

## On The Existence of Generalized Designs

Amin Bahmanian, Illinois State University

A set  $S$  of  $q$ -subsets of an  $n$ -set  $X$  is a design with parameters  $(n, q, r, \lambda)$  if every  $r$ -subset of  $X$  belongs to exactly  $\lambda$  elements of  $S$ . In other words, a design with parameters  $(n, q, r, \lambda)$  is an  $n$ -vertex  $q$ -uniform hypergraph in which every  $r$ -subset of the vertex set belongs to exactly  $\lambda$  edges. The existence of a design with parameters  $(n, q, r, \lambda)$  is equivalent to a  $K_q^r$ -decomposition of  $\lambda K_n^r$  (the complete  $\lambda$ -fold  $r$ -uniform hypergraph of order  $n$ ). By Keevash's Theorem (2014),  $\lambda K_n^r$  can be decomposed into  $K_q^r$  when some obvious divisibility conditions are satisfied and  $n$  is sufficiently large. In this talk, I will discuss a "multipartite" version of Keevash's Theorem.

Keywords: hypergraphs, designs, generalized designs, multipartite, amalgamation, detachment