Abstracts

Marc Bourdon (University of Lille)

Title: L^p-cohomology of topological groups: quasi-isometric invariance and applications

Abstract: The L^p-cohomology of a topological group G is the continuous group cohomology of G with values in the regular representation on $L^p(G)$. We show that it is a quasi-isometric invariant of G. As an application we obtain some partial vanishing results for the L^p cohomology of simple Lie groups of higher rank. This is a joint work with Bertrand Remy.

Michael Brandenbursky (Ben Gurion University of the Negev)

Title: Entropy, metrics and quasi-morphisms

Abstract: One of the mainstream and modern tools in the study of non abelian groups are quasi-morphisms. These are functions from a group to the reals which satisfy homomorphism condition up to a bounded error. Nowadays they are used in many fields of mathematics. For instance, they are related to bounded cohomology, stable commutator length, metrics on diffeomorphism groups, displacement of sets in symplectic topology, dynamics, knot theory, orderability, and the study of mapping class groups and of concordance group of knots. Let S be a compact oriented surface. In this talk I will discuss several invariant metrics and quasi-morphisms on the identity component $Diff_0(S, area)$ of the group of area preserving diffeomorphisms of S. In particular, I will show that some quasi-morphisms on $Diff_0(S, area)$ are related to the topological entropy. More precisely, I will discuss a construction of infinitely many linearly independent quasi-morphisms on $Diff_0(S, area)$ whose absolute values bound from below the topological entropy. If time permits, I will define a bi-invariant metric on this group, called the entropy metric, and show that it is unbounded. Based on a joint work with M. Marcinkowski.

Kai-Uwe Bux (Bielefeld University)

Title: Arc matching complexes and higher generation in braid groups

Abstract: Abels-Holz have introduced the concept of higher generation. By definition, a group G is m-generated by a family of subgroups $H_1, H_2, ..., H_n$ if the nerve N of the cover of G by cosets gH_i is $(m-1)$-connected. Note that N is connected if and only if G is generated by the union of the H_i. This is to say that G is 1-generated by the H_i. Similarly, G is the free product of the H_i amalgamated along their intersections if and only if N is

connected and simply connected. I.e., G is 2-generated in this case. I shall discuss the case where G is a braid group and provide a model for the nerve N for some families $H_1, ..., H_n$ that are of particular interest. These coset nerves have some similarities to the arc complex of a surface and also relate to the matching complex of a graph. I will discuss some results on higher generation in this context. The coset nerves we encounter here also arise as relative links in filtrations that can be used to derive finiteness properties of braided Thompson and Houghton groups.

Michael Davis (Ohio State University)

Title: Curve complexes of Artin groups and Borel-Serre bordifications of hyperplane arrangement complements

Abstract: This will be a report on work in progress with Jingyin Huang. The complement of an arrangement of linear hyperplanes in a complex vector space has a natural "Borel-Serre bordification" as a smooth manifold with corners. Its universal cover is analogous to the Borel-Serre bordification of an arithmetic lattice acting on a symmetric space as well as to the Harvey bordification of Teichmuller space. In the first case the boundary of this bordification is homotopy equivalent to a spherical building; in the second case it is homotopy equivalent to curve complex of the surface. In the case of a reflection arrangement the boundary of its universal cover is the "curve complex" of the corresponding spherical Artin group. By definition this is the simplicial complex of all conjugates of proper, irreducible, spherical parabolic subgroups in the Artin group. A cohomological method is used to show that the curve complex of a spherical Artin group has the homotopy type of a wedge of spheres.

Carlos De la Cruz (ETH Zürich)

Title: Measured Stiefel complexes and bounded cohomology

Abstract: We present a new kind of complexes, the so-called Stiefel complexes, that are associated to any vector space over a local field equipped with a sesquilinear form. They live in the category of measure-class spaces, and admit a highly transitive action of the automorphism group of the form. After describing their construction, we will focus on the case where the form is symplectic: we will explain the construction of explicit probability measures on the associated Stiefel complex and give a proof of its high (measurable) connectivity. As an application, we derive bounded-cohomological stability of the family of symplectic groups and of their lattices. This is joint work with Tobias Hartnick.

Jan Dymara (IMPAN and Uniwersytet Wrocławski)

Title: Tautological classes in group cohomology

Abstract: The tautological cochain of a simplicial complex maps a simplex to the same simplex treated as an element of the chain group. Passing to a suitable quotient of the chain group one can turn this cochain into a cocycle. If the simplicial complex is acted upon by a group G, one can further produce a tautological G-invariant cocycle. If the complex is contractible, one can get a group cohomology class. We investigate this procedure for several linear groups (like $PSL(2,K)$, $PSp(2n,K)$ or $PGL_+(n,K)$) and their actions on complexes spanned by "generic" configurations of points in projective spaces (or Grassmannians). This is a joint work with T. Januszkiewicz and L. Kramer.

Elia Fioravanti (University of Oxford)

Title: Cross ratios on cube complexes and length-spectrum rigidity

Abstract: A conjecture from the 80s claims that the isometry type of a closed, negatively-curved Riemannian manifold should be uniquely determined by the lengths of its closed geodesics. By work of Otal, this is equivalent to the problem of extending cross-ratio preserving maps between Gromov boundaries of simply connected, negatively-curved manifolds. Progress on the conjecture has been remarkably slow, with only the 2-dimensional and locally symmetric cases having been solved so far (Otal '90 and Hamenstädt '99). Still, it is natural to try leaving the world of manifolds and address the conjecture in the general context of non-positively curved metric spaces. We restrict to the class of CAT(0) cube complexes, as their geometry is both rich and well-understood. We consider a new notion of cross ratio on their horoboundary and use it to provide a full answer to the conjecture in this setting. More precisely, we show that essential, hyperplane-essential cubulations of Gromov-hyperbolic groups are completely determined by their combinatorial length functions. One can also consider non-proper non-cocompact actions of non-hyperbolic groups, as long as the cube complexes are irreducible and have no free faces. Joint work with J. Beyrer (Heidelberg).

