Colin Adams, Williams College
Title: Hyperbolic Volumes of Virtual Knots and their Compositions
Abstract: Many knots are known to be hyperbolic and therefore have a hyperbolic volume. But composite knots are never hyperbolic. It turns out that virtual knots can also be hyperbolic. But in this case, in joint work with Alexander Simons, we show compositions of hyperbolic virtual knots are hyperbolic and you can get strong lower bounds on their volumes from the factor knots.

Boris Apanasov, University of Oklahoma
Title: Non-rigidity for Hyperbolic Lattices and Geometric Analysis
Abstract: We create a conformal analogue of the M. Gromov-I. Piatetski-Shapiro interbreeding construction to obtain non-faithful representations of uniform hyperbolic 3-lattices with arbitrarily large kernels (free groups on m generators) and to apply it for solving long standing problems for bounded quasiregular mappings in space.

Dhananjay Bhaskar, Yale University
Title: Data-Driven Modeling & TDA of Self-Organized Multicellular Architectures
Abstract: Heterogeneous cell populations exhibit coordinated motion, self-organization, and phase transitions during embryo formation, skin pigmentation, wound healing, and cancer metastasis. In particular, cell motility and cell-cell adhesion drive pattern formation, resulting in complex yet stable multicellular configurations. Examples include sorting (separation of cell types), engulfment (one cell type surrounded by another), and self-assembly into radially symmetric and stripe-like patterns. In this talk, I will demonstrate the application of TDA and machine learning for the automated classification of multicellular structures associated with cancer EMT and embryonic development.

First, individual and collective phases of epithelial migration are characterized by varying adhesion and random propulsion parameters in an agent-based model derived from experimental observations. Next, persistent homology is computed using cell positions as input, followed by unsupervised classification of the topological features. Finally, classification results are mapped onto the adhesion-propulsion phase diagram for automatic delineation of phase boundaries. A similar methodology, applied to co-culture simulations with varying adhesion parameters, reveals phase transitions between various patterns of self-assembly in cell sorting. Overall, I envision this model-agnostic approach will enable new quantitative insights into the emergence of complex tissue topologies via spatiotemporal interactions between one or more cell types.

Jack Calcut, Oberlin College
Title: Mazur and Jester 4-manifolds
Abstract: Mazur and Poénaru constructed the first compact, contractible manifolds distinct from disks. More recently, Sparks modified Mazur's construction and defined Jester

manifolds. Sparks used Jester manifolds to produce compact, contractible 4-manifolds distinct from the 4-disk that split as the union of two 4-disks meeting in a 4-disk. We survey several very different proofs that all Mazur and Jester manifolds are not 4-disks. We discuss the problem of distinguishing these 4-manifolds from one another. And, we present pertinent questions on knots in $S^1 \times S^2$ and hyperbolic triangle groups. This is joint work with Alexandra Du.

Nicholas Cazet, UC Davis
Title: Surface-link Families with Arbitrarily Large Triple Point Number
Abstract: Analogous to a classical knot diagram, a surface-knot can be generically projected to 3-space and given crossing information to create a broken sheet diagram. A generic compact surface in 3-space has finitely many triple points. The triple point number of a surface-knot is the minimal number of triple points among all broken sheet diagrams representing that surface-knot. I will introduce the weight of a symmetric quandle 3-cocycle to show that there are non-split surface-links of arbitrarily many trivial components, each of arbitrarily large genus, whose triple point number is determined by the genera of its non-orientable components.

Rima Chatterjee, University of Cologne
Title: Structure Theorems of Legendrian Knots in Contact Manifold
Abstract: Structure theorems of a Legendrian knot have been an interesting study in contact geometry. One can ask when topological operations on a knot gives us important information about the geometry or under what conditions the geometric features of the knot are preserved under certain topological constructions. In this talk I'll explore this question and focus on a recent work on answering when does cabling operation preserves the special geometric property of a knot in an overtwisted contact manifold. This is a joint work with Etnyre, Min, and Mukherjee.

