Nonpositively Curved Groups on the Mediterranean
Titles & Abstracts

Jason Behrstock:
Title: Quasiflats in hierarchically hyperbolic spaces

Abstract: Hierarchically hyperbolic spaces provide a uniform framework for working with many important examples, including mapping class groups, right angled Artin groups, Teichmuller space, and others. In this talk I'll provide an introduction to studying groups and spaces from this point of view. This discussion will center around recent work in which we classify quasiflats in these spaces, thereby resolving a number of well-known questions and conjectures.
This is joint work with Mark Hagen and Alessandro Sisto.

Indira Chatterji:
Title: A flow on delta hyperbolic and fine graphs.

Abstract: We construct a flow on any delta hyperbolic and fine graph, that allows us to flow one point towards another through probability measures on the graph. This flow uses a family of reasonable paths, that are quasi-geodesics in Alvarez-Lafforgue's settings of Cayley graphs of delta hyperbolic groups, but conical quasi-geodesics in the absence of local finiteness. This flow then allows us to define random coset representatives for parabolic subgroups of a relatively hyperbolic group, and to extend several types of actions of the parabolic subgroups to the whole group. This is joint work with François Dahmani.

Matthew Cordes:
Title: Convex cocompactness in finitely generated groups

Abstract: A Kleinian group is convex cocompact if its orbit in hyperbolic 3-space is quasi-convex or, equivalently, that it acts cocompactly on the convex hull of its limit set in in hyperbolic 3-space.

Subgroup stability is a strong quasi-convexity condition in finitely generated groups which is intrinsic to the geometry of the ambient group and generalizes the classical quasi-convexity condition above. Importantly, it coincides with quasi-convexity in hyperbolic groups and the notion of convex cocompactness in mapping class groups which was developed by Farb-Mosher, Kent-Leininger, and Hamenstädt.

Using the Morse boundary, I will describe an equivalent characterization of subgroup stability which generalizes the above boundary characterization from Kleinian groups. Along the way I will discuss some known results about stable subgroups of various groups, including the mapping class group and right-angled Artin groups. The talk will include joint work with Matthew Gentry Durham and joint work with David Hume.

Rémi Coulon:
Title: Non positive curvature in the Burnside variety ?

Abstract : Given an integer n, the Burnside variety of exponent n consists of all groups satisfying the law x^n = 1.
Its study was originally motivated by a question of W. Burnside who asked whether every finitely generated group in this variety is necessarily finite.
It turns out that for sufficiently large exponent n the answer is negative. In particular free Burnside groups are infinite.

At first sight these groups have nothing to to with negative curvature. Nevertheless their local geometry is very close to the one of hyperbolic groups.
I will explain how to take advantage of this feature, in particular to develop a small cancellation theory in the Burnside variety.

Talia Fernos:
Title: Boundaries of CAT(0) cube complexes

David Futer:
Title: Random quotients of cubulated hyperbolic groups

Jonah Gaster:
Title: Curves on surfaces, hyperbolic length, and dual cube complexes

Ilya Gekhtman:
Title: "Green metric and Martin boundary for relatively hyperbolic groups."

Abstract: Generalizing results of Ancona for hyperbolic groups, we prove that a random path between two points in a relatively hyperbolic group (e.g. a nonuniform lattice in hyperbolic space) has a uniformly high probability of passing any point on a word metric geodesic between them that is not inside a long subsegment close to a translate of a parabolic subgroup. We use this to relate three compactifications of the group: the Martin boundary associated with the random walk, the Bowditch boundary, associated to an action of the group on a proper hyperbolic space, and the Floyd boundary, obtained by a certain rescaling of the word metric. We demonstrate some dynamical consequences of these seemingly combinatorial results. For example, for a nonuniform lattice G in hyperbolic space Hn, we prove that the harmonic (exit) measure on the boundary associated to any finite support random walk on G is singular to the Lebesgue measure.
Moreover, we construct a geodesic flow and G invariant measure on the unit tangent bundle of hyperbolic space projecting to a finite measure on T1Hn/G whose geodesic current is equivalent to the square of the harmonic measure. The axes of random loxodromic elements in G equidistribute with respect to this measure.
Analogous results hold for any geometrically finite subgroups of isometry groups of manifolds of pinched negative curvature, or even proper delta-hyperbolic metric spaces.

