Talks titles and abstracts

Speaker: Lei Chen
Title: *Nielsen realization problem.*

Abstract: Nielsen realization problem asks whether the projection $\mathrm{Homeo}(M) \to \pi_0(\mathrm{Homeo}(M))$ has a section or not for a manifold M. This problem relates the existence of flat structure on the universal M-bundle. In this talk, I will focus on the case when M is a surface. I will talk about what other people have done in the past and then describe my results. The proof method involves homological obstruction, fixed point theory, surface dynamics and Poincaré–Birkhoff Theorem. This is partly a joint work with Markovic.

Speaker: Bassam Fayad
Title: *On local rigidity of linear abelian actions on the torus.*

Abstract: In which cases and ways can one perturb the action on the torus of a commuting pair of $\mathrm{SL}(n,\mathbb{Z})$ matrices? Two famous manifestations of local rigidity in this context are: 1) KAM-rigidity of simultaneously Diophantine torus translations (Moser) and 2) smooth rigidity of hyperbolic or partially hyperbolic higher rank actions (Damjanovic and Katok). To complete the study of local rigidity of affine abelian actions on the torus one needs to address the case of actions with parabolic generators. In this talk, I will review the two different mechanisms behind the rigidity phenomena in 1) and 2) above, and show how blending them with parabolic cohomological stability and polynomial growth allows to address the rigidity problem in the parabolic case. This is a joint work with Danijela Damjanovic and Maria Saprykina.

Speaker: David Fisher
Title: *Classifying* $\mathrm{SL}(n,\mathbb{R})$ *actions on n manifolds and new analytic actions of* $\mathrm{SL}(n,\mathbb{Z})$

Abstract: I will describe a classification of $\mathrm{SL}(n,\mathbb{R})$ actions on n-manifolds that is joint work with Karin Melnick. We also use the same ideas to build a new class of "exotic" analytic actions of $\mathrm{SL}(n,\mathbb{Z})$ on n-dimensional tori. The actions of $\mathrm{SL}(n,\mathbb{R})$ in this dimension manage to be both quite flexible and at the same time in a sense classifiable, which seems important for future work on the Zimmer program. The talk will include some history and motivation, some of which comes from the Zimmer program and some of which does not in quite surprising ways. I also hope to include some ideas of proofs and some open questions.

Speaker: Andrey Gogolev
Title: *Smooth rigidity for codimension one Anosov flows.*

Abstract: I will explain how to establish smoothness of a continuous conjugacy between two codimension one Anosov flows. The proof works for an open dense set of codimension one conservative Anosov flows on manifolds of dimension 4 or more. Joint work with F. Rodriguez Hertz.

Speaker: Sebastian Hurtado Salazar
Title: *Actions on the line of lattices in higher rank.*

Abstract: (Joint with Bertrand Deroin) We classify actions on the line and the circle by groups such as $\mathrm{SL}_2(O)$, where O is the ring of integers of $\mathbb{Q}(\sqrt{2})$. One of the ideas in the proof is a new method that allows to show that for certain actions of Lie groups of higher rank, stationary measures are invariant. We will explain this method and talk about other possible applications.

Speaker: Adam Kanikowski
Title: *Ergodic and statistical properties of smooth systems*

Abstract: We will discuss some classical ergodic (Bernoulli, K-property, positive entropy,...) and statistical (limit theorems, quantitative mixing,...) properties of smooth dynamical systems. We will focus on their flexibility (i.e., non-trivial examples of systems which satisfy some but not all of them) and rigidity (i.e., some properties imply other).

Speaker: Tamara Kucherenko
Title: *Flexibility of the Pressure Function*

Abstract: We discuss the flexibility of the pressure function of a continuous potential (observable) with respect to a parameter regarded as the inverse temperature. It is well known that the pressure function is convex, Lipschitz, and has an asymptote at infinity. We show that in a setting of one-dimensional compact symbolic systems these are the only restrictions. We present a method to explicitly construct a continuous potential whose pressure function coincides with any prescribed convex Lipschitz asymptotically linear function starting at a given positive value of the parameter. This is based on joint work with Anthony Quas.

Speaker: François Ledrappier
Title: *Entropies for negatively curved compact manifolds*

Abstract: Negatively curved compact manifolds give rise to several rich dynamics. In these

lectures we review some of their properties, in particular the different entropies and their relations. We will consider

- the ergodic theory entropy of the geodesic flow on the unit tangent bundle,
- the stochastic entropy of diffusions along the invariant manifolds of the geodesic flow, and
- the relative entropy of the stochastic flows associated to these diffusions.

The different dynamics have "natural" invariant (or stationary) probability measures that enter into simple formulas for the entropies.

