

COMBINATORICS
SEMINAR

Matchings in hypergraphs defined by groups

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Abstract: When can we find perfect matchings in hypergraphs whose vertices represent group elements and edges represent solutions to systems of linear equations? A prototypical problem of this type is the Hall-Paige conjecture, which asks for a characterisation of the groups whose multiplication table (viewed as a Latin square) contains a transversal. Other problems expressible in this language include the toroidal n -queens problem, Graham-Sloane harmonious tree-labelling conjecture, Ringel's sequenceability conjecture, Snevily's subsquare conjecture, Tannenbaum's zero-sum conjecture, and many others. All of these problems have a similar flavour, yet until recently they have been approached in completely different ways, using algebraic tools ranging from the combinatorial Nullstellensatz to Fourier analysis. In this talk we discuss a unified approach to attack these problems, using tools from probabilistic combinatorics. In particular, we will see that a suitably randomised version of the Hall-Paige conjecture can be used as a black-box to settle many old problems in the area for sufficiently large groups. Joint work with Alexey Pokrosvkiy.

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