

RYERSON UNIVERSITY  
DEPARTMENT OF MATHEMATICS  
GRAPHS AT RYERSON (G@R) SEMINAR

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Date: Thursday, November 22, 2018

Time: 10am

Location: ENG 210

## The codegree threshold of $K_4-$

### Abstract:

The codegree threshold  $ex_2(n, F)$  of a 3-graph  $F$  is the minimum  $d$  such that every 3-graph on  $n$  vertices in which every pair of vertices is contained in at least  $d+1$  edges contains a copy of  $F$  as a subgraph. In this talk, we focus on the codegree threshold of  $F = K_4-$ , the 3-graph on 4 vertices with 3 edges.

Using flag algebra techniques, we prove that  $ex_2(n, K_4-) = n/4 + O(1)$ . This settles in the affirmative a conjecture of Nagle from 1999. In addition, we show that for every near-extremal 3-graph  $G$ , there is a quasirandom tournament  $T$  on the same vertex set such that  $G$  is close in the edit distance to the 3-graph  $C(T)$  whose edges are the cyclically oriented triangles of  $T$ . Using that, we determine the exact value of  $ex_2(n, K_4-)$  for infinitely many values of  $n$  by a close relation to the existence of skew Hadamard matrices. In fact, we show that determining the exact value of  $ex_2(n, K_4-)$  for  $n = 4k + 3$  is equivalent to Seberry's conjecture, which states there exists a skew Hadamard matrix for any  $n = 4k$ .

This is a joint work with Victor Falgas-Ravry, Oleg Pikhurko and Emil Vaughan.

ALL FACULTY, STAFF, STUDENTS AND GUESTS ARE WELCOME TO ATTEND