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Colourings of group divisible designs and packing designs

A combinatorial design is a pair $(V, \mathcal{B})$ where V is a nonempty set of points, and $\mathcal{B}$ is a collection of subsets of $\mathcal{B}$, called blocks. A c-colouring of a design $(V, \mathcal{B})$ is a function $f : V \to C$ which assigns to each point one of c colours, such that each block contains at least two points of different colours. The design's chromatic number is the least value of c for which it admits a c-colouring. Colourings of balanced incomplete block designs have been extensively studied in the literature.

In this talk, we extend the study of colourings to group divisible designs and packing designs. We consider the existence of c-chromatic uniform k-GDDs with arbitrary group size. We further discuss colourings of GDDs with additional restrictions on the colours appearing in each group. We also present some results on block-equitable colourings of group divisible designs and packing designs; in this type of colouring, every colour must appear an equal number of times (or as closely as possible) in each block.

This is joint work with Peter Danziger, Diane Donovan, Tara Kemp, James Lefevre, David Pike and E. Šule Yazıcı.