Nafaa Chbili, United Arab Emirates University
Title: On Quasi-alternating Links
Abstract: An interesting class of knots and links has been introduced by Ozsváth and Szabó while studying the Heegaard Floer homology of the branched double-covers of alternating links. The homological properties of alternating links extend naturally to this new class of links. However, unlike alternating links which admit a simple diagrammatic definition, quasi-alternating links are defined in a recursive way. Using such recursive definition to determine whether a given link is quasi-alternating is a very challenging task. In this talk, we plan to review the main obstruction criteria that have been introduced to characterize quasi-alternating links. Then, we shall explain how to extend the twisting technique of Champanerkar and Kofman to introduce new examples of quasi-alternating links.

Lizhi Chen, Lanzhou University
Title: Triangulation Complexity of Hyperbolic Manifolds and Asymptotic Geometry
Abstract: The triangulation complexity is related to volume of hyperbolic manifolds via simplicial volume. On the other hand, Gromov showed that simplicial volume is related to topological invariants arising from asymptotic geometry. These two areas can be connected by using Jorgensen and Thurston's theorem of hyperbolic volume. We prove that the triangulation complexity of hyperbolic manifolds is related to some topological invariants in asymptotic geometry.

Ashani Dasgupta, University of Wisconsin-Milwaukee
Title: Local Connectedness of Boundaries for Relatively Hyperbolic Groups
Abstract: Let $(\Gamma, \mathbb{P})$ be a relatively hyperbolic group pair that is relatively one ended. Then the Bowditch boundary of $(\Gamma, \mathbb{P})$ is locally connected. Bowditch previously established this conclusion under the additional assumption that all peripheral subgroups are finitely presented, either one or two ended, and contain no infinite torsion subgroups. In this talk I will sketch a proof that removes these restrictions; this joint work with Chris Hruska makes no restriction on the cardinality of Γ and no restriction on the peripheral subgroups $P \in \mathbb{P}$.

Filiz Dogru, Grand Valley State University
Title: Outer Billiards: A Comparison Between Affine Geometry, Hyperbolic Geometry, and Symplectic Geometry
Abstract: Outer billiards appeared first as an entertainment question. Its popularity increased after J. Moser's description as a crude model of the planetary motions, in 1978. Since then, outer billiard map has been studied extensively in Euclidean geometry, hyperbolic geometry, spherical geometry and most recently in symplectic geometry. This talk will provide some analysis and comparison of the map properties in those geometries.

Sam Fisher, University of Oxford
Title: Fibring of RFRS groups
Abstract: A group G is said to algrebraically fibre if it admits an epimorphism to $\mathbb{Z}$ with finitely generated kernel. The motivation for this definition comes from a result of Stallings, which states that if G is the fundamental group of a closed 3-manifold M, then an algebraic fibration of G is induced by a topological fibration of M over the circle.

The main result I will discuss is a characterisation of fibring of RFRS groups: a virtually RFRS G group virtually fibres with kernel of type $\mathtt{FP}(\mathbb{Q})$ if and only if the first n ℓ^2-Betti numbers of G vanish. I will also mention a version of this result over arbitrary skew fields, as well as applications to fibring of high-dimensional hyperbolic manifolds.

Daniel Gulbrandsen, University of Wisconsin - Milwaukee
Title: Cubical Collapses and a New Compactification of Locally-Finite CAT(0) Cube Complexes
Abstract:: In this talk we will define what it means for a cube complex to be collapsible. In particular, our definition will apply to the case that the complex is not finite. Then, we will show that all locally-finite CAT(0) cube complexes are collapsible. The process will yield an inverse sequence of compacta, the inverse limit of which will provide a weak Z-structure. Time permitting, we will discuss how this compactification relates to other established compactifications of CAT(0) cube complexes.

Denise Halverson, Brigham Young University
Title: General Position Properties that Detect Codimension One Manifold Factors
Abstract: The R.L. Moore Problem, or the product with a line problem, essentially asks, "Which spaces X have the property that $X \times \mathbb{R}$ is a manifold?" Such spaces are called codimension one manifold factors. In this presentation, we will consider the product with a line problem for finite dimensional spaces having dimension $n \geq 4$.

