

Mini-Courses

Name	Sam Ballas
Title	Deformations of Properly Convex Projective Structures
Abstract	Properly convex projective structures offer a flexible generalization of finite-volume hyperbolic structures. While hyperbolic structures are quite rigid their properly convex counterparts have a very interesting deformation theory. In the last 10 years much has been learned about properly convex structures, particularly by Benoist in the closed case. However, there is still much to be explored, particularly in the non-compact setting. In these talks I will discuss various aspects of the geometry of properly convex sets and the deformation theory of convex projective structures on manifolds, with a focus on the 3-dimensional non-compact case.

Name	Ana Peón-Nieto
Title	Connected components of representation varieties. A view through Higgs bundles.
Abstract	Given a Riemann surface X , Teichmüller space can be identified with a connected component of the representation variety $\text{Hom}(\pi_1(X), \text{PSL}(2, \mathbb{R}))$. Hitchin generalised this result to split real forms G , identifying a connected component of $\text{Hom}(\pi_1(X), G)$ (called the Hitchin--Teichmüller component) via the so called Hitchin-section. In the particular case of $\text{PSL}(n, \mathbb{R})$, he identified the total number of connected components of the moduli space depending on the parity of n . I will explain his results, complementing them with a new point of view developed since on moduli spaces of real Lie groups. Finally, I will explain how the Hitchin section can be generalised to arbitrary real groups, providing a tool to study other connected components for groups of non-tube Hermitian type.

Name	Maria Beatrice Pozzetti
Title	Boundary maps and maximal representations.
Abstract	Bounded cohomology is an useful tool to study representation varieties, since in many cases it allows to define numerical invariants, and select the so-called maximal representations. These generalize, in the appropriate setting, the Teichmüller space, and have nice geometric properties. In my minicourse I will discuss the relevant aspects of the theory of continuous bounded cohomology and focus on maximal representations with values in Hermitian Lie groups, comparing what is known for fundamental groups of surfaces and for complex hyperbolic

	lattices of dimension bigger than two. In this latter case I will discuss a rigidity result for representations with values in $SU(m,n)$. To prove it I will define natural incidence structures on the boundary of the complex hyperbolic space and on some suitable boundary S , the Shilov boundary, associated to the group $SU(m,n)$, and I will prove rigidity properties of "boundary" maps preserving these geometries.
--	---

Research Talks

Name	Ryan Greene
Title	Hyperbolic and projective structures on Coxeter orbifolds.
Abstract	Reflection groups have long been a source of examples in hyperbolic geometry and the study of real convex projective structures. I will discuss results on the existence and nonexistence of hyperbolic structures as well as the deformation theory of hyperbolic structures through nonhyperbolic projective structures on Coxeter orbifolds, a class of orbifolds naturally associated with reflection groups, including some recent joint work with S. Choi, G.-S. Lee, and L. Marquis.

Name	Yuichi Kabaya
Title	Exotic components in linear slices of quasi-Fuchsian groups
Abstract	The linear slice of quasi-Fuchsian punctured torus groups is defined by fixing the length of some simple closed curve to be a fixed positive real number. It is known that the linear slice is a union of disks, and it has one 'standard' component containing Fuchsian groups. Komori-Yamashita proved that there exist non-standard components if the length is sufficiently large. In this talk, I give another proof based on the theory of complex projective structures, and show a generalization to other surfaces.

Name	Kenji Kozai
Title	Hyperbolic structures from Sol on pseudo-Anosov mapping tori
Abstract	The invariant foliations of a pseudo-Anosov homeomorphism define a Euclidean structure on the surface, and the suspension flow endows the mapping torus with a (usually singular) Sol structure. In the case where the surface is a punctured torus, Heusener-Porti-Suarez and Hodgson have shown that the Sol structure on the 3-manifold can be deformed to hyperbolic cone structures. If the surface has higher complexity, then we show that given some additional restrictions on the pseudo-Anosov map, then the singular Sol structure can be deformed to hyperbolic cone structures that are nearby, in the sense of projective structures. The deformation is achieved by showing that the representation variety is

	smooth at the metabelian representation corresponding to a projection of the Sol structure onto an embedded hyperbolic plane, then utilizing Danciger's half-pipe geometry.
--	---

Name	Hidetoshi Masai
Title	Cusped random mapping tori are non-arithmetic.
Abstract	We consider random walks on the mapping class groups. This lets us consider random 3-manifolds by taking mapping tori. It has been shown that random walks give rise to pseudo-Anosov element with asymptotic probability one. Hence we may say "random mapping tori are hyperbolic". In this talk we consider arithmeticity of such random mapping tori. Our goal is to prove that random mapping tori are non-arithmetic if underlying surface has at least one puncture. We also mention the notion called fibered commensurability, which is the main ingredients of the proof.

Name	Laura Schaposnik
Title	Higgs bundles and branes in the A-model and B-model
Abstract	Through the hyperkähler structure of the moduli space of Higgs bundles for complex groups we shall construct three natural involutions whose fixed points in the moduli space give branes in the A-model and B-model with respect to each of the complex structures. Then, by means of spectral data, we shall look at these branes and their topological invariants, propose what the dual branes should be under Langlands duality and relate them to certain representations of 3-manifolds.

Name	Andy Sanders
Title	Hitchin harmonic maps are immersions
Abstract	In 1992, Hitchin used his theory of Higgs bundles to construct an important family of representations of the fundamental group of a closed, orientable surface of genus at least two into the split real form of a complex adjoint simple Lie group. These Hitchin representations comprise a component of the space of conjugacy classes of all such representations and are deformations of the irreducible Fuchsian representations which uniformize the surface. For any choice of marked complex structure on the surface and any Hitchin representation, we show that the corresponding equivariant harmonic map from the universal cover into the symmetric space is an immersion. Pulling back the Riemannian metric on the symmetric space, we construct a map from the space of Hitchin representations to the space of isotopy classes of Riemannian metrics on the surface. As an application of this procedure, we obtain a new lower bound on the exponential growth rate of orbits in

	the symmetric space under the action of the image of a Hitchin representation.
--	--

Name	Dmitriy Slutskiy
Title	Flexibility of hyperbolic polyhedra and Compact domains with prescribed convex boundary metrics in quasi-Fuchsian manifolds
Abstract	The first part of the talk will be about flexibility and infinitesimal flexibility of suspensions, or bipyramides. The second part of my talk is about a generalisation of a "French" result of the dissertation.