Fall 2019

- **August 22**
  Speaker: **TBA** (Institution)
  Title: **TBA** *Abstract:* TBA

- **August 29**
  Speaker: **Catherine Pfaff** (Queen's University)
  Title: **Typical Trees: An $Out(F_r)$ Excursion** *Abstract:* Random walks are not new to geometric group theory (see, for example, work of Furstenberg, Kaimonovich, Masur). However, following independent proofs by Maher and Rivin that pseudo-Anosovs are generic within mapping class groups, and then new techniques developed by Maher-Tiozzo, Sisto, and others, the field has seen in the past decade a veritable explosion of results. In a 2 paper series, we answer with fine detail a question posed by Handel-Mosher asking about invariants of generic outer automorphisms of free groups and then a question posed by Bestvina as to properties of $\mathbb R$-trees of full measure in the boundary of Culler-Vogtmann outer space. This is joint work with Ilya Kapovich, Joseph Maher, and Samuel J. Taylor.

- **September 5**
  Speaker: **TBA** (Institution)
  Title: **TBA** *Abstract:* TBA

- **September 12**
  Speaker: **Caglar Uyanik** (Yale University)
  Title: **Dynamics on geodesic currents and atoroidal subgroups of $Out(F_N)$** *Abstract:* Geodesic currents on surfaces are measure theoretic generalizations of closed curves on surfaces and they play an important role in the study of the Teichmuller spaces. I will talk about their analogs in the setting of free groups, and try to illustrate how the dynamics and geometry of the $Out(F_N)$ action reflects on the algebraic structure of $Out(F_N)$.

- **September 19**
  Speaker: **Cary Malkiewich** (Binghamton University)
  Title: **What algebraic K-theory has to do with fixed-point theory** *Abstract:* The goal of this talk is to give a gentle introduction to algebraic K-theory and the Dennis trace. We'll see how the concept naturally arises when we try to enumerate all the ways to algebraically count the fixed points of a map $f: X \rightarrow X$ for a finite CW complex X.

- **September 26**
  Speaker: **TBA** (Institution)
  Title: **TBA** *Abstract:* TBA

- **October 3**
  Speaker: **TBA** (Institution)
  Title: **TBA** *Abstract:* TBA

- **October 10**
  Speaker: **Inbar Klang** (Columbia University)
  Title: Hochschild homology for C_n-equivariant things *Abstract:* After introducing Hochschild homology and topological Hochschild homology, I will talk about about the twisted versions of these that can be defined in the presence of an action of a finite cyclic group. I will discuss joint work with Adamyk, Gerhardt, Hess, and Kong in

which we develop a theoretical framework and computational tools for these twisted Hochschild homology theories.

- **SPECIAL DATE AND TIME: October 15, 1:15 - 2:15, WH 100E** (Joint with the Combinatorics Seminar)
  Speaker: **Emanuele Delucchi** (Fribourg/Freiburg)
  Title: **Fundamental Polytopes of Metric Spaces via Parallel Connection of Matroids** *Abstract:* Motivated by applications in phylogenetics, Linard Hoessly and I tackle the problem of a combinatorial classification of finite metric spaces via their fundamental polytopes, as suggested by Vershik in 2010. We consider a hyperplane arrangement associated to every split pseudometric and, for tree-like metrics, we study the combinatorics of its underlying matroid. We give explicit formulas for the face numbers of fundamental polytopes and Lipschitz polytopes of all tree-like metrics, and we characterize the metric trees for which the fundamental polytope is simplicial.

- **October 17**
  Speaker: **TBA** (Institution)
  Title: **TBA** *Abstract:* TBA

- **October 24**
  Speaker: **Nicholas Vlamis** (CUNY, Queen's College and Graduate Center)
  Title: **Topology of (big) mapping class groups** *Abstract:* Mapping class groups inherit a natural topology from the compact-open topology on homeomorphism groups. When the underlying surface is of infinite type, this topology is no longer discrete, which allows us to study these mapping class groups from the perspective of topological group theory. We will explain how to see that mapping class groups are Polish groups and how we can use topological aspects to prove algebraic statements.

- **SPECIAL DATE AND TIME: October 28, 4:30 - 5:30, WH 100E**
  Speaker: **Yash Lodha** (EPFL)
  Title: **Property FW and smoothability** *Abstract:* I shall describe joint work with Matte Bon and Triestino. We demonstrate that aperiodic actions of Kazhdan groups by countably singular diffeomorphisms on closed manifolds are smoothable. In the case of the circle, we obtain a proof that groups of piecewise linear or piecewise projective homeomorphisms are not Kazhdan unless they are finite. The key new idea is the application of Property FW, which is a weakening of Kazhdan's property (T).

