December 22, 2023

ST 1-2

Chair: Anima Nagar

Speaker : Radhika Gupta

Title: Combinatorial isoperimetric inequality for the free factor complex

Abstract: Groups acting on Gromov hyperbolic spaces and CAT(0) spaces reveal a lot of information about the group itself. The group of outer automorphisms of a finitely generated free group acts on a Gromov hyperbolic graph called the free factor graph and this graph has been a very useful tool to understand the automorphism group, a la curve complex for the mapping class group of a surface. However, based on Webb's work for the curve complex, we show that the free factor graph does not admit a CAT(0) metric with finitely many shapes.

Speaker : Abhijit Pal

Title : Boundary at Infinity

Abstract : Bordification of metric spaces obtained by adjoining a 'boundary at infinity' has created a lot of interest in recent times. One such instance is the Gromov boundary of a hyperbolic metric space. The hyperbolic metric spaces were discovered by Misha Gromov and are generalizations of the hyperbolic plane. In this talk, using 'contracting' properties of geodesics in a hyperbolic metric space, we will define a boundary at infinity for more general spaces due to the work of Charney-Sultan, Cordes and Cashen-Mackay. We will finally end with some recent developments obtained about the contracting boundary of groups.

ST 3-4

Chair: Rukmini Dey

Speaker : Pradip Kumar

Title: Constructing Zero Mean Curvature Surfaces in Euclidean Space and in the Lorentz-Minkowski Space.

Abstract: Similar to minimal surfaces in R^3, maximal surfaces are zero-mean curvature immersions in Lorentz-Minkowski space. These surfaces arise as solutions to the variational problem of locally maximizing the area among spacelike surfaces. In this talk, we will define minimal surfaces in Euclidean space and maximal surfaces in Lorentz-Minkowski space. We will demonstrate how calculus on Teichmuller space aids us in constructing these maximal and minimal surfaces. In particular, we will show the construction of new higher-genus maximal surfaces with Enneper end. To address the period problem, we will apply Wolf and Weber’s method. This is a joint work with Rivu Bardhan and Indranil Biswas.

Speaker : Aritra Bhowmick

Title : Fibration with a Section and H-Splitting of the Looped Total Space

Abstract : It is well-known that any principal G-bundle admitting a section is trivial. However, this does not hold for a general fibration with a section. To any such fibration, I. M. James introduced a certain product involving the homotopy groups of the fiber and the base space, known as the James brace product. In the first part of this talk, we shall see when the vanishing of the James brace product implies that the fibration is trivial.

The space of based loops in a given space is a prototypical example of an H-space. It is widely known that any fibration with a section is trivial when it is looped once. This means that the loop space of the total space is homotopy equivalent to the product of the loop spaces of the base and the fiber. A natural question arises: when is this splitting a map of H-spaces, i.e., an H-splitting? In the second part of this talk, we shall introduce a generalization of the James brace product. We shall identify the vanishing of this generalized brace product as the obstruction for the H-splitting of a fibration with section after looping. We shall provide an example where the generalized brace products do not vanish, even though the James brace products vanish identically.

This is an ongoing work in collaboration with S. Basu and S. Samanta.

December 23, 2023

ST 5-6

Chair: Riddhi Shah

Speaker : Ved Datar

Title: Diameter rigidity for Kahler manifolds with positive bi-sectional curvature

Abstract: A classical result in Riemannian geometry (the so-called Myers theorem) says that the diameter of an n-dimensional Riemannian manifold with Ricci curvature bounded below by one, is bounded above by the diameter of the round sphere with (constant) Ricci curvature one. In the 1970's, Cheng proved that equality holds if and only if the Riemannian manifold is isometric to the round sphere. In the Kahler setting, and analogue of Myers' theorem, with Ricci curvature replaced by bi-sectional curvature, was proved recently by Wang-Li. In 2021, in collaboration with Harish Seshadri, we were able to establish a version of Cheng's result in the Kahler setting. Our proof relied on complex analytic techniques and was a departure from previously used methods. In my talk, I will survey some of these recent developments.

Speaker: Arijit Dey

Title: Toric bundles and its semistability.

Tite: Brauer group of moduli space of parabolic bundles

Abstract: Brauer groups are interesting birational invariants for smooth algebraic varieties but not an easy task to compute. In this talk I will explain how these groups are computed for moduli spaces of stable parabolic bundles over a smooth projective curve. This is a joint work with Indranil Biswas and Sujoy Chakraborty.

ST 7-8

Chair : Dheeraj Kulkarni

Speaker : Abhijeet Ghanawat

Title:Trisections of 4-manifolds and their Murasugi sum.