In order for an n-dimensional space X, $n \geq 4$, to be a codimension one manifold factor, the following two conditions are necessary and sufficient:

- the space X is resolvable, i.e. can be represented as the image of a cell-like map defined on a manifold, as a result of the algebra of the Quinn index number, and
- the space $X \times \mathbb{R}$ has the disjoint disks property, as a result of Edward's Cell-Like Approximation Theorem.

Because of the manner in which resolvable generalized manifolds are generally constructed, or arise, and subsequently analyzed, having options to replace the second condition with a general position property defined on X is greatly advantageous. There are a variety of general position properties that, when applicable, can be utilized for this purpose. In this presentation we will discuss the various options, their limitations, and their strengths and weaknesses.

Cong He, University of Wisconsin Milwaukee
Title: Right-angled Coxeter Groups with Menger Curve Boundary
Abstract: Hyperbolic Coxeter groups with Sierpinski carpet boundary was investigated by Świątkowski. And hyperbolic right-angled Coxeter group with Gromov boundary as Menger curve was studied by Daniel Danielski. Also, Haulmark, Hruska, and Sathaye's produced the first known examples of non-hyperbolic CAT(0) groups whose visual boundary is homeomorphic to the Menger curve. The examples in question are the Coxeter groups whose nerve is a complete graph on n vertices for n greater than or equal to 5. Recently, Danielski and Świątkowski gave complete characterizations (in terms of nerves) of the word hyperbolic Coxeter groups whose Gromov boundary is homeomorphic to the Sierpiński curve and to the Menger curve, respectively. In our presentation, we find new examples with both hyperbolic

and nonhyperbolic groups which state: the punctured torus admits a triangulation that is a nerve of right-angled Coxeter group with Menger curve boundary. The construction in Haulmark, Hruska, and Sathaye's paper depended on a slight extension of Sierpinski's theorem on embedding 1–dimensional planar compacta into the Sierpinski carpet. However, our methods depend on a perturbing trick for paths and special techniques for nullity condition; also we exploit good properties of Pontryagin surface.

Mark Hughes, Brigham Young University
Title: Branched Coverings Over Surface Braids and (Broken) Lefschetz Fibrations on Noncompact 4-Manifolds
Abstract: In this talk I will discuss a construction of Lefschetz type fibrations on 4–manifolds via coverings branched over braided surfaces. When applied to noncompact 4–manifolds these techniques yield fibrations with fibers of infinite type. As an application we obtain branched coverings and monodromy representations of Casson handles and exotic $\mathbb{R}^4$s.

Kristof Huszar, Inria Sophia Antipolis - Méditerranée, France
Title: On the Pathwidth of Hyperbolic 3-Manifolds
Abstract: In recent years there has been an emergence of fixed-parameter tractable (FPT) algorithms that efficiently solve hard problems for triangulated 3-manifolds as soon as the dual graph of the input triangulation has bounded treewidth - a parameter that quantifies the similarity of a graph to any tree.

Motivated by these FPT algorithms, Maria and Purcell have recently shown that every closed hyperbolic 3-manifold M with volume $\mathrm{vol}(M)$ admits a triangulation with dual graph of treewidth at most $C\,\mathrm{vol}(M)$, for some universal constant C.

Here we prove that the volume provides a linear upper bound even on the pathwidth of the dual graph of some triangulation, which can potentially be much larger than the treewidth. Our proof relies on a synthesis of tools from 3-manifold theory: generalized Heegaard splittings, amalgamations, and the thick-thin decomposition of hyperbolic 3-manifolds. We provide an illustrated overview of this toolbox and also discuss the algorithmic consequences of the result.

