Lightning talks - Abstracts

Javier Aramayona (Instituto de Ciencias Matematicas): *Asymptotically rigid mapping class groups of Cantor manifolds*

(Joint work with Bux, Flechsig, Petrosyan, Wu) A Cantor manifold C is a non-compact manifold obtained by gluing (holed) copies of a fixed compact manifold Y in a tree-like manner. Its asymptotic mapping class group B is the group whose elements are proper isotopy classes of self-diffeomorphisms of C that are "eventually trivial"; it is an extension of a Higman-Thompson group by a direct limit of mapping class groups of compact submanifolds of C.

The group B acts on a contractible cube complex X of infinite dimension, and we use this action to determine finiteness properties of B. In well-behaved cases, X is CAT(0) and B is of type F_∞. More concretely, this is the case when Y is a 2-dimensional torus, $S^2 \times S^1$, or $S^n \times S^n$, for $n > 2$. In these cases, the group B contains, respectively, the mapping class group of every compact surface with boundary, the automorphism group of every finitely generated free group, or an infinite familiy of groups commensurable (up to finite kernel) to discrete matrix groups.

Edgar A. Bering IV (Technion): *Finite rigid sets in sphere graphs*

A subset X of a simplical complex C is rigid if every locally injective simplicial map $f : X \to C$ is the restriction of an automorphism of C. Aramayona and Leininger proved that the curve complex of a closed orientable surface can be exhausted by finite rigid sets. The sphere complex is an $\mathrm{Out}(F)$ analog of the curve complex defined using isotopy classes of essential spheres in a connect sum of n copies of $S^1 \times S^2$. In this talk I will exhibit a finite rigid set in the sphere complex when $n = 3$, illustrating recent joint work with Leininger where we construct an exhaustion of the sphere complex by finite rigid sets for all $n \geq 3$.

Aaron Calderon (Yale University): *Vector fields, mapping class groups, and holomorphic 1-forms*

Given a vector field on a surface, one would like to know which mapping classes preserve (the isotopy class of) this vector field. Despite the fundamental nature of this question, little is known about these "framed mapping class groups." In this talk I will describe some joint work with Nick Salter in which we gave explicit, finite generating sets for framed mapping class groups, as well as highlight an application to the topology of moduli spaces of holomorphic 1-forms.

Inhyeok Choi (KAIST): *Limit laws and their consequences on* MCG *and* $\mathrm{Out}(F_n)$

I'm going to explain:
- CLT and LDP,
- (partial) LDP for the volume of random 3 mfd,

- CLT for the random Heegaard distance,
- the asymmetry of the expansion factors of a generic fully irreducible and its inverse.

Sami Douba (McGill University): *Neutrality and virtual unipotency of Dehn twists*

We discuss how Bridson's result on neutrality of Dehn twists in (generic) mapping class groups implies Button's result that the image of a Dehn twist is virtually unipotent under any finite-dimensional representation of such a group.

Antoine Goldsborough (Heriot-Watt University): *Random walks and quasi-isometries*

The study of random walks on various groups is a very rich area of mathematics and a considerable amount of research has been done on these. In geometric group theory, a crucial notion is that of a "quasi-isometry" between two spaces. Sadly, random walks and quasi-isometries do not behave well together. In this talk, we will propose the study of a more general process, namely of a Markov chain in order to resolve this issue. This leads to interesting results about random walks on groups quasi-isometric to specific groups, including a Central Limit Theorem. This is joint work with Alessandro Sisto.

Yassine Guerch (Université Paris-Saclay): *Growth and subgroups of* $Out(F_n)$

Let n be an integer and let $Out(F_n)$ be the outer automorphism group of a nonabelian free group of rank n. Let $[g]$ be a conjugacy class of F_n and $F \in Out(F_n)$. The class $[g]$ has exponential growth under iteration of F if the word length (for a given basis of F_n) of $F^m([g])$ grows exponentially fast with m. We will present a structure result for subgroups of $Out(F_n)$ which shows that, given a subgroup H of $Out(F_n)$, there exist generic elements of H which encapture the exponential growth of every element of H.

Sam Hughes (University of Oxford): *Hierarchical hyperbolicity versus biautomaticity*

In this lightning talk we will settle the question of whether every hierarchically hyperbolic group is biautomatic. Joint with Motiejus Valiunas.

Annette Karrer (Technion): *Connected components of Morse boundaries of graphs of groups*

Each finitely generated group G has a topological space associated to it called the Morse boundary. This boundary generalizes the Gromov boundary of Gromov-hyperbolic groups and captures how similar the group is to a Gromov-hyperbolic group.

Let G be a graph of groups where the edge groups are undistorted and do not contribute to the Morse boundary of G. I will explain why then each connected component of the Morse boundary with at least two points originate from the Morse boundary of a vertex group. This is joint work with Elia Fioravanti.

Xabier Legaspi Juanatey (Université de Rennes 1 / Instituto de Ciencias Matematicas): *A review of the contraction property*

There are plenty of reformulations of hyperbolicity. One of them describes geodesics of hyperbolic spaces in terms of the contraction property, which permits to generalise hyperbolic groups to those just containing a contracting element. In this talk, I will give a quick overview of the different reformulations of the contraction property.

Marta Leśniak (University of Gdańsk): *Generating the mapping class group of a nonorientable surface by three torsions*

We prove that the mapping class group of a closed nonorientable surface of genus different than 4 is generated by three torsion elements, and for large enough genus these torsion elements can be chosen to be conjugate. The same is also shown for the twist subgroup of the mapping class group.