Daniel Groves:
Title: Hyperbolic groups acting improperly

Abstract: We prove that if a hyperbolic group G acts cocompactly on a CAT(0) cube complexes and the cell stabilizers are quasiconvex and virtually special, then G is virtually special. This generalizes Agol's Theorem (the case shen the action is proper) and Wise's Quasiconvex Hierarchy Theorem (the case when the cube complex is a tree). We also prove some basic structural geometric properties about the Sageev construction in the case of a hyperbolic group and quasi-convex codimension 1 subgroups.
This is joint work with Jason Manning.

Mark Hagen:
Title: Introduction to hierarchically hyperbolic spaces

Abstract: Hierarchical hyperbolicity is a unified framework for studying many interesting spaces and groups: mapping class groups, many cube complexes, Teichmuller space, etc. I will introduce hierarchically hyperbolic spaces, mentioning the main examples and some applications. The main part of the talk will

be about the definition itself, illustrated by a concrete example. I will also explain some of the main tools: distance formula, realisation theorem, standard product regions and how to cone them off; these tools illustrate why the definition is the way it is

Chris Hruska:
Title: "Distortion of surface subgroups in nongeometric 3-manifolds
(Joint work with Hoang Thanh Nguyen)

Abstract: Nongeometric (compact) 3-manifolds come in two types: graph manifolds (in which all JSJ components are Seifert fibered) and mixed manifolds (in which at least one JSJ component is hyperbolic). Work of Hruska-Nguyen and of Nguyen on surface subgroups of nongeometric 3-manifold groups has led to a complete determination of the distortion of any surface subgroup in such a manifold. The distortion is either linear, quadratic, exponential, or double exponential, depending on the geometry of the surface immersion.

Huang Jingyin:
Title: Quasi-isometries between higher rank CAT(0) spaces;

Abstract: This is a survey talk on quasi-isometric rigidity of higher rank CAT(0) spaces. We will model on the rigidity results of Kleiner-Leeb and Eskin-Farb on quasi-isometric rigidity of higher symmetric spaces, and make comparisons with several other non-positively curved spaces/groups.

Curtis Kent:
Title: Tits boundaries of CAT(0) groups

Abstract: There is a canonical embedding of the Tits boundary of a CAT(0) space X into any asymptotic cone of X. I will show how to endow the set of asymptotic cones of a CAT(0) space with a limit structure which respects this embedding. I will show that the direct limit of the asymptotic cones of a CAT(0) space is isometric to the Euclidean cone on its Tits boundary and the connecting maps are determined by the topology on the visual boundary. As an application, we will give a geometric proof that quasi-isometric CAT(0) groups with compact Tits boundaries have bi-Lipshits Tits boundaries.

Mahan MJ:
Title: Cubulating surface-by-free groups

Abstract: Let $1 \to H \to G \to Q \to 1$ be an exact sequence where $H= \pi_1(S)$ is the fundamental group of a closed surface S of genus greater than one, G is hyperbolic and Q is finitely generated free.
We shall describe sufficient conditions to prove that G is cubulable. The main result may be thought of as a combination theorem for virtually special hyperbolic groups when the amalgamating subgroup is not quasiconvex.

Ingredients include the theory of tracks, the quasiconvex hierarchy theorem of Wise, the distance estimates in the mapping class group from subsurface projections due to Masur-Minsky et al and the model for doubly degenerate Kleinian surface groups used in the proof of the ending lamination theorem. This is joint work in progress with Jason Manning and Michah Sageev.

Damain Osajda:
Title: Two-dimensional Artin groups and systolicity (joint with Jingyin Huang)

Dani Pallavi:

Title: "Subgroup distortion in hyperbolic groups

Abstract: I would survey what is known about subgroup distortion and then talk about joint work with Tim Riley in which we construct free subgroups of hyperbolic groups with distortion functions $2^{n^{p/q}}$, for all integers $p > q > 0$.)"

