

The Fall 2023 Texas Geometry and Topology Conference (TGTC) was held at the Rice University, November 10-12. National and international speakers are indicated by (*).

Titles and abstracts of talks

Steven Boyer *, **Université du Québec à Montréal (UQAM)**

Stir-frying $\text{Homeo}_+(S^1)$ -representations and the L-space conjecture

This is joint work with Cameron Gordon and Ying Hu. Different structures on 3-manifolds give rise to interesting actions of their fundamental groups on the circle, and hence representations with values in $\text{Homeo}_+(S^1)$. This talk will discuss representations arising from pseudo-Anosov flows and an operation called stir-frying, which adds great variability to their construction. We'll apply these results to the study of the L-space conjecture for cyclic branched covers.

Aaron Calderon *, **University of Chicago**

Long simple curves on hyperbolic surfaces and the geometry of their complements

In her thesis, Maryam Mirzakhani counted the number of simple closed geodesics of bounded length on a (real) hyperbolic surface. This breakthrough theorem and the subsequent explosion of related results use techniques and draw inspiration from Teichmüller theory, symplectic geometry, surface topology, and homogeneous dynamics. In this talk, I'll discuss what these curves, and their complements, actually (generically) look like. This is joint work with Francisco Arana-Herrera.

Daniel Groves *, **University of Illinois Chicago**

Negative curvature in group theory (the lecture for graduate students) and Drilling Hyperbolic Groups

The geometry of the hyperbolic plane is beautiful, important in many areas of mathematics, and admits various generalizations. This talk will focus on one of them - Gromov hyperbolic spaces. This leads to a rich and important class of groups in geometric group theory. I will introduce these spaces and groups, talk about various success stories around these groups, and also talk about generalizations, and open questions.

Daniel Groves *, **University of Illinois Chicago**

Drilling Hyperbolic Groups

The notion of "filling" of groups has been very fruitful over recent years. Motivated by questions around the Cannon Conjecture, I will explain how to take a (residually finite) hyperbolic group with a two-sphere boundary and "drill" it to produce a relatively hyperbolic group with two-sphere boundary. This allows us to relate the Cannon Conjecture to the relatively hyperbolic version. This is joint work with Peter Haïssinsky, Jason Manning, Damian Osajda, Alessandro Sisto, and Genevieve Walsh.

Jonathan Johnson *, **Oklahoma State University**

Algorithmic Obstructions and Order-Preserving Braids

A braided link is the link formed by a braid closure along with the braid's axis. The bi-orderability of such links is equivalent to asking whether or not the free group automorphism

induced by the braid preserves a bi-ordering of the free group. Kin-Rolfsen produced many examples of both order-preserving and non-order-preserving braids including a complete classification of periodic braids. In our project, we use algorithmic techniques to expand the library of examples of both order-preserving and non-order-preserving braids. This work is partially funded by the NSF grant DMS-2213213. Part of this research was conducted using computational resources and services at the Center for Computation and Visualization, Brown University. This work is joint with Nancy Scherich and Hannah Turner.

Giuseppe Martone, Sam Houston State University

d-pleated surfaces and their coordinates

Thurston introduced pleated surfaces as a powerful tool to study hyperbolic 3-manifolds. An abstract pleated surface is a representation of the fundamental group of a hyperbolic surface into the Lie group $\mathrm{PSL}(2, \mathbb{C})$ of orientation preserving isometries of hyperbolic 3-space together with an equivariant map from the hyperbolic plane into hyperbolic 3-space which satisfies additional properties. In this talk, we introduce a notion of d-pleated surface for representations into $\mathrm{PSL}(d, \mathbb{C})$ which is motivated by the theory of Anosov representations. In addition, we give a holomorphic parametrization of the space of d-pleated surfaces via cocyclic pairs, thus generalizing a result of Bonahon. This talk is based on joint work with Sara Maloni, Filippo Mazzoli and Tengren Zhang.

Maggie Miller (Stanford/University of Texas at Austin)

Topology in Dimension 4.5

I'll discuss some recent work proving 4D topological theorems by considering bounded 5D objects, e.g. unlinks in S^4 that have distinct splitting spheres distinguished by balls they bound into B^5 . This is joint with Mark Hughes and Seungwon Kim.

Anna Parlak *, University California Davis

Pseudo-Anosov flows and the Thurston norm

A pseudo-Anosov flow on a closed 3-manifold dynamically represents a face F of the Thurston norm ball if the cone on F is spanned by the homology classes of surfaces almost transverse to the flow. Fried showed that for every fibered face of the Thurston norm ball there is a unique, up to isotopy and reparameterization, flow which dynamically represents the face. Mosher found sufficient conditions on a non-circular flow to dynamically represent a non-fibered face, but the problem of the existence and uniqueness of the flow for every non-fibered face was unresolved. I will outline how veering triangulations can be used to obtain new results in that direction.

Rachel Skipper *, University of Utah

Braiding groups of homeomorphisms of the Cantor set

In this talk we will discuss some recent work on groups which connect self-similar and Higman-Thompson groups to big mapping class groups via "braiding". We will explain some results on the topological finiteness properties of the resulting groups, which are topological generalizations of the algebraic properties of being finitely generated and finitely presented. The talk will involve recent joint works with Xiaolei Wu (Fudan) and Matthew Zaremsky (Albany).

Jing Tao *, University Oklahoma

Genericity of pseudo-Anosov maps

Let S be a surface of finite type. By Nielsen-Thurston Classification, every element of the mapping class group $\text{Map}(S)$ of S is either finite order, reducible, or pseudo-Anosov. While there are these three types, it seems that from any reasonable point of view a “generic” element of $\text{Map}(S)$ is pseudo-Anosov. In this talk, we will discuss several constructions of pseudo-Anosov maps to demonstrate their abundance and then explore the question of genericity.

Bena Tshishku *, Brown University

Hyperbolic manifolds, smooth structures, and group actions

We consider finite group actions on smooth manifolds that are homeomorphic to a hyperbolic manifold. The first nontrivial examples were provided by Farrell-Jones, motivated by a question of Schoen-Yau about Nielsen realization. We discuss progress toward classifying these actions. This is joint work with Mauricio Bustamante.

Demographic Data for Fall 2023 TGTC

- 122 participants: 4 organizers, 10 speakers (including 4 women);
- 29 women, 89 men;
- 5 Black, 36 Asian, 81 White , 11 of Hispanic origin;
- 82 graduate students, 15 postdocs, 2 junior faculty.