
September 7, 2026 - Monday

Entropy versus volume via Heegaard diagrams

Yi Liu(刘毅)

Beijing International Center for Mathematical Research, Peking University, China

We introduce a notion called the Heegaard presentation length for closed orientable 3-manifolds. Using this as a bridge, we compare the entropy of a surface mapping class and the volume of its mapping torus, obtaining inequalities improving former results of Kojima.

From cyclic Higgs bundles to Anosov representations

Qionglin Li(李琼玲)

Chern Institute of Mathematics, Nankai University, China

Anosov representations generalize Fuchsian representations of surface groups, retaining key properties such as discreteness and faithfulness. Constructing new families of Anosov representations remains difficult. Via nonabelian Hodge theory, surface group representations can be studied through Higgs bundles. In this talk, I will present several families of cyclic Higgs bundles whose associated representations are Anosov, yielding new closed families of Anosov representations. This is based on work in progress with Samuel Bronstein and Colin Davalo.

The Carathéodory metric on Teichmüller space of genus two surface

Weixu Su(苏伟旭)

Sun Yat-sen University, China

Let $\mathcal{T}_{g,n}$ be the Teichmüller space of Riemann surfaces of genus g with n punctures. It is conjectured that the Teichmüller and Carathéodory metrics agree on a Teichmüller disk if and only if all the zeros of the corresponding holomorphic quadratic differential are of even order. The conjecture was proved by Gekhtman and Markovic for $\mathcal{T}_{0,5} \cong \mathcal{T}_{1,2}$. We confirm the conjecture for $\mathcal{T}_{2,0} \cong \mathcal{T}_{0,6}$. This is a joint work with Kejie Lin.

Entropy and domination for quasi-Hitchin representations

Subhojoy Gupta

Indian Institute of Science, India

A famous result of Bowen implies that the entropy or critical exponent of a quasi-Fuchsian representation strictly increases off the Fuchsian locus. I will explain how this follows from a

domination result comparing marked length spectra, together with the Anosov property of the geodesic flow. I will then discuss recent work proving analogues of this in the context of surface-group representations into $\mathrm{PSL}(n, \mathbb{C})$ that are quasi-Hitchin, obtained by bending or pleating deformations of Hitchin representations along a maximal lamination. In the higher-rank case our methods are linear algebraic, and involve weight-matrices of weighted planar networks. This represents joint work with Pabitra Barman.

Bending Teichmüller spaces and character varieties

Shinpei BABA

Osaka University, Japan

Let S be a closed oriented surface of genus at least two. The Teichmüller space of S can be identified with the space of discrete faithful representations of the fundamental group of S into $\mathrm{PSL}(2, \mathbb{R})$, called Fuchsian representations. Given a simple closed curve on S with positive weight (or a measured lamination), we can "bend" each Fuchsian representation along the curve by an angle equal to the weight, and obtain a representation of the surface group into $\mathrm{PSL}(2, \mathbb{C})$. This bending deformation induces a mapping from the Teichmüller space into the space of representations of the surface group into $\mathrm{PSL}(2, \mathbb{C})$. We discuss a few basic properties of this mapping.

If time permits, we also discuss a complexification of this mapping, constructed geometrically.

September 8, 2026 - Tuesday

Ray Structures on Teichmüller Space

Mike Wolf

Georgia Institute of Technology, USA

We depict harmonic map ray structures on Teichmüller space as a geometric transition between Teichmüller ray structures and Thurston geodesic ray structures. As an application, while there may be many Thurston metric geodesics between a pair of points in Teichmüller space, we find that by imposing an additional energy minimization constraint on the geodesics, thought of as limits of harmonic map rays, we select a unique Thurston geodesic through those points. We describe applications to the structure of the envelope of Thurston geodesics between a pair of points. (Joint work with Huiping Pan.)

Hierarchical hyperbolicity, ball quotients, and the moduli space of smooth cubic surfaces

Alex Wright

University of Michigan, USA

I will present on new work with Daniel Allcock that shows that the fundamental group of the moduli space of smooth complex cubic surfaces is a hierarchically hyperbolic group. The proof also applies to some other moduli spaces, and gives many new corollaries.