Piotr Przytycki:
Title: A CAT(0) space for the tame automorphism group

Abstract: The 3-dimensional tame automorphism group Tame (k^3) is the group of automorphisms of the affine space k^3 generated by affine maps and maps of form (x, y, z) → (x + P(y, z), y, z) for P a polynomial in k[y, z]. We construct a simply-connected non-positively curved space with an action of Tame(k^3). That leads to the classification of finite subgroups of Tame(k^3). This is joint work with Stéphane Lamy."

Alessandro Sisto:
Title: Actions and geometry of Gromov's monsters

Abstract: There are two types of groups containing expanders, also known as Gromov's mosters. The "random Gromov's monsters" are constructed, following Gromov and Arzhantseva-Delzant, using random labellings on suitable expanders. On the other hand, Osajda (again using probabilistic arguments) showed that there are labellings on suitable expanders satisfying a graphical small-cancellation condition, yielding the "graphical Gromov's monsters". These two types of Gromov's monsters look superficially similar, but in fact they are quite different. More specifically, I will discuss the
fact that graphical Gromov's monsters are acylindrically hyperbolic, while random Gromov's monsters cannot act non-elementarily on hyperbolic spaces. In particular, groups of the latter type cannot be isomorphic to groups of the former type. What is more, random Gromov's monsters cannot even be quasi-isometric to graphical Gromovs's monsters, since, as I will explain, the latter have linear divergence along a subsequence.
This same phenomenon can also be used to show that there are uncountably many quasi-isometry types of random Gromov's monsters.
The proofs rely on comparing random walks on expander graphs with random walks on the corresponding groups, following Naor-Silberman.
Based on joint works with Dominik Gruber and Romain Tessera.

Eric Swenson:
Title: Semi stability and non positive curvature.

Jing Tao:
Title: Stable commutator lengths in right-angled Artin groups.

Genevieve Walsh:
Title: Party with boundaries.

Abstract: I will review the definition of relatively hyperbolic group pairs and their (Bowditch) oundaries. I will discuss relations with other types of boundaries and use this to construct lots of examples of boundaries of relatively hyperbolic group pairs. Since I plan on giving this talk on the whiteboards, the examples of boundaries will be planar. I'll talk about what of the boundary of the group pair can tell us about the group, in some cases with very explicit answers. Any new results stated will be joint work with Haissinsky and Paoluzzi, or separate joint work with Hruska.

Daniel Woodhouse:
Title: CAT(0) cube complexes.
Probably joint work with Emily Stark on simple surface amalgams."

Wenyuan Yang:
Genericity of contracting elements in nonpositively curved groups. The main results are as follows: The proportion of rank-1 elements inside a growing ball in CAT(0) metric tends to 1 in CAT(0) groups. The same results hold for hyperbolic elements in relatively hyperbolic groups for word metric, and pseudo-Anosov elements in mapping class groups for Teichmuller metric. More details, see https://arxiv.org/abs/1707.06006

Lightning talks titles:

Carlos De la Cruz Mengual: Stability in continuous bounded cohomology

Matthew Durham: Geometry of surface group extensions by Veech groups

Elia Fioravanti: "Cross ratios and isometries of CAT(0) cube complexes".

Radhika Gupta: Homotopy type of the free factor complex

Antonius Hase: Quaternionic symmetric spaces

Kasia Jankiewicz: Cubical dimension of C'(1/6) groups

Arpan Kabiraj: Goldman Lie algebra

Claudio Llosa Isenrich - Kähler groups and subdirect products of surface groups

Christopher Perez- Elementary Theories and Embeddings of Toral Relatively Hyperbolic Groups

Tomasz Prytuła: Classifying space for proper actions for groups admitting a strict fundamental domain

Federico Vigolo: 'Cube Complexes with Coupled Links'

Feng Zhu: A notion of geometric finiteness in higher rank