Abstract: In this talk, we first discuss the notion of a (relative) trisection of a (compact) closed oriented 4-manifold introduced by Gay and Kirby in 2016, which is a 4-dimensional analog of Heegaard splittings of closed 3-manifolds.
Then, we will discuss the Murasugi sums of relative trisections of compact oriented 4--manifolds with connected boundary, the Murasugi sums of (trivially extendable) TE-relative trisection diagrams for closed 4--manifolds and give sketch of the following results:
1. The compact oriented 4-manifold associated to a Murasugi sum of relative trisections of two compact oriented 4--manifolds X and X′ with connected boundary is the boundary connected sum of X and X′.
2. A trisection diagram associated to a Murasugi sum of two TE-relative trisection diagrams D and D′ is the connected sum of the trisection diagrams associated to D and D′.

The talk is based on a joint work with Suhas Pandit and Selvakumar A.

Speaker: Bidyut Sanki

Title. A proof of Aougab-Huang conjecture

Abstract: A pair (α, β) of simple closed geodesics on a closed and oriented hyperbolic surface M_g of genus g is called a filling pair if the complementary components of $\alpha \cup \beta$ in M_g are simply connected. The length of a filling pair is defined to be the sum of their individual lengths. In [Algebr Geom Topol 15:903–932, 2015], Aougab-Huang conjectured that the length of any filling pair on M is at least $m_g/2$, where m_g is the perimeter of the regular right-angled hyperbolic $(8g - 4)$-gon. In this talk, we study a generalized isoperimetric inequality for disconnected regions and we prove Aougab-Huang conjecture as a corollary.

ST 9-10

Chair: Arijit Dey

Speaker : Rukmini Dey

Title: Pull back coherent states and some applications

Abstract: We define coherent states on compact smooth manifolds by embedding them into CP^n by Whitney embedding and pulling them back from coherent states on CP^n. We apply these RKHS techniques to Berezin quantization. If time permits we will also mention applications in machine learning.

Speaker: Anima Nagar

Title: Transitivity in dynamical systems given by closed relations

Abstract: Dynamical systems are generally studied as solutions of initial value problems. These are also studied as the action of homeomorphisms or continuous mappings on topological spaces. Dynamics by closed relations gives a unified approach to studying initial value problems over a range of initial values.

One of the oldest and widely studied dynamical properties is 'topological transitivity'. We investigate various forms of transitivity for such systems.

This talk is based on joint work chronologically with V. Kannan, Ethan Akin, Joseph Auslander and Nayan Adhikary.

December 24, 2023

ST-11 – 13

Chair: Mahuya Datta

Speaker : Riddhi Shah

Title: The structure of Cartan subgroups in connected locally compact groups

Abstract: We define Cartan subgroups in connected locally compact groups extending the classical notion of Cartan subgroups in Lie groups. We prove their existence and justify our choice of the definition which differs from the one given by Chevalley on general groups in 1955. We prove some results about properties and the structure of Cartan subgroups extending known results on Lie groups, which include some of our earlier results. We also show that Cartan subalgebras defined by Hofmann and Morris in pro-Lie algebras are the same as those corresponding to Cartan subgroups in case of pro-Lie algebras of connected locally compact groups, and that they are nilpotent. We characterise the density of the image of a power map in such a group in terms of its surjectivity on all Cartan subgroups and show that the weak exponentiality of the group is equivalent to the condition that all its Cartan subgroups are connected. (Joint work with Arunava Mandal, https://arxiv.org/abs/2310.15564).

Speaker: Apratim Chakraborty

Title: Cabling Legendrian and Transverse Knots

Abstract: We will present an approach to classify sufficiently positive cables of Legendrian and transverse knots in terms of the underlying knot without requiring any additional hypothesis. We will also explain the phenomena of Legendrian large cables. These are Legendrian representatives of cables that have Thurston-Bennequin invariant larger than what was classically expected.This is a joint work with J. Etnyre, and H. Min.

Speaker : Dheeraj Kulkarni

Title: On The Cost Function Associated With Legendrian Knots

Abstract: In this talk, we will discuss a non-negative integer valued function that measures the obstruction for converting any topological isotopy between two Legendrian knots into a Legendrian isotopy. We refer to this function as Cost function. We show that the Cost function induces a metric on the set of topologically isotopic Legendrian knots. Hence the set of topologically isotopic Legendrian knots can be seen as a graph with path-metric given by the Cost function. Legendrian simple knot types are shown to be characterized using Cost function. We also get a quantitative version of Fuchs-Tabachnikov's Theorem that asserts that any two topologically isotopic Legendrian knots become Legendrian isotopic after applying sufficiently many stabilizations to both of them. If time permits, we discuss how the Cost function behaves with respect to connected sum operation and give examples.

This talk is based on the joint work with Monika Yadav and Tanushree Shah.