

DISCRETE MATH  
SEMINAR

*Independent transversals in multipartite graphs*

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**Abstract:** An independent transversal in a multipartite graph is an independent set that intersects each part in exactly one vertex. We show that given any positive even integer  $r$ , every  $r$ -partite graph with parts of size  $n$  and maximum degree  $\Delta \leq n / (2r-2) - t$  ( $t \geq 0$ ) contains  $c t n^{r-1}$  independent transversals. This is best possible up to the constant  $c=c_r$ , confirming a conjecture of Haxell and Szabo from 2006 and partially answering a question Erdos from 1972 and a question of Bollobas, Erdos and Szemerédi from 1975.

We also show that for every  $s \geq 2$ , even  $r \geq 2$  and sufficiently large  $n$ , every  $r$ -partite graph with parts of size  $n$  and maximum degree  $\Delta \leq n / (2r-2) - c n^{1-1/s}$  contains an independent set with exactly  $s$  vertices in each part. This is best possible up to the value of  $c$  for  $s=2, 3$  due to well-known constructions for the Zarankiewicz problem. This is a joint work with Yantao Tang.

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