Seminario de Análisis y Aplicaciones

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A compactification result for the set of positive sequences (with applications to graph limits)

Resumen:

The notion of graph limits aims to provide a better understanding of large graphs by providing a limit object which is linked to a convergence notion for sequences of graphs. One of the problems that arise is the following: even when the convergent notions care about similar parameters, the different convergence notions either only work for certain families of graphs, or they trivialize for others. The best known example of this behaviour is the notion of left-convergence introduced by Lovasz et. al., and the Benjamini-Schramm convergence for bounded degree graphs: in both cases the convergence of the sequence involves the subgraph counts (we fix the subgraph to count, such as the triangle K_3, and let the parameter of the sequence grow). For the left-convergence, if the graphs G_n are not dense, then the limit trivializes; for the Benjamini-Schramm convergence, we can only consider sequences of graphs with bounded maximum degree.

We present the following 'compactification' result: assuming the continuum hypothesis, there exists a set of positive sequences A (with the property that the quotient of every pair of sequences in A has a limit, possibly infinite), for which, for any subsequence b of positive numbers, there exist an $a \in A$, a finite positive constant c, and a subsubsequence d of b (indexed by I) such that

$$d_n/a_n \to_{n\to\infty, n\in I} c$$

(the limit of d along the subsequence is comparable to a). With this, we give a convergence notion that is the common generalization of the Benjamini-Schramm convergence and the left-convergence for graphs, and has the property that any sequence of graphs (with growing number of vertices) has a convergent subsequence.

This is a joint work with David Chodounský.

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