Paroles aux jeunes chercheurs en géométries et groupes : Programme

Université de Strasbourg, 28-30 Novembre 2016

LUNDI 28 NOVEMBRE

13h 30 : Accueil au café

14h-14h50 : Moritz GRUBER (Karlsruher Institut für Technologie)
Filling functions of stratified nilpotent Lie groups
Large scale geometry describes the properties of a metric space, which are invariant under quasi-isometries. The filling functions are such invariants. Roughly speaking, they measure how difficult it can get to fill a given boundary. I will introduce these functions for Riemannian manifolds and give an outline of their behaviour for spaces with curvature bounds. Further I will discuss some new results for filling functions for a class of nice-behaving nilpotent Lie groups.

15h10-16h : Dominik FRANCOEUR (Université de Genève)
Maximal Subgroups in Branch Groups
Branch groups are a class of groups which act on rooted trees in a way reminiscent of the action of the whole automorphism group of the tree. Since their introduction by Grigorchuk, branch groups have garnered a lot of attention as a rich source of easy to describe examples of groups with exotic properties, such as finitely generated infinite torsion groups and groups of intermediate growth. Despite intensive research, many aspects of these groups remain mysterious, notably the question of which branch groups admit maximal subgroups of infinite index.

We will discuss what is known about this question and present new examples of branch groups with maximal subgroups of infinite index, the first among groups of intermediate growth. This is joint work with Alejandra Garrido.

Pause thé

17h-17h50 Alexandre BELLIS (Université de Rennes I))
On the topological dynamics of geodesic flow
We consider a hyperbolic surface coming from a Fuchsian group without torsion. The topology of horocycles on such surfaces is completely described in the convex cocompact case : horocycles are either dense in the non-wandering set or closed topologically. But in the general case, the situation is different and the closure of a horycle may be more complex. Using the injectivity radius along a geodesic ray, we will explain the different types of closures of horocyclic orbits in the general case.

MARDI 29 NOVEMBRE

9h30-10h20 : Sabine BRAUN (Karlsruher Institut für Technologie)
Simplicial and Riemannian volume
Simplicial volume is a homotopy invariant of closed manifolds - defined in terms of the singular chain complex - which measures the efficiency of representing the fundamental class by singular chains. So it gives an indication of how difficult it is to triangulate the manifold in question. It was first introduced by Gromov in the early 1980's and since then

it has been central to the investigation of the relationship between the large scale geometry and the topology of manifolds. The most fundamental theorem in this subject is Gromov's Main Inequality which bounds the simplicial volume of a manifold M by its Riemannian volume provided M satisfies a lower Ricci curvature bound.

After a short introduction to simplicial volume, I will address new developments around curvature-free versions of the main inequality.

Pause café

11h-11h50 : Stéphane MARSEGLIA (Université de Strasbourg)
Convex projective manifolds of finite volume
A convex projective manifold is the quotient of an open convex subset of the real projective space by a discrete group of projective transformations. We consider the set of holonomies of strictly convex projective structures. When the convex projective manifolds are compact, results of Koszul and Benoist show that this set of holonomies is a union of connected components of the representation variety. In order to extend this fact to the case of convex projective manifolds of finite volume, we will explain how to prove the closeness. The openness has already been proved by Cooper, Long and Tillmann a year ago.

Repas

14h-14h50 : Anna SCHILLING (Ruprecht-Karls-Universität Heidelberg)
Compactifications of Symmetric Spaces
In order to compactify proper metric spaces, Gromov introduced the horofunction compactification. For finite-dimensional normed spaces, Walsh explicitely determined the set of Busemann points, which form a subset of the horofunctions. In this talk, we explain the general construction of the horofunction compactification for metric spaces and then focus on finite-dimensional normed spaces with polyhedral norms, for which all horofunctions are Busemann points. We characterize converging sequences in the horofunction compactification and, if time permits, show that the compactification is homeomorphic to the dual unit ball by an explicit map. This result is joint work with Lizhen Ji.

15h10h-16h : Sébastien MIQUEL (Université Paris-Sud, Orsay)
Arithmeticity of subgroups generated by unipotents in products of rank one Lie groups
We consider discrete, Zariski-dense subgroups of a real Lie group G which contain a lattice inside the unipotent radical of a parabolic subgroup of G. For most simple Lie groups G of real rank greater than 1, it was proven by Hee Oh that such a discrete subgroup is always an arithmetic lattice. For G a rank 1 group such as SL(2,R), this is not always the case. We take G to be a product of Lie groups of real rank 1 (this was originally investigated by Selberg when G is a product of SL2's), then, under a suitable condition, all such discrete subgroups are again arithmetic. We'll give a proof of this when G is a product of orthogonal groups of rank 1.

Pause thé

16h40-17h30 : Clément GUERIN (Université de Strasbourg)

Centralizers of irreducible subgroups and singular locus of the character variety in the projective special linear group

It has been known for some time that an irreducible representation of a Fuchsian group (e.g. a surface group) into complex simple Lie groups is a non-singular point of the representation variety. However, on the character variety, this might lead to orbifold singularities. In order to study those particular singularities, one needs to understand centralizers of irreducible representations, we will explain what happens when the Lie group is $PSL(n, \mathbf{C})$. 19h30 : Dîner de la conférence

MERCREDI 30 NOVEMBRE

9h30-10h20 : Léo Brunswick (Université d'Avignon et des Pays de Vaucluse)

Decorated Teichmüller space, polyhedral surfaces and singular space-times

The Teichmüller space parametrizes the complete hyperbolic metrics on a given surface up to equivalence. In 1987, Penner introduced a so-called decorated Teichmüller space (a fiber bundle over the usual Teichmüller space) in order to obtain a stratification of the Teichmüller space. His construction can be re-explained using flat space-times and BTZ-extensions of flat space-times. This leads to correspondences between complete hyperbolic surfaces, Cauchy-compact space-times with BTZ and compact singular Euclidean surfaces. As by products, we obtain a parametrization of Cauchy-compact flat space-times with BTZ and a the existence of polyhedral Cauchy-surfaces in every such space-time.

Pause café

10h50-11h40 : Andrea Tamburelli (Université du Luxembourg)

Surfaces with prescribed metric in Anti-de-Sitter 3-manifolds

The study of Anti-de Sitter geometry has grown in interest since Mess discovered many similarities with hyperbolic geometry and many connections to Teichmuller theory. In this talk I will introduce globally hyperbolic Anti-de Sitter 3-manifolds and explain how it is possible to prescribe the induced metrics on the boundary components.

12h-12h50 : Elena Frenkel (Université de Strasbourg)

On some of Euler's works and their analogs in hyperbolic geometry

My talk will be about the hyperbolic analogue of work of Leonhard Euler on area of spherical triangles. I will give a formula for the area of hyperbolic triangles in terms of the side lengths. I will speak furthermore about the Lexell problem in hyperbolic plane, that is, the problem of finding the locus of vertices of triangle of fixed area and fixed basis, and its application.