Speaker: Kathryn Mann
Title: *Anosov flows, bifoliated planes, and ideal circles.*

Abstract: From an Anosov flow on a 3-manifold, one can extract an action of the fundamental group of the manifold on a plane preserving a pair of transverse foliations, and on a compactification of the plane by an ideal circle. My talks will give an introduction to this picture and show a recent application, joint with Thomas Barthelmé and Steven Frankel on the classification problem for Anosov flows. By proving rigidity results about group actions on planes and circles, we show that transitive (pseudo-)Anosov flows are determined (up to orbit equivalence) by the algebraic data of the set of free homotopy classes of closed orbits.

Speaker: Thang Nguyen
Title: *How hard is it to perturb a nice action?*

Abstract: Given a group acting nicely on a compact manifold, are we able to slightly perturb the action to obtain a new one? In joint works with C. Connell, M. Islam, and R. Spatzier, we give some answers to this question. We consider groups that are lattices or fundamental groups of non-positively curved manifolds, and compact manifolds that are geometric boundaries or Furstenberg boundaries. The results are related to ones obtained by Kanai, Katok–Spatzier, Bowden–Mann, and Mann–Manning. The proof uses ideas from dynamics of geodesics flow or Weyl chamber flow as well as coarse geometry of flats and symmetric spaces.

Speaker: Rafael Potrie
Title: *Some aspects of partially hyperbolic diffeomorphisms in dimension 3.*

Abstract: I will present some results that concern the geometry and dynamics of partially hyperbolic diffeomorphisms in 3D manifolds. On some classes of such diffeomorphisms, one can obtain unconditional results on ergodicity or rigidity of uu-states.

Speaker: Federico Rodriguez Hertz
Title: *Smooth conjugacy for codimension 1 Anosov diffeomorphisms.*

Abstract: In this talk we shall present joint work with A. Gogolev on some rigidity results in the setting of codimension one Anosov diffeomorphisms on manifolds of dimension larger than or equal to 3. This result is a further development of our program with Andrey of classifying smooth conjugacy via matching of jacobians. Even though the data is much coarser than the usual matching of derivatives it results in a more stable theory.

Speaker: Ralf Spatzier
Title: *Higher Rank Anosov Actions*

Abstract: Dynamical systems with extra symmetry turn out to be surprisingly rigid. For instance generically a diffeomorphism cannot have infinite index in its centralizer in the diffeomorphism group, as asserted by Smale and proved by Bonatti, Crovisier and Wilkinson. For hyperbolic systems one can hope to go one step further, and conjecture that such are always smoothly conjugate to an action on a homogeneous space (conjecture by Katok–Spatzier).
For a special class of hyperbolic actions, the so-called totally Cartan actions, this was proved recently (Vinhage–S). Most importantly, we introduce a novel way of providing a homogeneous structure to a system coming from actions of free products. As we will explain, this particular conjecture was motivated in part by the Zimmer program on actions of higher rank semisimple Lie groups and their lattices. And indeed, recently Butler, Damjanovic, Spatzier, Vinhage and Xu proved a classification result for (totally) Anosov volume preserving actions of such groups, using related tools.
These ideas are closely related to superrigidity, rank rigidity in Riemannian geometry. This will be the setting for the mini course, and also the promise and outlook for future work. I will first provide an overview of the subject, then explain details of this new tool for homogenization, and how it is used in Anosov dynamics and the Zimmer program.

Speaker: Dennis Sullivan
Title: *Quasiconformally flexible and quasiconformally rigid holomorphic equivalence relations which are recurrent*

Abstract: Consider an equivalence relation on a Riemann surface generated by countably many local holomorphic bijections . Example one : generated by a countable set of moebius transformations of the two sphere. Example two : generated by the inverse branches of a rational mapping of the two sphere . Suppose the orbit relation is recurrent : almost every orbit that intersects any set A of positive measure intersects A in an infinite set. The talk is about questions concerning the quasiconformal rigidity or flexibility of such recurrent equivalence relations. It begins with the remark that recurrence in the sense of measure theory is a necessary condition for quasi conformal rigidity because of the measurable Riemann mapping theorem. In example one recurrence is sufficient for quasiconformal rigidity. In example

two there are quasiconformally flexible examples and these examples are "essentially linear". Is there a general result that quasiconformally flexible holomorphic equivalence relations on Riemann surfaces which are countable and recurrent must also be essentially linear ?

Speaker: Kurt Vinhage
Title: *Entropy rigidity for Anosov flows on 3-manifolds*

Abstract: The topological entropy of a continuous flow has an important relationship with the space of invariant measures, given by the variational principle: the entropy with respect to an arbitrary measure is always at most the topological entropy. Systems with sufficient hyperbolicity usually have a unique measure which achieves this maximum. The maximizing measure can be thought of as the one which is concentrated where points separate with maximal speed. Systems in which this measure has smoothness properties can be expected to exhibit special homogeneous structures. I will give a brief history of these ideas, and a new result which obtains rigidity for all Anosov flows on 3-manifolds. Joint with J. De Simoi, M. Leguil and Y. Yang.

Speaker: Amie Wilkinson
Title: *TBA*