

## **Syntactic Methods in Continuous Combinatorics**

Alexander Razborov, University of Chicago

Extremely large combinatorial structures prevail these days in many disciplines ranging from statistical mechanics to the theory of social networks. Moreover, most properties researchers are interested in are continuous with respect to small perturbations of the structure. This makes it quite appealing to actually perform the limit transition and replace very large structures with their infinite mathematical abstractions. We coin "Continuous Combinatorics" as an unifying term for several directions in the modern combinatorics bound together by the principle of admitting these infinite abstractions as legitimate and respectful objects of study rather than technical tools.

As it turns out, the most important invariants of these limit objects are densities (or statistics) with which fixed finite objects of the same type occur in them. The geometric, semantic direction ("graph limits") treats these densities primarily as a tool for studying actual limit objects, and it will be a subject of several talks at this workshop. For this reason we will mostly focus on the inverse problem that makes the backbone of extremal combinatorics: what collections of densities are realizable in limit objects? A characteristic feature of this approach ("flag algebras") is that it tries to avoid any direct references to limit objects themselves and tends to analyze the densities in question in purely algebraic and syntactic way.