Embedded non-orientable minimal surfaces in $\mathbb{S}^4$ via eigenvalue optimization

Mikhail Karpukhin

University College London, UK

Given a Riemannian surface, the study of sharp upper bounds for Laplacian eigenvalues under the area constraint is a classical problem of spectral geometry going back to J. Hersch, P. Li, S.-T. Yau and N. Nadirashvili. The particular interest in this problem stems from the remarkable fact that the optimal metrics for such bounds arise as metrics on minimal surfaces in spheres. I will describe a surprisingly effective method of constructing new minimal surfaces based on the eigenvalue optimisation with a prescribed symmetry group, which among other things can be used to construct families of examples of embedded non-orientable surfaces in 4-sphere of area below 8π for any given genus. Furthermore, some of the highly symmetric families constructed in this way exhibit fascinating properties that could be compared with those of Lawson's $\xi_{k,1}$ -surfaces.

Bending, entropy and proper affine actions of surface groups

Martin Bridgeman

Boston College, Chestnut Hill, USA

Let $QF(S)$ be the space of quasifuchsian representations for a closed surface S and $h : QF(S) \rightarrow \mathbb{R}$ the function given by taking the hausdorff dimension of the limit set. Ruelle used thermodynamics to show that h is analytic and Bowen proved that $h(\rho) = 1$ if and only if ρ is Fuchsian. Margulis gave examples of proper affine actions of free groups on $\mathbb{R}^3$, which are now called Margulis space times. Recently Danciger, Guéritaud and Kassel gave the first examples of proper affine actions of a closed surface group producing a quasifuchsian group $\rho \in QF(S)$ such that there is a proper affine action on $\mathfrak{sl}(2, \mathbb{C}) \simeq \mathbb{R}^6$ with linear part $\text{Ad}(\rho)$. We show that there is a uniform neighborhood U of the Fuchsian locus so that every critical point of h in U lies on the Fuchsian locus. We further show that there is a smaller uniform neighborhood V of the fuchsian locus in quasifuchsian space $QF(S)$ such that for every representation $\rho \in V$ which is not fuchsian, there is a proper affine action on $\mathfrak{sl}(2, \mathbb{C}) \simeq \mathbb{R}^6$ with linear part $\text{Ad}(\rho)$. The main ingredients are the new notion of a moderately bent quasifuchsian manifold and the use of bending deformations to produce the non-critical directions and the proper affine actions. This work is joint with Dick Canary and Andres Sambarino

The entropy spectrum of hyperbolic surfaces

Hugo Parlier

University of Fribourg, Switzerland

The study of closed geodesics on hyperbolic surfaces sits at the crossroads of geometric topology and dynamics and often has links to geometric probability and number theory. This talk will discuss new quantitative bounds for the growth of the number of closed geodesics on surfaces with geodesic boundary. The main theme is that coarse geometric data, such as boundary length, width, or diameter, already strongly constrain geodesic growth and entropy.

The talk will also introduce the entropy spectrum of a hyperbolic surface, consisting of the entropies of its subsurfaces. This leads to the study of gaps in the entropy spectrum, rigidity phenomena, and discreteness results that reveal new geometric features of subsurface dynamics.

This is joint work with Ara Basmajian.

September 9, 2026 - Wednesday

**Closed geodesics in homology classes on
random hyperbolic surfaces of large genus**

Zeev Rudnick

Tel Aviv University, Israel

We study the distribution of closed geodesics in homology classes on random hyperbolic surfaces of large genus. Viewing the surface as a random point in moduli space equipped with the Weil–Petersson probability measure, we investigate the fluctuations of the number of closed geodesics of bounded length in homology classes, and compare it with what is conjectured for primes in arithmetic progressions.

Apollonian random manifolds and their bass notes

Bram Petri

Sorbonne Université, France

I will speak about joint work with Will Hide, Anna Roig Sanchis and Joe Thomas. We use a model of random hyperbolic 3-manifolds to investigate the set of all possible spectral gaps of hyperbolic 3-manifolds of finite volume.

Nearly optimal spectral gaps for random Belyi surfaces

Yang Shen(沈洋)

Hunan University, China

we show that a random hyperbolic surface in the Brooks-Makover model has a spectral gap greater than $\frac{1}{4} - \frac{c}{\log n}$ for some universal constant $c > 0$, confirming the nearly optimal spectral gap conjecture in this model. It is a joint work with Yunhui Wu.

