Michael Chapman

Subgroup Tests and the Aldous-Lyons conjecture

Abstract:
The Aldous-Lyons conjecture from probability theory states that every (unimodular random) infinite graph can be (Benjamini-Schramm) approximated by finite graphs. This conjecture is an analogue of other influential conjectures in mathematics concerning how well certain infinite objects can be approximated by finite ones; examples include Connes' embedding problem (CEP) in functional analysis and the soficity problem of Gromov-Weiss in group theory. These became major open problems in their respective fields, as many other long standing open problems, that seem unrelated to any approximation property, were shown to be true for the class of finitely-approximated objects. For example, Gottschalk's conjecture and Kaplansky's direct finiteness conjecture are known to be true for sofic groups, but are still wide open for general groups.

In 2019, Ji, Natarajan, Vidick, Wright and Yuen resolved CEP in the negative. Quite remarkably, their result is deduced from complexity theory, and specifically from undecidability in certain quantum interactive proof systems. Inspired by their work, we suggest a novel interactive proof system which is related to the Aldous-Lyons conjecture in the following way: If the Aldous-Lyons conjecture was true, then every language in this interactive proof system is decidable. A key concept we introduce for this purpose is that of a Subgroup Test, which is our analogue of a Non-local Game. By providing a reduction from the Halting Problem to this new proof system, we refute the Aldous-Lyons conjecture.

These talks are based on joint work with Lewis Bowen, Alex Lubotzky, and Thomas Vidick.

Jean Raimbault

Abstract:
"The goal of these lectures is to introduce invariant random subgroups (IRS) in Lie groups and present some applications to the geometry and topology of locally symmetric spaces. I will start with a short discussion of IRS in discrete groups, then a short survey of discrete subgroups semisimple Lie groups with emphasis on lattices. The rest of the lectures will be devoted to IRS in semisimple Lie groups and the Benjamini--Schramm topology. "