Tejas Kalelkar, Indian Institute of Science Education and Research Pune
Title: An Algorithm to Identify Hyperbolic Manifolds from Their Geometric Triangulations
Abstract: Abstract: A geometric triangulation of a Riemannian manifold is a triangulation by totally geodesic simplexes. Any two triangulations of a PL manifold are related by a sequence of local combinatorial changes to the triangulation called Pachner moves. We give a bound on the length of this sequence for closed hyperbolic, spherical and Euclidean n-manifolds (after taking a bounded number of barycentric subdivisions) and for cusped complete hyperbolic 3-manifolds. These bounds are in terms of the dimension of the manifold, number of top dimensional simplexes and upper bounds on lengths of edges in the

compact case and lower bounds on dihedral angles in the cusped hyperbolic case. This leads to an algorithm to check from the combinatorics of the triangulations and bounds on the lengths of edges or dihedral angles, if two geometrically triangulated closed hyperbolic n-manifolds or cusped hyperbolic 3-manifolds are isometric or not. This is joint work with Advait Phanse and Sriram Raghunath.

Rose Kaplan-Kelly, Temple University
Title: Right-angled Links in Thickened Surfaces
Abstract: Traditionally, alternating links are studied with alternating diagrams on S^2 in S^3. In this talk, we will consider links which are alternating on higher genus surfaces S_g in $S_g \times I$. We will define what it means for such a link to be right-angled generalized completely realizable (RGCR) and show that this property is equivalent to the link having two totally geodesic checkerboard surfaces, and equivalent to a set of restrictions on the link's alternating projection diagram. We will then use these diagram restrictions to answer a question posed by Champanerkar, Kofman, and Purcell about links with alternating projections on the torus.

Thorben Kastenholz, University of Goettingen
Title: Simplicial Volume of Total Spaces of Fiber Bundles
Abstract: It is a classical result that manifolds that are total spaces of fiber bundles, whose fiber has amenable fundamental group, have vanishing simplicial volume. In this talk I will explore the opposite question, where the manifolds fiber non-trivially with arbitrary fiber over a manifold with amenable fundamental group. The main focus will lay on manifolds fibering over simply-connected spaces and spheres in particular. Most of this is joint work with Jens Reinhold except for some new results that are part of an upcoming project.

Nursultan Kuanyshov, University of Florida
Title: Lusternik-Schnirelmann category of group homomorphism
Abstract: We prove the equality $\mathrm{cat}(\phi) = \mathrm{cd}(\phi)$ for homomorphisms $\phi : \Gamma \to \Lambda$ of a torsion free finitely generated nilpotent groups Γ to an arbitrary group Λ. We construct an epimorphism $\psi : G \to H$ between geometrically finite groups with $\mathrm{cat}(\psi) > \mathrm{cd}(\psi)$.

Monika Kudlinska, University of Oxford
Title: Quasi-isometries of Free-by-cyclic Groups
Abstract: A group is free-by-cyclic if it admits an epimorphism onto the infinite cyclic group with kernel a free group of finite rank. The study of free-by-cyclic groups is largely motivated by the case of 3-manifolds which fiber over the circle. In this talk we will show that the class of free-by-cyclic groups is quasi-isometrically rigid amongst all groups of finite cohomological dimension with the property of being residually finite rationally solvable

(RFRS).

Porfirio Leandro Leon Alvarez, Instituto de Matematicas, UNAM
Title: Virtually Abelian Dimension for 3-Manifold Groups
Abstract: Given a group Γ, we say a collection $\mathcal{F}$ of subgroups of Γ is a family if it is non-empty, closed under conjugation and under taking subgroups. Fixing a group Γ and a family $\mathcal{F}$ of subgroups of Γ, we say that a Γ-CW-complex X is a model for the classifying space $E_{\mathcal{F}}\Gamma$ if every isotropy group of X belongs to the family $\mathcal{F}$ and the fixed point set X^H is contractible whenever H belongs to $\mathcal{F}$. It can be shown that a model for the classifying space $E_{\mathcal{F}}\Gamma$ always exists and it is unique up to Γ-homotopy equivalence. We define the $\mathcal{F}$-geometric dimension of Γ, denoted as $gd_{\mathcal{F}}(\Gamma)$, as the minimal dimension of the models for the classifying space $E_{\mathcal{F}}\Gamma$. Now, let Γ be the fundamental group of a 3-manifold. Define the family $\mathcal{F}_n$ as the family of virtually $\mathbb{Z}^r$ subgroups for $0 \leq r \leq n$. In joint work with Luis Jorge Sánchez Saldaña we computed $gd_{\mathcal{F}_n}(\Gamma)$ for all $n \geq 2$. In this talk I will give an explicit formula for this dimension.

