algorithms

27 Apr
13:30pm
R639
Yinfeng Zhu

Mikhail Volkov
Ural Federal University

Kauffman monoids were introduced by Temperley and Lieb in their studies on some problems in statistical physics. Later, they were independently rediscovered as geometric objects by Kauffman in his work on knot theory. Over the past few years it turned out that algebraic properties of Kauffman monoids are of interest too. The talk presents results on equational theories of Kauffman monoids found by the speaker and his coauthors. We have discovered that, even though these theories admit no finite axiomatization, there are certain cases in which the identities of Kauffman monoids can be recognized by polynomial time algorithms.

Spectrum of uniform hypergraph via tensors

27 Apr
14:50pm
R639
Huiqiu Lin

Xiying Yuan
Shanghai University

In this talk some known results and further research problems related spectrum of uniform hypergraphs will be presented.

The A_α-spectra of graphs

28 Apr
09:20am
R705
Sergey Goryainov

Huiqiu Lin
East China University of Science and Technology

Let G be a graph with adjacency matrix $A(G)$ and let $D(G)$ be the diagonal matrix of the degrees of G. For any real $\alpha \in [0,1]$, Nikiforov [Merging the A- and Q-spectral theories, Appl. Anal. Discrete Math. 11 (2017) 81–107] defined the matrix $A_\alpha(G)$ as $A_\alpha(G) = \alpha D(G) + (1-\alpha)A(G)$. In this talk, we will report results on the A_α-spectra.

Polynomial reconstruction, polynomial enumeration, and polynomial codes

28 Apr
10:20am
R705
Da Zhao

Jiyou Li
Shanghai Jiao Tong University

Given n points $x_i, y_i, 1 \leq i \leq n$ in a plane with x_i distinct, how to find a polynomial $f(x)$ of degree $\leq k-1$ passing through at least $n-r$ points? In this talk, we will introduce this problem, as well as some recent results and applications in decoding Reed-Solomon codes.

This is joint work with Daqing Wan.