September 10, 2026 - Thursday

Calabi's Intrinsic Harmonicity, $\mathbb{Z}/2$ Harmonic 1-Forms, and Foliations of 3-Manifolds

Siqi He(何思奇)

Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China

$\mathbb{Z}/2$ harmonic 1-forms, introduced by Taubes as limiting objects in the compactness theory of gauge-theoretic equations, play an important role in differential geometry and gauge theory. On 3-manifolds, they are closely related to measured foliations, harmonic maps to $\mathbb{R}$ -trees, and the Morgan-Shalen compactification of the $SL(2, \mathbb{C})$ character variety. In this talk, I will explain a two-valued analogue of Calabi's intrinsic harmonicity theorem, which gives an intrinsic criterion for when a closed two-valued 1-form can be made harmonic by a suitable choice of metric. I will then describe how this viewpoint leads to Calabi surgery, a flexible method for constructing and modifying $\mathbb{Z}/2$ harmonic 1-forms, and discuss some of its applications. This talk is based on joint work with Jiahuang Chen and Dashen Yan.

Exponential volumes of moduli spaces of hyperbolic surfaces

Zhe Sun(孙哲)

University of Science and Technology of China, China

Mirzakhani found a remarkable recursive formula for the volumes of the moduli spaces of the hyperbolic surfaces with geodesic boundary, and the recursive formula plays very important role in several areas of mathematics: topological recursion, random hyperbolic surfaces etc.

We consider some more general moduli spaces $\mathcal{M}_{\mathbb{S}}(K, L)$ where the hyperbolic surfaces would have crown ends and horocycle decorations at each ideal points. But the volume of the space $\mathcal{M}_{\mathbb{S}}(K, L)$ is infinite when $\mathbb{S}$ has the crown ends. To fix this problem, we introduce the exponential volume form given by the volume form multiplied by the exponent of a canonical function on $\mathcal{M}_{\mathbb{S}}(K, L)$. We show that the exponential volume is finite. And we prove the recursion formulas for the exponential volumes, generalising Mirzakhani's recursions for the volumes of moduli spaces of hyperbolic surfaces. We expect the exponential volumes are relevant to the open string theory. This is a joint work with Alexander Goncharov.

Dichotomy for Minimal Surfaces in Hyperbolic 3-manifolds

Zeno Huang

City University of New York, USA

In complete hyperbolic 3-manifolds, there are often abundant closed minimal surfaces. I will present some dichotomy results and describe some open problems on the existence and abundance

of minimal surfaces in degenerate hyperbolic 3-manifolds. Much of the talk is based on joint work with Coskunuzer, Lowe and Vargas Pallet.

Thurston's metric on surfaces: The Euclidean case

Athanase Papadopoulos

Institut de Recherche Mathématique Avancée, University of Strasbourg, France

I will explain recent results on Euclidean analogues of Thurston's metric on Teichmüller space. These analogues include metrics on spaces of Euclidean triangles and more generally on spaces of surfaces obtained by gluing Euclidean pieces. In each case, I will describe the geodesics, the infinitesimal Finsler structure and the isometries of these metrics. I will point out relations with the classical Thompson metric. The results are obtained in collaboration with Hideki Miyachi, Ken'ichi Ohshika and Ismail Saglam. The work gives rise to several new open questions.

Stable norm old and new

Greg McShane

Université Grenoble Alpes, France

In the 90s McShane and Rivin studied the stable norm on the first homology of a once punctured torus equipped with a hyperbolic metric. - they used it to count simple closed geodesics on the torus - studied the variation of its area as a function on moduli space- classified the points on the boundary of the unit ball of the stable norm.

Hines in 2019 gave a new proof of the McShane Identity using a rather mysterious function defined on the rationals. We'll explain how his proof can be interpreted in terms of the stable norm and how this relates to recent work of Doan and his collaborators.

Motivated by this work McShane in 2021 gave a (unified) proof of Aigner's conjectures for Markoff numbers labelled by rationals.

Finally we'll discuss unpublished work of Montealegre (Montpellier thesis 2024) for the stable norm of translation surfaces.

Towards a universal non-Abelian Hodge correspondence

Peter Smillie

Max Planck Institute for Mathematics in the Sciences, Germany

The resolution of the Schoen conjecture by Markovic established a bijection between universal Teichmüller space - the space of quasimetric homeomorphisms of the circle up to projective equivalence - and the space of bounded quadratic differentials on the hyperbolic plane. This can be seen as a 'universal' generalization of the non-Abelian Hodge correspondence between Higgs bundles and flat connections for the group $SL_2\mathbb{R}$ over the Hitchin section. I will explain a partial

generalization of this picture from $SL_2\mathbb{R}$ to $SL_n\mathbb{R}$ in joint work with Max Riestenberg, and a conjectural relationship with work of Li and Mochizuki on the Higgs bundles side.