Didac Martinez-Granado, University of California, Davis
Title: Volume Bounds for a Random Canonical Lift Complement
Abstract: Given a filling closed geodesic on a hyperbolic surface, one can consider its canonical lift in the projective tangent bundle. Drilling this knot, one obtains a hyperbolic 3-manifold. In this talk we are interested in volume bounds for these manifolds in terms of geometric quantities of the geodesic, such as the hyperbolic length. In particular, we give a volume lower bound in terms of length when the filling geodesics are closed geodesics converging to the Liouville geodesic current. The bound is given in terms of a counting problem in the unit tangent bundle that we solve by applying an exponential multiple mixing result for the geodesic flow. This is joint work with Tommaso Cremaschi, Yannick Krifka and Franco Vargas Pallete.

Kirk McDermott, Slippery Rock University of Pennsylvania
Title: Topological Aspects of the Shift Dynamics of the Groups of Fibonacci Type
Abstract: A group is cyclically presented if it admits a presentation with a certain cyclic symmetry. Such a symmetry induces a periodic automorphism of the group (say of exponent $n > 0$) called the shift, and its dynamics strongly impacts the structure of the group. Here we consider the topology of the shift dynamics. We focus on examples arising from the groups of Fibonacci type, which includes cyclic branched coverings of the figure eight and trefoil knots. A result of Lin and Wang provides that the structure of the fixed point subgroup of the shift restricts the geometry of the manifold. Here we show that if a cyclically presented group is the fundamental group of a hyperbolic manifold, then the shift is an outer automorphism of order n.

Sergey Melikhov, Steklov Math Institute (Moscow)
Title: Fine Shape
Abstract: A shape theory is something which is supposed to agree with homotopy theory on polyhedra and to treat more general spaces by looking at their polyhedral approximations. Or if you prefer, it is something which is supposed to agree with homotopy theory on ANRs and to treat more general spaces by looking at their ANR neighborhoods. For (metric) compacta there is just one reasonable shape theory, known as strong shape, which does everything that one expects of a shape theory. It was introduced in a Princeton dissertation by D. Christie (supervised by Lefschetz), published in 1944, but became widely appreciated only in the mid-70s, when it was rediscovered by a number of authors as a "corrected" form of Borsuk's shape.

For non-compact (separable metrizable) spaces the story used to be much more complicated. It has been long understood that there is just one reasonable "shape-like" ordinary cohomology theory (Čech cohomology) and just one reasonable "shape-like" ordinary homology theory (Steenrod-Sitnikov homology). Nevertheless, many shape theories have been constructed in the last 50 years, some with obvious "defects" and others being so intricate that while a lot has been written about them, including heavy books, the only substantial results were of the form that certain very basic questions cannot be answered in ZFC.

Fine shape is a new shape theory of metrizable spaces, which is not only free of the deficiencies of the previous theories, but also much easier to define. New results to be discussed in the talk suggest that it is just that one reasonable shape theory which was no longer hoped to exist in the non-compact case.

Sanjay Mishra, Lovely Professional University
Title: Preservation of Properties during Topological Equivalence of Function Space
Abstract: The study of convergence of sequence of functions is the most important and active area of research in theoretical mathematics that solve several problems of approximation theory, Fourier analysis, functional analysis, measure theory, group theory, ring theory, mathematical modeling, computer science etc. A topological approach in the study of function space is an effective and popular idea for solving many problems that are not possible to solve in other ways. The primary goal of the study of function space with a topological approach is to investigates the convergence of sequences of functions over some topological space. In this talk we discuss preservation of properties during topological equivalence (t-equivalence) of sets of real valued continuous functions under the topology of pointwise convergence.

