Research Talk

Friday, January 31, 2014

3:00 pm in Hume 331

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Dicromatic number and fractional chromatic number

ABSTRACT

Given an undirected graph G, the chromatic number $\chi(G)$ is the minimum order of partitions of $V(G)$ into independent sets. Given a directed graph D, a vertex set is acyclic if it does not contain a directed cycle. The chromatic number $\chi(D)$ is the minimum order of partitions of $V(G)$ into acyclic sets. The dichromatic number of an undirected graph G, denoted by $\overrightarrow{\chi}(G)$, is the maximum chromatic number over all its orientations. Erdös and Neumann-Lara proved that $C_1\frac{n}{\log n} \leq \overrightarrow{\chi}(K_n) \leq C_2\frac{n}{\log n}$ for some constants C_1, C_2. They conjectured that if the dichromatic number of a graph is bounded, so does its chromatic number.

Let $\mathcal{I}(G)$ be the set of all independent sets of G, and let $\mathcal{I}(G,x)$ be the set of all those independent sets which include vertex x. For each independent set I, define a nonnegative real variable x_I. The fractional chromatic number $\chi_f(G)$ is the minimum value of $\sum_{I\in\mathcal{I}(G)} x_I$, subject to $\sum_{I\in\mathcal{I}(G,x)} x_I \geq 1$ for each vertex x. We prove that there is a constant C such that for any graph G, we have $\overrightarrow{\chi}(K_n) \geq C\frac{N}{\log n}$.

This is joint work with Professor Bojan Mohar in Simon Fraser University.