Seminar 2024

Math

When measures don't care about structure

(and when they do)

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TU Wien(Vienna University of Technology)

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Science Hall 254

Joint work with Colin Jahel and Samuel Braunfeld. We study ways in which we can expand a homogeneous relational structure in a "random" way. The most basic example of this, studied by Ackerman, Freer and Patel (2016) and many others, are measures on the space of L-structures on a countable set which are invariant under the action of S_∞. For a fixed homogeneous structure we study Aut(M)-invariant measures on the space of expansions of M to a language L'. Such measures have been previously studied by Crane & Towsner (2018) and Jahel & Joseph (2023). In particular, we are interested in the case of M being a homogeneous k-hypergraph, for which we study Aut(M)-invariant expansions by a lower arity hypergraph. Heavily modifying techniques of Angels, Kechris and Lyons (2014), we are able to prove that in various cases these Aut(M)-invariant measures are actually S_∞ -invariant. In particular, we manage to prove this also for some homogeneous structures M with free amalgamation but not satisfying disjoint n-amalgamation for all n. This was essentially out of the reach of previous work. Moreover, invariant Keisler measures on a given homogeneous structure are a special case of the context we study. Hence, we are able to describe the spaces of invariant Keisler measures for various homogeneous structures and show in many cases that the measure of a formula does not depend on the relations between its parameters. An especially important example is the generic tetrahedron-free 3-hypergraph, for which we prove that there are non-forking formulas which are universally measure zero. Finally, our techniques also provide an explanation for why the universal homogeneous two-graph has a unique invariant Keisler measure which is quite oddly behaved.

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