

Masterclass: Expanders and rigidity of group actions Titles and abstracts

Alex Lubotzky: *High dimensional expanders in pure and applied mathematics.*

In the last 40 years expanders graphs have played a important role in computer science and more recently also in pure mathematics. In recent years a high dimensional theory is emerged of expanding hypergraphs/simplicial complexes.

We will describe the basics of this theory and show few applications (which are very different than those of the one dimensional theory) to pure math (overlapping properties a' la Gromov) and computer science (random simplicial complexes, property testing and quantum error correcting codes).

The lectures will be related to the colloquium talk but completely independent.

Nicolas Monod: *Amenability and fixed point theorems*

Amenability is a fixed point property for groups. The lectures will explore this property and use the recurring theme of fixed points to explore other directions. This can serve as an excuse to discuss some of the most elementary fixed point statements, but also some of the more mysterious. A few concrete examples and counter-examples will be given.

Damian Osajda: *Groups containing expanders*

I will present a construction of finitely generated groups with Cayley graphs containing isometrically certain infinite families of finite graphs. In particular, this results in groups containing expanders. Such groups have exotic properties: They do not embed coarsely into the Hilbert space and do not satisfy some versions of the Baum-Connes conjecture.

I will start with some motivations and a short discussion of Gromov's monster. Then basics on the main tool used for the construction, the graphical small cancellation, will be presented. I will give an outline of the main construction and finally I will present some further applications. One of them is constructing non-exact groups with the Haagerup property.

Mikael de la Salle: *Rigidity properties for group actions on Banach spaces*

The purpose of this series of lectures is to present some recent developpement on rigidity for group actions on Banach spaces. This includes Banach space property (T), the fixed point property for affine actions on Banach spaces, and applications to coarse embeddability of expanders in Banach spaces. We will mainly focus on Kazhdan projections and Banach space valued spectral gaps, as in the work Lafforgue and some of its later extensions.