Atish Mitra, Montana Tech
Title: Controlled Quasi-Isometric Embeddings of Spaces of Persistence Diagrams
Abstract: It was earlier shown by the authors that the space of persistence diagrams on n points with certain metrics coarsely embeds into Hilbert space. In this talk, we will describe

quantitative versions of our earlier results. This is joint work with Žiga Virk.

Ian Montague, Brandeis University
Title: Seiberg-Witten Flooer K-Theory and Cyclic Group Actions on Spin 4-Manifolds with Boundary
Abstract: I will outline the construction of a metric-independent $\mathrm{Pin}(2)\widetilde{\times}\mathbb{Z}_m$-equivariant Seiberg-Witten Floer spectrum $\mathrm{SWF}(Y)$ associated to a spin rational homology 3-sphere Y equipped with a spin $\mathbb{Z}_m$-action, as well as equivariant analogues of Manolescu's invariant $\kappa(Y)$, defined as the minima of a certain semi-infinite lattice associated to the equivariant K-theory of $\mathrm{SWF}(Y)$. As an application, I will discuss how these invariants provide bounds on the intersection forms of equivariant spin fillings of Y, as well as obstructions for H-sliceness in spin 4-manifolds.

Barbara Nimershiem, Franklin & Marshall College
Title: Geometric Triangulations of a Family of Hyperbolic 3-Braids
Abstract: We construct topological triangulations for complements of $(-2, 3, n)$-pretzel knots and links with $n \geq 7$. Following a procedure outlined by Futer and Guèritaud, we use a theorem of Casson and Rivin to prove the constructed triangulations are geometric. Futer, Kalfagianni, and Purcell have shown (indirectly) that such braids are hyperbolic. The new result here is a direct proof.

Rebekah Palmer, Temple University
Title: Totally Geodesic Surfaces in Knot Complements with Small Crossing Number
Abstract: Studying totally geodesic surfaces has been essential in understanding the geometry and topology of hyperbolic 3-manifolds. Recently, Bader-Fisher-Miller-Stover showed that containing infinitely many such surfaces compels a manifold to be arithmetic. We are hence interested in counting totally geodesic surfaces in hyperbolic 3-manifolds in the finite (possibly zero) cases. We expand an obstruction, due to Calegari, to the existence of these surfaces using Euler class and Thurston's norm. On the flipside, we prove the uniqueness of known totally geodesic surfaces by considering their behavior in the universal cover. This talk will explore this progress for both the uniqueness and the absence of totally geodesic surfaces in knot complements with small crossing number. Joint work with Khánh Lê.

Prayagdeep Parija, University of Wisconsin Milwaukee
Title: Random Quotients of Hyperbolic Groups and Property (T)
Abstract: What does a typical quotient of a group look like? Gromov had looked at density model of quotients of free groups. The density parameter d measures the rate of exponential growth of the number of relators compared to the size of the Cayley ball. Using this model, he had proved that for $d < 1/2$ a typical quotient of a free group is non-elementary hyperbolic.

Ollivier extended Gromov's result to show that for $d < 1/2$ a typical quotient of even a non-elementary hyperbolic group is non-elementary hyperbolic.

Żuk/Kotowski-Kotowski proved that for $d > 1/3$ a typical quotient of a free group has Property-(T).We show that (in a closely related density model) for $1/3 < d < 1/2$ a typical quotient of a non-elementary hyperbolic group is non-elementary hyperbolic and has Property-(T). This provides an answer to a question of Gromov (and Ollivier).

Sachchidanand Prasad, Indian Institute of Science Education and Research Kolkata
Title: Morse-Bott Flows and Cut Locus of Submanifolds
Abstract: We will recall the notion of cut locus of closed submanifolds in a complete Riemannian manifold. Using Morse-Bott flows, it can be seen that the complement of the submanifold deforms to the cut locus. This enhances our understanding of well-known classical deformation retracts as well as the homotopy type of certain complements. We will also discuss how is the Thom space of the normal bundle related to the cut locus. This is based on joint work with Dr. Somnath Basu.