Yusen Long (Université Paris-Saclay): *Action by isometries of amenable group on quasi-tree and its application to big mapping class group (in progress)*

One studies the group action by isometries on a quasi-tree. Similar to the case of trees, the action of an amenable group acting on a quasi-tree by isometries cannot be of general type. This is shown by considering an invariant probability measure defined on the Busemann compactification of a quasi-tree. One applies these results to study the action of an amenable subgroup of the big mapping class group on a surface with non-displaceable subsurfaces.

Antonio Lopez Neumann (École Polytechnique): *Vanishing of L^p-cohomology in degree 2 for some higher rank simple Lie groups*

L^p-cohomology is a quasi-isometry invariant popularized by Gromov. For simple Lie groups, he predicts a classical behaviour of L^p-cohomology (vanishing for every $p > 1$) in degrees below the rank. It was first shown by Bader-Furman-Gelander-Monod that this is true in degree 1. We show it also holds in degree 2 for some higher rank non-Archimedean simple Lie groups. Our techniques can be adapted and complemented with previous vanishing results by Bourdon-Rémy to show vanishing for all $p > 1$ in degree 2 for some higher rank real simple Lie groups.

Thomas Ng (Technion): *Locally uniform exponential growth in automorphism groups*

Growth of finitely generated groups studies the cardinality of balls as the radius grows. Precise growth rates are generating set dependent. It is, however, sometimes possible to obtain uniform control over growth rates over all generating sets. I will discuss both algebraic and geometric tools relating the subgroup and quotient structure of a group to such uniform growth bounds. Using these ideas, we will discuss joint work with Robert Kropholler and Rylee Lyman proving an exponential growth gap for subgroups generated by automorphisms of one-ended hyperbolic groups with extensions to automorphisms of certain right-angled Artin groups and relatively hyperbolic groups.

Anna Parlak (University of Warwick): *Pseudo-Anosov homeomorphisms via veering triangulations*

Veering triangulations combinatorially encode pseudo-Anosov flows without perfect fits. In particular, they can be used to study different ways in which a hyperbolic 3-manifold fibers over the circle.

I will advertise some tools - implemented by Henry Segerman, Saul Schleimer and myself - that use a veering triangulation of a fibered 3-manifold to obtain information about pseudo-Anosov monodromies of its fibrations.

Anja Randecker (Heidelberg University): *Conjugacy classes of big mapping class groups*

Surfaces of infinite topological type have mapping class groups which are called "big" (here: uncountable) and have an interesting topology (here: non-discrete). This lets us ask many new questions: When considering the conjugacy action of a big mapping class group on itself, can there be comeager orbits? Or at least dense orbits? Or at least somewhere dense orbits?

I'll introduce these questions and hint at the answers, based on joint work with Jesús Hernández Hernández, Michael Hrušák, Israel Morales, Manuel Sedano, and Ferrán Valdez.

Jacob Russell (Rice University): *Purely pseudo-Anosov subgroups of fibered 3-manifold groups*

After defining convex cocompact subgroups of the mapping class group, Farb and Mosher asked if every finitely generated and purely pseudo-Anosov subgroup had to be convex cocompact. While still open, the answer has been shown to be "yes" when the subgroup is contained inside certain subgroups of the mapping class group. A nice class of subgroups of the mapping class group arise from the inclusion of fibered 3-manifold groups via the Birman exact sequence. Dowdall, Kent, and Leininger showed that when the fibered 3-manifold is hyperbolic, its finitely generated and purely pseudo-Anosov subgroups are always convex cocompact as a subgroup of the mapping class group. In joint work with Chris Leininger, we show that the same is true when the fibered 3-manifold is not hyperbolic.

Donggyun Seo (Seoul National University): *Stable translation length of RAAGs on their hyperbolic graphs*

Many authors showed that RAAGs (a.k.a. right-angled Artin groups, partially commutative groups) act on Gromov-hyperbolic graphs, namely, extension graphs similar to mapping class group actions on their curve graphs. In this talk, I will talk about what kind of number can be realized by stable translation lengths of RAAGs on their extension graphs. This is joint work with Harry Baik and Hyunshik Shin.

Davide Spriano (Oxford University): *Recognize hyperbolicity with languages*

It is a known fact that quasi-geodesics in a hyperbolic group form regular languages. We prove that the converse holds, providing a new characterization of hyperbolic groups. This is joint work with Sam Hughes and Patrick Nairne.

Philippe Tranchida (KAIST): *Asymptotic translation lengths of pseudo-Anosov maps vs. their action on homology*

The mapping class group of a surface has natural actions by isometries on the curve graph and on the Teichmuller space. For any subgroup H of the mapping class group, it is then interesting, in both cases, to investigate the minimum asymptotic translation lengths of mapping classes in H. Perhaps surprisingly, this minimum is related to the action of H on the first homology of the underlying surface.

Abdul Zalloum (Queens University): *Hyperplanes in locally quasi-cubical spaces*

(Joint with Petyt and Spriano) A revolutionary work of Sageev shows that the entire geometry of a CAT(0) cube complex is dictated by its hyperplanes and the way they interact with one another.

A space is said to be *locally quasi-cubical* if the convex hull of any finite set of points is approximated by a CAT(0) cube complex. Examples of such spaces include mapping class groups, Teichmüller spaces, CAT(0) cube complexes and hierarchically hyperbolic spaces.

I will introduce a notion of a hyperplane for locally quasi-cubical spaces and show that such hyperplanes describe a great deal of their ambient geometry.