Designs

(Chair/Président: **Mathieu Loiselle** (Concordia University))

RICHARD ANSTEE, UBC Mathematics

Forbidden Families of Configurations

Define a matrix A to be simple if it is a (0,1)-matrix with no repeated columns. Given a matrix F, we say A has no configuration F if there is no submatrix of A which is a row and column permutation of F. Given m and a family $\mathcal{F}$ of forbidden configurations, we seek an upper bound forb$(m,\mathcal{F})$ on the number of columns in an m-rowed simple matrix which has no configuration in $\mathcal{F}$.

A conjecture of Anstee and Sali predicts the asymptotics of forb$(m,\mathcal{F})$ when $|\mathcal{F}|=1$. We consider $|\mathcal{F}|>1$. (C.Koch, M.Raggi and A.Sali).

RAÚL FALCÓN, University of Seville

Concurrence designs based on partial Latin rectangles autotopisms

The set of isotopisms with a given cycle structure of $r\times s$ partial Latin rectangles based on n symbols and the set of partial Latin rectangles which have one of such isotopism in their autotopism group determine an incidence structure which becomes a 1-design if we focus on each isotopism class. The points and blocks of such a design can be identified in order to determine a concurrence design, whose properties and parameters are analyzed in the current talk, as well as those conditions under which it becomes a PBIBD. A complete classification is exposed for small orders $r,s,n\leq 5$.

ANEESH HARIHARAN, University of Washington

n-Graceful Blocks

An n-block is called graceful if:

- It consists of n pairs of distinct integers (x_i,y_i) taken from the set $\{1,2,...,2n\}$ that are pairwise disjoint.
- $\{x_i-y_i,y_i-x_i\}$ mod $(2n+1)$ = $\{1,2,...,2n\}$ for $i=1,2,...n$;

Problem: Can the $2n$ choose 2 pairs from $\{1,2,...,2n\}$ be partitioned into $2n-1$ graceful n-blocks?

Computational results and attempts towards a non-computational proof will be discussed. This problem arose while studying decomposition of complete graphs into cubic graphs using cubic labels with Moshe Rosenfeld. Applications include scheduling perfectly optimal round robin tournaments.

MATHIEU LOISELLE, Concordia University

Design's Inspired by the Erdös-Ko-Rado Theorem

The talk will cover the existence of t-(v,k,λ) designs with the additional property that λ is the maximum size of any t-intersecting subset of blocks. The Erdös-Ko-Rado theorem (EKR) proves that for any t and k, for a sufficiently large value of v, $v\geq v_0(t,k)$, the set of k-subsets of a set of size v forms such a design. Such a design occurs prominently in Katona's proof of EKR when $t = 1$; in fact, the existence of such a design is exactly what is needed to generalize this proof. Methods and results searching for such designs will be presented.

IAN WANLESS, Monash University

Non-extendible latin cubes

A famous theorem of Hall says that every Latin rectangle can be extended to a Latin square. It has been known for some time that the analogous statement fails for all dimensions greater than 2. For example, not all Latin cuboids can be extended to a Latin cube. We (Bryant/Cavenagh/Maenhaut/Pula/W) construct $(2k+1) \times (2k+1) \times k$ Latin cuboids that cannot even be extended to a $(2k+1) \times (2k+1) \times (k+1)$ Latin cuboid. This demonstrates that obstacles to extension can be encountered in "thinner" examples than previously thought possible.