

DISSERTATION
DEFENSE

Topics in Ramsey Theory

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Abstract: In this thesis we discuss two results in Ramsey Theory.

Result I: the size-Ramsey number of a graph H is the smallest number of edges a graph G must have in order to force a monochromatic copy of H in every 2-coloring of the edges of G . In 1990, Beck studied the size-Ramsey number of trees: he introduced a tree invariant $\beta(\cdot)$, and proved that the size-Ramsey number of a tree T is at least $\beta(T)/4$. Moreover, Beck showed an upper bound for this number involving $\beta(T)$, and further conjectured that the size-Ramsey number of any tree T is of order $\beta(T)$. We answer his conjecture affirmatively. Our proof uses the expansion properties of random bipartite graphs.

Result II: We prove the following metric Ramsey theorem. For any connected graph G endowed with a linear order on its vertex set, there exists a graph R such that in every coloring of the t -sets of vertices of R it is possible to find a copy G' of G inside R satisfying the following two properties:

- the distance between any two vertices $x, y \in V(G')$ in the graph R is the same as their distance within G' ;
- the color of each t -set in G' depends only on the graph-distance metric induced in G' by the ordered t -set.

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