Spring 2025

- **January 23rd**
  Organizational meeting, meet in WH 100E at 2:50pm

- **January 30th**
  Speaker: **Matthew Zaremsky** (University at Albany)
  Title: **Progress around the Boone-Higman conjecture** *Abstract:* The Boone-Higman conjecture (1973) predicts that every finitely generated group with solvable word problem embeds in a finitely presented simple group. There has been a flurry of recent activity around this conjecture, in particular relating it to the family of so called twisted Brin-Thompson groups. In this talk I will give some background on the conjecture, give a gentle introduction to twisted Brin-Thompson groups, and then discuss various recent results of mine, including some joint with combinations of Jim Belk, Collin Bleak, Francesco Fournier-Facio, James Hyde, and Francesco Matucci.

- **February 6th**
  Problem session

- **February 13th**
  No seminar

- **February 20th**
  No seminar

- **February 27th**
  Speaker: **Valentina Zapata Castro** (University of Virginia)
  Title: **Monoidal complete Segal spaces** *Abstract:* Viewing a monoid as a category with a single object allows us to encode the binary operation using the properties of composition and associativity inherent in any category. In this talk, we use this idea to explore the relationship between $(\infty,1)$-categories with a monoidal structure and $(\infty,2)$-categories with one object. This exploration relies on the model structure of simplicial and Θ_2-spaces. The talk is designed to be self-contained, requiring no prior knowledge of the aforementioned categories.

- **March 6th**
  Speaker: **Inhyeok Choi** (Cornell University)
  Title: **Genericity of pseudo-Anosovs and quasi-isometries** *Abstract:* In this talk, I will explain a recent result that pseudo-Anosov mapping classes are generic in every Cayley graph of mapping class groups. If time permits, I will also explain why this strategy goes well with quasi-isometries and implies genericity of Morse elements for groups quasi-isometric to (many) 3-manifold groups and special cubical groups.

- **March 13th**
  Spring break

- **March 20th**
  Peter Hilton Memorial Lecture

- **March 27th**
  Speaker: **Colby Kelln** (Cornell University)

Title: **Coning off a hyperbolic manifold with totally geodesic boundary** *Abstract:* Let M be a compact hyperbolic manifold with totally geodesic boundary. If the injectivity radius of ∂M is larger than an explicit function of the normal injectivity radius of ∂M, we show there is a negatively curved metric on the space obtained by coning each boundary component of M to a point. Moreover, we give explicit geometric conditions under which a locally convex subset of M gives rise to a locally convex subset of the cone-off. Group-theoretically, we conclude that the fundamental group of the cone-off is hyperbolic and the π_1-image of the locally convex subset is a quasi-convex subgroup.

- **April 3rd**
  Speaker: **Theodore Weisman** (University of Michigan)
  Title: **Anosov representations of cubulated hyperbolic groups** *Abstract:* An Anosov representation of a hyperbolic group Γ is a representation which quasi-isometrically embeds Γ into a semisimple Lie group - say, SL(d, R) - in a way which imitates the behavior of a convex cocompact group acting on a hyperbolic metric space. It is unknown whether every linear hyperbolic group admits an Anosov representation. In this talk, I will discuss joint work with Sami Douba, Balthazar Flechelles, and Feng Zhu, which shows that every hyperbolic group that acts geometrically on a CAT(0) cube complex admits a 1-Anosov representation into SL(d, R) for some d. Mainly, the proof exploits the relationship between the combinatorial/CAT(0) geometry of right-angled Coxeter groups and the projective geometry of a convex domain in real projective space on which a Coxeter group acts by reflections.

- **April 10th**
  Speaker: **Marco Volpe** (University of Toronto)
  Title: **Fiberwise simple homotopy theory** *Abstract:* Simple homotopy theory is, roughly speaking, the study of finite CW-complexes up to collapses and expansions. From its early stages, it has been observed that simple homotopy types are deeply connected to K-theory. This connection is realized through Wall's finiteness obstruction for finitely dominated complexes and the Whitehead torsion of a homotopy equivalence between finite complexes. One of Waldhausen's main contributions ('83) to simple homotopy theory was to incorporate both Wall's obstruction and the Whitehead torsion in the study of assembly maps in K-theory. Later on, Dwyer-Weiss-Williams ('03) have introduced “fiberwise” assembly maps associated to fibrations over a fixed base space, thereby providing a framework for understanding simple homotopy types varying in families. In this talk, we introduce a novel perspective on fiberwise assembly maps, developed via the infinity-category of sheaves of spectra on a topological space. Using this approach, we are able to simultaneously generalize both the recently announced (but as yet unpublished) work of Bartels-Efimov-Nikolaus and the topological Dwyer-Weiss-Williams index theorem ('03). This is a joint work with Maxime Ramzi and Sebastian Wolf.

