Taxonomy of sparse convergence notions and their limit objects

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Presentation’s abstract:

Given two large graphs, there are several natural notions of when these graphs are similar. Each of these notions gives a (typically metrizable) topology in the set of finite graphs up to isomorphism and limit graph theory studies what objects can serve as limit points of these convergence notions. The case of dense graphs is well understood: several of these a priori very different convergence notions are in fact equivalent and the limit objects that capture most of the convergences notions are graphons. To study sparse graphs without getting a trivial limit, the usual approach is to renormalize several of the convergence notions, but when we do so, the resulting analogue properties are no longer equivalent. Furthermore, graphons no longer correctly capture limits and the “correct” limit object depends on how sparse are the graphs and on the convergence notion being studied. The main questions of sparse limit theory concern not only different implications and separations between different convergence notions but also how to unify different limit objects tailored to different sparsity regimes and convergence notions under a single theory and how to generalize such theory to arbitrary combinatorial objects.

In this talk, I will present some of the different convergence notions for sparse graph sequences and some of the associated limit objects of the literature. I will also present a proof sketch of some of the implications between such convergence notions and the existence results of some limit objects.

References


