

Abstracts: Groups, Property (T), and Expansion II

Lodha Mathematical Sciences Institute

Name: Arie Levit

Title: Invariant random subgroups, characters and stability

Talk1: Introduction to IRS and characters. Examples in rank one. The relationship to the permutation and HS-stability of amenable groups.

Talk2: Nilpotent, metabelian and polycyclic groups.

Talk3: Diagonal products, B.H Neumann groups, and the IRS and characters of finitary simple groups.

Talk4: Characters and IRS of higher rank irreducible lattices.

Name: Ben Lowe

Title: Minimal Submanifolds and the Geometry of Locally Symmetric Spaces

Abstract: Locally symmetric spaces are the most natural class of Riemannian manifolds to study, but much remains unknown about their geometry and topology. In these lectures I will talk about an approach to studying locally symmetric spaces based on minimal submanifolds, joint with Mikolaj Fraczyk. Minimal k -submanifolds are classic objects from the calculus of variations that minimize k -volume in the same way that geodesics minimize length. I will explain how estimates on the rate of growth of minimal submanifolds in symmetric spaces in the form of what are called a monotonicity formulas lead to the following statements (focusing on the case of the locally symmetric spaces $\Gamma \backslash X$ corresponding to $SL(n, \mathbb{R})$):

1. Waist inequalities for compact $M = \Gamma \backslash X$. i.e., statements to the effect that maps from $M \rightarrow \mathbb{R}^d$ must have fibers with codimension- d volume proportional to the volume of M , for a proportionality constant depending only on X and not on M . Waist inequalities of this kind make precise the statement that manifolds within a certain class have large codimension- d thickness.
2. The geography problem for infinite volume $\Gamma \backslash X$ is not very well understood so far. We prove vanishing theorems for their homology in low-codimension.
3. Time permitting, I will also talk about applications to systolic geometry and how our results can be used to constrain actions of lattices in $SL(n, \mathbb{R})$.

At the end I plan to explain in detail how the tension between the monotonicity formula we prove for low codimension minimal submanifolds of X and facts about the unitary representations of $SL(n, \mathbb{R})$ lead to these conclusions. I will assume no background on minimal submanifolds and will assume only minimal background on locally symmetric spaces, Lie groups, and representation theory. The presentation will prioritize examples, the landscape of what is known, and the ideas behind the arguments, and will focus on technical details selectively.

Name: Michael Glasner

Title: Higher property (T) and unitary cohomology.

Abstract: The course will consist of a self-contained introduction to the theory of higher property (T), introduced and developed by Bader and Sauer. A group G has property $[T_n]$ if the cohomology $H^q(G; V)$ vanishes for every $q \leq n$ and unitary representation V . We will begin by reviewing the relevant notions and considering the general theory. After that we will discuss the prime examples of groups with higher property (T), i.e. Semisimple groups and their lattices, whose cohomology vanishes up to the rank. Finally we will discuss applications of higher property (T) to rigidity, such as the recent work of Bader Bader Bader and Sauer on Farb's property FA_n .