Combinatorics Seminar

Wednesday, April 24th, 2024

4:00-5:00pm in Hume 321

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A general theorem in spectral extremal graph theory

ABSTRACT

Turán numbers are a cornerstone of extremal graph theory. Their asymptotics are completely known when forbidding graphs with chromatic number at least three, however they remain unknown for several basic bipartite graphs. Nikiforov introduced a spectral analogue to Turán problems referred to as spectral Turán problems. Here our objective is to maximize the spectral radius of the adjacency matrices of graphs not containing some subgraphs. Such a study may give strong upper bounds for the associated Turán problems. While the asymptotics of spectral Turán numbers are known for graphs with chromatic number at least three, several families of bipartite graphs remain open in this scenario too.

In this talk we will share recent progress on the spectral Turán numbers for some families of bipartite graphs. In some cases, this will strengthen the previous upper bounds for the associated Turán numbers.

Conversely, a recent result for forbidden graphs with chromatic number at least three, proves that whenever the extremal graph for a Turán problem consists of a Turán graph + finitely many edges added into it, the spectral extremal graph is also edge extremal. In this talk we will share our recent explorations where we show similar phenomena also occurring with bipartite Turán problems, where the role of the Turán graph is now replaced by a small clique joined to an independent set.