- **October 31**
  Speaker: **Eduard Schesler** (Universität Bielefeld)
  Title: **The Sigma conjecture for solvable S-arithmetic groups via discrete Morse theory on Euclidean buildings.** *Abstract:* Given a finitely generated group G, the Σ invariants of G consist of geometrically defined subsets $\Sigma^k(G)$ of the set $S(G)$ of all characters $\chi: G\to \mathbf{R}$ of G. These invariants were introduced independently by Bieri-Strebel and Neumann for $k=1$ and generalized by Bieri-Renz to the general case in the late 80's in order to determine the finiteness properties of all subgroups H of G that contain the commutator subgroup $[G,G]$. In this talk we determine the Sigma invariants of certain S-arithmetic subgroups of Borel groups in Chevalley groups. In particular we will determine the finiteness properties of every subgroup of the group of upper triangular matrices $B_n(\mathbf{Z}[1/p]) < SL_n(\mathbf{Z}[1/p])$ that contains the group $U_n(\mathbf{Z}[1/p])$ of unipotent matrices where p is any sufficiently large prime number.

- **November 7**
  Speaker: **Edgar Bering** (Temple University)

Title: **Special covers of alternating links** *Abstract:* The “virtual conjectures” in low-dimensional topology, stated by Thurston in 1982, postulated that every hyperbolic 3-manifold has finite covers that are Haken and fibered, with large Betti numbers. These conjectures were resolved in 2012 by Agol and Wise, using the machine of special cube complexes. Since that time, many mathematicians have asked how big a cover one needs to take to ensure one of these desired properties. We begin to give a quantitative answer to this question, in the setting of alternating links in S^3. If an alternating link L has a diagram with n crossings, we prove that the complement of L has a special cover of degree less than $72((n-1)!)^2$. As a corollary, we bound the degree of the cover required to get Betti number at least k. We also quantify residual finiteness, bounding the degree of a cover where a closed curve of length k fails to lift. This is joint work with David Futer.

- **November 14**
  Speaker: **Ian Frankel** (Queens University)
  Title: **Quantitative recurrence and hyperbolicity in Teichmüller space** *Abstract:* The moduli space of compact hyperbolic surfaces of genus $g > 1$ has a metric which displays geometric and dynamical properties similar to the properties of hyperbolic surfaces. In particular, we will describe a Teichmüller space analog of the basic fact from hyperbolic geometry: if two geodesics in hyperbolic space converge to the same point on the boundary, then the distance between them decreases exponentially.

- **November 21**
  Speaker: **Yu Zhang** (Ohio State University)
  Title: **Topological Quillen localization of structured ring spectra** *Abstract:* Homotopy groups and stable homotopy groups of spaces are central invariants in algebraic topology. Stable homotopy groups are comparatively easier to work with, at the expense of losing certain information. However, if we are working with nice spaces, nothing will be lost by working stably: A map between nilpotent spaces induces homotopy groups isomorphisms if and only if it induces stable homotopy groups isomorphisms. Structured ring spectra are spectra with certain algebraic structure encoded by the action of an operad O. For such O-algebras, the analog of stable homotopy groups are played by Topological Quillen (TQ) homology groups. In this talk, we will draw the analogy between topological spaces and O-algebras, discuss the TQ-localization of O-algebras, and show the TQ-Whitehead theorem for homotopy pro-nilpotent O-algebras. Part of the work in this talk is joint with John E. Harper.

- **SPECIAL DATE AND TIME: November 26, 1:15 - 2:15, WH 100E** (Joint with the Combinatorics Seminar)
  Speaker: **Casey Donoven** (Binghamton University)
  Title: **Counting Boxes: A Friendly Introduction to Fractal Dimension** *Abstract:* The box-counting dimension of a set is calculated by covering a set with 'boxes' and seeing how fast the number of boxes grows in proportion to decreasing the size of the box. For manifolds in Euclidean space, such as curves, surfaces, etc., the box-counting dimension agrees with the topological dimension. My work explores the box-counting dimension (and Hausdorff dimension) in Cantor space, the boundary of an infinite tree. Specifically, I will answer the following question: Given sets E and F in Cantor space and a random isometry f, what is the dimension of the intersection of E and $f(F)$?

- **November 28** No seminar (Thanksgiving)

- **December 5**
  Speaker: **Steven Gindi** (Binghamton University)
  Title: **Long Time Limits of Generalized Ricci Flow** *Abstract:* We derive modified Perelman-type monotonicity formulas for solutions to the generalized Ricci flow equation with symmetry on principal bundles. This leads to rigidity and classification results for nonsingular solutions.

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