Koji Fujiwara (Kyoto University)

Title: Group actions on quasi-trees

Abstract: A quasi-tree is a geodesic metric space which is quasi-isometric to a tree. We give a general construction of actions of groups on quasi-trees. As an application, we show that mapping class groups act on finite products of quasi-trees so that orbit maps are quasi-isometric embeddings. It implies

that mapping class groups have finite asymptotic dimension. This is a joint work with Bestvina and Bromberg.

Nicolaus Heuer (University of Oxford)

Title: The Spectrum of Simplicial Volume

Abstract: Simplicial volume was first introduced by Gromov to study the minimal volume of manifolds. Since then it has emerged as an active research field with a wide range of applications. However, not much is known about the actual set of simplicial volumes for manifolds of a fixed dimension d: Only for $d = 2, 3$ this set is known by explicit calculations and using Geometrization. In joint work with Clara Löh, we show that for d larger than 3, the set of simplicial volumes is dense in R^+. For $d = 4$, we obtain that every non-negative rational number may be realised as the simplicial volume of some 4-manifold. We show these statements using stable commutator length. This is joint work with Clara Löh (University of Regensburg).

Martin Kassabov (Cornell University)

Title: Graph Complexes, Kontsevich Theorem and Simplicial Operads

Abstract: I will go over the construction of graphs homology for cyclic operads and explain an old result of Kontsevich which relates the graph homology of the associate and the Lie operads with the cohomology of mapping class groups and the automorphism groups of free groups. There is a natural/geometric definition of the graph homology defined for all simplicial operads. Using this definition one can obtain an alternative proof of the Kontsevich theorem which reduces to the observation that a pair of classifying spaces essentially coincide. (Based on join work with Yuri Berest.)

Robert Kropholler (Tufts University)

Title: Almost finitely presented subgroups of hyperbolic groups

Abstract: Groups which were almost finitely presented but not finitely presented (FP_2 not F_2) were first constructed by Bestvina and Brady. Since then many more such groups have been constructed by various people using similar techniques. We give the first construction of almost finitely presented subgroups of hyperbolic groups. The key techniques are branched covers and Morse theory. We will discuss some examples of these techniques and describe the how they can be extended to create the subgroups in question.

Ian Leary (University of Southampton)

Title: CAT(0) groups need not be biautomatic

Abstract: Ashot Minasyan and I construct (find?) examples of groups that establish the result in the title. These groups also fail to have Wise's property: they contain a pair of elements no powers of which generate either a free subgroup or a free abelian subgroup. I will discuss these groups.

Michał Marcinkowski (IMPAN)

Title: Bounded cohomology of transformation groups

Abstract: Let M be a finite-volume Riemannian manifold and let μ be the measure induced by the volume form. Denote by G_M the group of all μ-preserving homeomorphisms of M isotopic to the identity. We show how to construct classes in the bounded cohomology of G_M. As an application we show that, under certain conditions on $\pi_1(M)$, the third bounded cohomology of G_M (and some of its subgroups) is highly non-trivial. It is a joint work with Michael Brandenbursky.

Kevin Schreve (University of Chicago)

Title: Proper actions versus uniform embeddings

Abstract: Whenever a finitely generated group G acts properly discontinuously by isometries on a metric space X, there is an induced uniform embedding (a Lipschitz and uniformly proper map) $f\colon G \to X$ given by mapping G to an orbit. I will talk about some examples of groups which uniformly embed into a contractible n-manifold but do not act on a contractible n-manifold. Kapovich-Kleiner constructed torsion-free hyperbolic groups that embed into R^3 but only act on R^4. My main application will be showing that k-fold direct products of these groups do not act on R^{3k}.

Rachel Skipper (University of Goettingen and ENS de Lyon)

Title: Finiteness properties of simple groups

Abstract: A group is said to be of type F_n if it admits a classifying space with compact n-skeleton. We will consider the class of Röver-Nekrachevych groups, a class of groups built out of self-similar groups and Higman-Thompson groups, and use them to produce a simple group of type F_{n-1} but not of type FP_n for each n. These are the first known examples for $n > 2$. This is a joint work with Stefan Witzel and Matthew C. B. Zaremsky.

Andreas Thom (TU Dresden)

Title: Cohomological obstructions to stability

Abstract: I will review recent joint work with Marcus de Chiffre, Lev Glebsky and Alex Lubotzky, where we used cohomological methods to study questions of stability of almost homomorphisms.

Stefan Witzel (Ecole polytechnique)

Title: Finiteness properties of arithmetic approximate groups

Abstract: Approximate groups are a generalization of groups that arises naturally in the context of geometric group theory. I will explain how S-arithmetic approximate groups arise in perfect analogy with S-arithmetic groups. I will then present joint work with Tobias Hartnick, establishing topological finiteness properties of certain S-arithmetic approximate subgroups of semisimple groups over number fields. The result is the number field-analogue of the so-called Rank Theorem.