Dale Rolfsen, University of British Columbia
Title: Braids, Orderings and Minimal Volume Cusped Hyperbolic 3-Manifolds
Abstract: The orderability properties of fundamental groups of minimal volume cusped hyperbolic 3-manifolds will be explored using the theory of braids and automorphisms of free groups.
This is joint work with Eiko Kin.

Jordan Sahattchieve,
Title: A Fibering Theorem for 3-Manifolds
Abstract: In this talk, I will endeavor to communicate a new fibering theorem for 3-manifolds in the style of Stalling's Fibration Theorem.

Kai Smith, Indiana University
Title: Character Varieties of Tangles and Singular Instanton Homology
Abstract: Singular Instanton Homology ($I^\natural$) is a knot homology theory defined by Kronheimer and Mrowka which has been instrumental in proving fundamental facts about Khovanov homology. Unfortunately, it is quite hard to compute. Hedden, Herald, and Kirk developed an easier to compute method using character varieties of tangles in order to get bounds on $I^\natural$. Furthermore, they proposed a new knot homology theory based on their methods which they conjectured to be isomorphic to $I^\natural$. Using their, methods I show how to calculate bounds on $I^\natural$ for a large class of knots and find a counterexample to their conjecture.

Ignat Soroko, Florida State University
Title: Divergence in Coxeter Groups
Abstract: Divergence of a metric space is an interesting quasi-isometry invariant of the space which measures how geodesic rays diverge outside of a ball of radius r, as a function of r. Divergence of a finitely generated group is defined as the divergence of its Cayley graph. For symmetric spaces of non-compact type the divergence is either linear or exponential, and Gromov suggested that the same dichotomy should hold in a much larger class of non-positively curved CAT(0) spaces. However this turned out not to be the case and we now know that the spectrum of possible divergence functions on groups is very rich. In a joint project with Pallavi Dani, Yusra Naqvi, and Anne Thomas, we initiate the study of the divergence in the general Coxeter groups. We introduce a combinatorial invariant called the 'hypergraph index', which is computable from the Coxeter graph of the group, and use it to characterize when a Coxeter group has linear, quadratic or exponential divergence, and also when its divergence is bounded by a polynomial.

Charles Stine, Brandeis University
Title: The Complexity of Shake Slice Knots
Abstract: It is a well studied conjecture that a shake slice knot is in fact slice. Many counterexamples have been given, but most are close to being slice in a technical sense. In this talk, we will give a precise way to measure how far away a shake slice knot is from being slice, and we construct examples which exhaust all possible degrees of difference. This subsumes all known counterexamples to the conjecture and has implications for the construction of exotic smooth structures on simply-connected 4-manifolds.

Bertuel Tangue Ndawa, University of Ngaoundere
Title: Infinite Lifting of an Action of Symplectomorphism Group on the Set of Bi-Lagrangian Structures
Abstract: We consider a smooth $2n$-manifold M endowed with a bi-Lagrangian structure $(\omega, \mathcal{F}_1, \mathcal{F}_2)$. That is, ω is a symplectic form and $(\mathcal{F}_1, \mathcal{F}_2)$ is a pair of transversal Lagrangian foliations on (M, ω) (Let us mention that a bi-Lagrangian structure $(\omega, \mathcal{F}_1, \mathcal{F}_2)$ on a manifold M corresponds one to one to a para-Kähler structure (G, F) on M). Such a structure has an important geometric object called the Hess Connection. Among the many importance of Hess connections, they allow to classify affine bi-Lagrangian structures.

In this work, we construct a diagram from a bi-Lagrangian where the vertical structure is a lift and the horizontal structure is the push forward by a diffeomorphis. If the iniatial struture is affine, then so are the other three. Moreover, the above diagram is commutative for some bi-Lagrangian.