- **April 17th**
  Speaker: **Sayantika Mondal** (CUNY)
  Title: **Distinguishing filling curves via designer metrics** *Abstract:* There are many topological invariants one can associate with homotopy classes of closed curves. These include algebraic and geometric self-intersection number, intersection with curves in a class of curves (for example, simple ones), the Goldman bracket, complementary component types of a curve, mapping class group stabilizers of a curve, and many others. How these invariants interact and determine the curve type (mapping class group orbit) is an active area of research today. In this talk, we focus on the so called inf invariant (shortest length metric) associated to a filling curve, its relationship with the geometric self-intersection number, and its relation to the optimal metric that is tailored to produce the minimum length. While clearly the geometric self-intersection number is a type invariant, we address whether the

inf invariant can distinguish between curves that have the same self-intersection. This is joint work with Ara Basmajian.

- **April 24th**
  Speaker: **Kasia Jankiewicz** (UC Santa Cruz / IAS)
  Title: **Cubical quotients of cubical nonproduct groups** *Abstract:* Burger-Mozes constructed examples of simple groups acting geometrically on a CAT(0) complex, which is a product of trees. As a counterpoint, we prove that every group acting geometrically on a CAT(0) cube complex which is not a product, admits a nontrivial quotient which also admits a geometric action on a CAT(0) cube complex. Our construction relies on the cubical version of small cancelation theory. This is joint work with M. Arenas and D. Wise.

- **Tuesday April 29th, 1:15-2:15 pm** (joint with the Combinatorics Seminar)
  Speaker: **Leo Jiang** (Toronto)
  Title: **Topology of Real Matroid Schubert Varieties** *Abstract:* Every linear representation of a matroid determines a matroid Schubert variety whose geometry encodes combinatorics of the matroid. When the representation is over the real numbers, we study the topology of the real points of the variety. Our main tool is an explicit cell decomposition, which depends only on the oriented matroid structure and can be extended to define a combinatorially interesting topological space for any oriented matroid. This is joint work with Yu Li.

- **May 1st - DOUBLE HEADER**
  Speaker: **Chaitanya Tappu** (Cornell University) – **2:50-3:50pm**
  Title: **Contractibility of the marked moduli space** *Abstract:* We prove that the marked moduli space of any infinite type surface is contractible. The marked moduli space of an infinite type surface (equipped with an action of the big mapping class group) is introduced as the generalisation of the usual Teichmüller space of a finite type surface. This result is analogous to that of Douady–Earle, who proved that the (quasiconformal) Teichmüller space of an arbitrary Riemann surface, whether of finite or infinite type, is contractible. Even though the marked moduli space reduces to the Teichmüller space in case the surface is of finite type, it is quite distinct from the Teichmüller space in case the surface is of infinite type. Nevertheless, we are able to adapt the Douady–Earle proof to the setting of the marked moduli space. A key difference is that in this setting, we use a Fréchet space topology on the vector space of (-1, 1)-forms (that is, Beltrami forms), rather than the usual Banach space topology.
  Speaker: **Filippo Calderoni** (Rutgers) – **4:15 - 5:15pm**
  Title: **Groups, orders, and dynamics: a new perspective** *Abstract:* A countable group G is said to be left-orderable if it admits a total order which is invariant under left multiplication, or, equivalently, if G admits a faithful action by orientation preserving homeomorphisms on the real line. There is a beautiful connection between the algebraic properties of a left-orderable group G and the conjugacy action on LO(G), the compact Hausdorff space of all left-orders supported by G. In this talk I will survey some results towards characterizing those left-orderable groups such that the orbit space of LO(G) modulo conjugacy is trivial from the viewpoint of descriptive set theory.