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2024-T2 GROUP ACTIONS AND RIGIDITY: AROUND THE ZIMMER PROGRAM

Mini-Courses GAR

Institut Henri Poincaré
Amphithéâtre Darboux
11 rue Pierre et Marie Curie
75005 Paris

INSCRIPTION

Group Actions and Rigidity: Around the Zimmer Program

Mini-Courses

Mini-courses will be held in amphitheater Darboux in IHP. The standard format will be three 2h long lectures during one week for each mini-course.

Week of May 6: Bertrand Deroin (Université de Cergy & CNRS)

URL de la page : <https://www.ihp.fr/fr/agenda/mini-courses-gar>

Monday 10-12, Tuesday 10-12, Tuesday 2-4

Orderability of lattices in semi-simple Lie groups.

Abstract : There are several interesting ways of ordering groups, but we will focus here on the notion of left-orderability, namely the existence of a total ordering on the group invariant by left translations. In the lectures, we will provide the complete classification of left-orders on irreducible lattices in a semi-simple Lie group of real rank at least 2, based on work of Derooin and Hurtado: such orders exist only if the Lie group has a $\widetilde{\mathrm{SL}(2, \mathbb{R})}$ -factor and are obtained by pull-back. This answers positively conjectures of Ghys and Witte in the beginning of the 90's. Techniques for the proof include 1) random walks on the group of homeomorphism of the real line, 2) group of almost-periodic homeomorphism of the real line 3) Furstenberg's Poisson formula, 4) dynamics of Cartan subgroups. If time permit, we will discuss the situation in the rank one case.

Week of May 13: Thang Nguyen (Florida State University)

Monday 10–12, Tuesday 10–12, Wednesday 10–12

Local rigidity of higher rank lattice actions on flag manifolds

Abstract: The main focus of the minicourse is to study local rigidity of standard actions of uniform lattices in higher rank Lie groups on flag manifolds within the space of actions by homeomorphisms. The rigidity in more differentiable actions often relies on the stability of uniform hyperbolic systems. In the setting of actions by homeomorphisms, We explore a much weaker form of stability derived from coarse geometry. We will go over how dynamics and coarse geometry intertwine to achieve a desired local rigidity. At the end of the minicourse, we will extend our discussion to other natural boundary actions.

The outlined of topics in the minicourse include:

Local rigidity: problems and results.

Stability of uniform hyperbolic systems and uniformly transverse foliations.

Geometry and coarse geometry of symmetric spaces.

Weyl chamber flows.

Suspension and developing.

Barycenter and its regularity.

Proof of local rigidity for actions on flag manifolds.

Actions on geodesic boundaries and some related actions.

Week of May 20: Romain Dujardin (Sorbonne Université)

Tuesday 10–12, Wednesday 10–12, Friday 10–12

Dynamics of automorphism groups of real and complex projective surfaces.

Abstract: In a series of papers in collaboration with Serge Cantat, we have studied group actions by automorphisms on compact complex surfaces. In these lectures, I will review our results and discuss a number of meaningful examples. Depending on time, the following results will be discussed:
action on cohomology and the notion of non-elementary group, classification of stationary and invariant measures, (non-)Zariski density of finite orbits, asymptotic distribution of infinite orbits.

Week of June 3: Cyril Houdayer (ENS Paris)

Monday 10–12, Tuesday 10–12, Wednesday 9:30-11:30

Noncommutative rigidity of higher rank lattices

Abstract: In this lecture series, I will survey recent results regarding the dynamics of positive definite functions and character rigidity of higher rank lattices. I will discuss the notion of noncommutative boundary structure and give the proof of the noncommutative Nevo-Zimmer structure theorem for ergodic actions of higher rank lattices on von Neumann algebras due to Boutonnet-Houdayer (2019). I will present several applications to ergodic theory, topological dynamics, unitary representation theory and operator algebras. I will also present a noncommutative analogue of Margulis' factor theorem for higher rank lattices and explain its relevance towards Connes' celebrated rigidity conjecture.

Week of June 3: Tim de Laat (University of Münster)

Monday 2–4, Tuesday 2–4, Wednesday 1–3

Isometric actions of higher rank groups on uniformly convex Banach spaces

Abstract: Fixed point properties for isometric group actions on Banach spaces are fundamental rigidity properties which can be viewed as Banach space versions of Kazhdan's property (T). After an introduction to this topic, I will explain that all isometric actions of higher rank semisimple Lie/algebraic groups (over arbitrary local fields) and their lattices on arbitrary uniformly convex Banach spaces have a fixed point. This theorem confirmed a long-standing conjecture of Bader, Furman, Geller and Monod. The proof of this result is a combination of the "Archimedean case", i.e. Lie groups, and the "non-Archimedean case", i.e. semisimple groups over non-Archimedean local fields. These two cases are proved with fundamentally different methods. The focus of this mini-course will lie on the Lie group side of the above theorem, which I recently proved in collaboration with Mikael de la Salle, vastly generalizing work of Oppenheim. I will explain the strategy and key steps of the proof and highlight certain new techniques.

Week of June 17: Karin Melnick (University of Luxembourg)

Monday 10–12, Tuesday 10–12, Wednesday 9:30-11:30

URL de la page : <https://www.ihp.fr/fr/agenda/mini-courses-gar>

Abstract: This mini-course will be an introduction to rigid differential-geometric structures and their automorphisms. It will cover some of the basic theory of G -structures of finite type in the sense of Cartan and a variety of examples. A few major theorems on automorphisms of such structures, such as Zimmer's Embedding Theorem and Gromov's Open-Dense Theorem, will be presented, along with some significant applications. In the last section of the course, the plan is to present a 21st-century rigidity result for conformal actions of nilpotent groups on compact pseudo-Riemannian manifolds.

Week of June 17: Kurt Vinhage (University of Utah)

Monday 2–4, Tuesday 2–4, Wednesday 1–3

Parameterized accessibility classes and rigidity

Abstract: In this mini-course, I will describe the way in which accessibility classes of partially hyperbolic systems interact with rigidity properties. In particular, I will explain a setting where the action of a certain topological group parameterizes accessibility classes, and methods to control this action to produce rigidity theorems. Time permitting, I will explain how common rigidity assumptions can place us in this special setting, and how sub-accessibility classes play an important role in understanding the non-rigid setting. Based on joint works and ideas developed with D. Damjanovic, R. Spatzier, A. Uzman, Z.J. Wang, and D. Xu.

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HORAIRES

L'institut :

- lundi au vendredi de 8h30 à 18h,
- fermé les jours fériés.

Le musée - Maison Poincaré :

- lundi, mardi, jeudi et vendredi de 9h30 à 17h30,
- samedi de 10h à 18h,
- fermé le mercredi et le dimanche.