Em Thompson, Monash University
Title: Describing Deformations

Abstract: The deformation variety of a hyperbolic knot parametrises the hyperbolic structures on the knot's complement that are 'close' to the complete hyperbolic structure. We can study these structures by finding an ideal triangulation of the manifold and considering solutions to the gluing and completeness equations, which are encoded in the so-called Neumann-Zagier matrix. Symplectic properties of this matrix allow us to change basis, uncovering additional structure in the equations defining the deformation variety. In this talk we will step through a tangible example of how these definitions and results apply to a particular triangulation. The talk will cover work that is joint with Josh Howie, Daniel Mathews and Jessica Purcell.

Aditya Tiwari, Indian Institute of Science Education and Research Bhopal, MP, India
Title: On the eigenvalues of the Laplacian on ellipsoids with curvature condition
Abstract: We study the eigenvalues of the Laplacian on ellipsoids that are obtained as analytic perturbations of the standard Euclidean unit sphere in dimension two. A comparison of these eigenvalues with those of the standard Euclidean unit sphere is obtained under a Gaussian curvature condition, in line with the Lichnerowicz theorem on the first positive eigenvalue on a compact Riemannian manifold.

Misha Tyomkin, Dartmouth College
Title: On Numbers Associated with a Strong Morse Function
Abstract: Morse function f on a manifold M is called strong if all its critical points have different critical values. Given a strong Morse function f and a field F we construct a bunch of elements of F, which we call Bruhat numbers (they're defined up to sign). More concretely, Bruhat number is written on each bar in the barcode of f (a.k.a. Barannikov decomposition). It turns out that if homology of M over F is that of a sphere, then the product of all the numbers is independent of f. We then construct the barcode and Bruhat numbers with twisted (a.k.a. local) coefficients and prove that the mentioned product equals to the Reidemeister torsion of M. In particular, it's again independent of f. This way we link Morse theory to the Reidemeister torsion via barcodes. Based on a joint work with Petya Pushkar.

Thomas Weighill, UNC Greensboro
Title: The Coarse Geometry of Hyperspaces
Abstract: We study the geometry of the space of subsets of an ambient metric space X equipped with the Hausdorff metric. We show that for the space of subsets with at most n points, most coarse geometric properties are inherited from the ambient space including finite asymptotic dimension and Property A. On the other hand, under mild assumptions on X, the space of all finite subsets of X is not coarsely embeddable in Hilbert space. Along the way, I will draw some parallels to recent results from the literature on spaces of persistence

diagrams. This is joint work with Takamitsu Yamauchi and Nicolò Zava.

Max Zahoransky von Worlik, Technische Universitat Berlin
Title: The Alexander Polynomial for Knots in the 3-Torus
Abstract: In this talk I will explain how to obtain diagrammatic representations for knots and links in the 3-torus. This includes a discussion of how one can obtain a complete set of isotopy moves for such diagrams. I will then explore a way to compute the Alexander polynomial of a 3-torus knot.

Andreas Zastrow, University of Gdansk (Inst. Math.)
Title: An Embedded Circle into $\mathbb{R}^3$ Might Not Be Able to Escape Before an Isotoped Linked Circle
Abstract: The mathematically precise statement of the problem that was intuitively described in the title is following isotopy-extension problem: Given two linked embedded circles and an isotopy for one of them, is it possible to extend the embedding of the second circle to an isotopy, so that at any time of the isotopy both circles remain disjoint? − Since, when isotopying a circle, it cannot bump into itself or just shrink via very small circles down to a point, the result as described in the title is a bit counter-intuitive. However in the first half of the talk a corresponding example will be constructed, based on a construction trick that has already been used to construct Alexander's horned sphere. In the second half of this talk I want to introduce the problem that made me ask this isotopy-extension question: It is the problem of deciding, whether there exist knots (and it is clear that at most totally wild knots might have such a property) that even with respect to ordinary (not necessarily ambient) isotopy are non-equivalent to the trivial knot. In particular the consequences that the newly discovered example has for attacking this problem shall be discussed.