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Seminario de Grafos

Speaker: Taruni Sridhar (CMM)

Title: On (n, m)-chromatic numbers of graphs with bounded sparsity parameters.

Abstract: An (n, m)-graph is characterised with n types of arcs and m types of edges.

A homomorphism of an (n, m)-graph G to an (n, m)-graph H, is a vertex mapping that preserves adjacency, direction, and type. The (n, m)-chromatic number of G, denoted by $\chi_{n,m}(G)$, is the minimum value of $|V(H)|$ such that there exists a homomorphism of G to H. The theory of homomorphisms of (n, m)-graphs has connections with graph theoretic concepts like harmonious coloring, nowhere-zero flows; with other mathematical topics like binary predicate logic, Coxeter groups; and has applications to the Query Evaluation Problem (QEP) in graph database.

In this talk, we show that the arboricity of G is bounded by a function of $\chi_{n,m}(G)$ but not vice versa. Additionally, we show that the acyclic chromatic number of G is bounded by a function of $\chi_{n,m}(G)$, a result already known in the reverse direction. Furthermore, we prove that the (n, m)-chromatic number for the family of graphs with maximum average degree less than $2 + \frac{2}{4(2n+m)-1}$, including the subfamily of planar graphs with girth at least $8(2n + m)$, equals $2(2n + m) + 1$. This improves upon previous findings, which proved the (n, m)-chromatic number for planar graphs with girth at least $10(2n + m) - 4$ is $2(2n + m) + 1$. It is established that the (n, m)-chromatic number for the family $\mathcal{T}_2$ of partial 2-trees is bounded below and above by quadratic functions of $(2n + m)$, with the lower bound being tight when $(2n + m) = 2$. We prove $14 \leq \chi_{(0,3)}(\mathcal{T}_2) \leq 15$ and $14 \leq \chi_{(1,1)}(\mathcal{T}_2) \leq 21$ which improves both known lower bounds and the former upper bound. We prove the first theoretical proof for the upper bound in both the cases.

Lugar/hora: Viernes 6 de Agosto , 2024 / 10.00-11.00, Sala Jacques L Lions. (7° Piso)