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The typical structure of sparse graphs in hereditary properties

The method of hypergraph containers, introduced a few years ago by Balogh, Morris and Samotij, and independently by Saxton and Thomason, has proved to be an extremely useful tool in the study of the typical properties of sparse H -free graphs. In particular, a fairly straightforward application of this technique allows one to locate the threshold at which the structure of a typical H -free graph transitions from being "random-like" to being "structured". For most hereditary graph properties, however, the standard version of this method does not allow one to establish even the existence of such a threshold. In this talk we will discuss a refinement of the container method that takes into account the asymmetry between edges and non-edges in a sparse member of a hereditary graph property. As an application, we will show how to determine the approximate structure of a typical graph with n vertices, m edges, and no induced copy of C_4 , for all $m \gg n^{4/3}(\log n)^3$.

This is based on joint work with Wojciech Samotij and David Saxton.