

Kervaire seminar in Groups and Dynamics
Swiss Doctoral Program in Mathematics
Les Diablerets (Switzerland)

8th-13th March 2020

Program

Talks

Jean-François Quint: *Additive representations of tree lattices.*

In this talk, I will describe a method for building unitary representations of a finitely generated free group, or more generally of a discrete groups with a cofinite action on a tree. The idea of the method is to deform the representation theory of the full group of automorphisms of the tree.

Nicolas Monod: *How (not) to prove (non) amenability.*

Courses

I. Measurable group theory and related topics

Damien Gaboriau: *Measured group theory and cost.* (3h)

An introduction into measurable group theory, the notion of cost of a countable group, and eventually L^2 Betti numbers.

Alain Valette: *The first L^2 -Betti number of a group.*

We will give a survey talk on the first L^2 -Betti number of a countable group, emphasizing what it is good for and why it is very often 0 (amenable, property (T),...).

Tom Hutchcroft: *Percolation and the cost of groups.* (2h)

An introduction to percolation on groups followed by a discussion of a recent result on the cost of groups with property (T).

Romain Tessera: *Quantitative measure equivalence between finitely generated groups.*

In a joint work with Delabie, Koivisto and Le Maitre, we initiate a quantitative study of measure equivalence between finitely generated groups that extends the classical setting of L_p measure equivalence. In particular we investigate quantitative versions of Orstein Weiss' theorem. We get new rigidity results, both for amenable groups and for hyperbolic groups. We also introduce a new method of construction of orbit equivalent actions between amenable groups, and use it to prove flexibility results.

II. Dynamical group theory

Volodymyr Nekrashevych: *Infinite simple groups with finiteness properties.* (2h)

Nicolás Matte Bon: *Confined subgroups and homomorphisms between groups of dynamical origin.*

A subgroup of a group is said to be confined if its set of conjugates does not accumulate on the trivial subgroup in the Chabauty topology, or equivalently if its Schreier graph does not have large balls isomorphic to the Cayley graph of the group. I will survey various results based on the study of confined subgroups of groups of homeomorphisms arising via a micro-supported action. In particular I will explain how they can be used to study homomorphisms between study actions on compact spaces of various groups (such as topological full groups and groups acting on rooted trees), and to describe the homomorphisms between them. The material of the talk includes ongoing work with Adrien Le Boudec.

Tianyi Zheng: *Rigid stabilizers and invariant random subgroups.* (2h)

We present a unified approach to classification of invariant random subgroups in several examples of groups acting by homeomorphisms on the Cantor set.

Laurent Bartholdi: *Symbolic dynamics and automata.*

I will show how certain symbolic dynamical systems, in particular subshifts, may efficiently be encoded by groups and automata. In particular, such classical notions as the enveloping semigroup, the isomorphism problem, and natural extensions are naturally expressed in this setting. I will concentrate, in particular, on some prominent examples: the Thue-Morse sequence, the Period doubling sequence, and the Fibonacci shift.

III. Automorphisms of free groups

Karen Vogtmann: *Euler characteristics of moduli spaces of graphs.* (2h)

Lecture 1. This lecture will focus on basic information about spaces of graphs (including Outer space) and rational Euler characteristics of groups.

Lecture 2. This lecture will focus on the rational Euler characteristic of the group $Out(F_n)$ of outer automorphisms of a free group and its relation with the Gamma function, zeta function and Lambert W-function.

Olga Kharlampovich: *Automorphisms of free group and first-order properties of tuples of elements.*

We study to which extent the first-order properties of an n -tuple \bar{a} in a non-abelian free group determine its automorphic orbit. By the results of Perin-Sklinos and Ould Houcine, the free group is homogeneous, namely the first-order type of a tuple determines this tuple up to automorphism. We prove that non-abelian free groups of finite rank at least 3 or of countable rank are not \forall -homogeneous (free group of rank 2 is \forall -homogeneous by the result of Nies). We also provide interesting examples of countable non-finitely generated groups elementary equivalent to free groups. These are joint results with C. Natoli.

IV. Around the space of marked groups

Denis Osin: *Applications of descriptive set theory to the study of geometric and model-theoretic properties of groups.* (2h)

The goal of the mini-course is to discuss applications of descriptive set theory to the study of geometric and first-order properties of groups. For example, we will show that generic torsion-free lacunary hyperbolic groups are elementarily equivalent. As another application, we will obtain an elementary method of constructing uncountable families of pairwise non-quasi-isometric groups with interesting algebraic and geometric properties. At the core of the proofs are topological properties of the corresponding equivalence relations on the Grigorchuck space of finitely generated groups. We will also discuss some open questions and directions for future research.

Yash Lodha: *Finitely generated simple left-orderable groups.*