The Algebra Seminar

The seminar will meet in-person on Tuesdays in room WH-100E at 2:50 p.m. There should be refreshments served at 4:00 in room WH-102. Masks are optional.

Anyone wishing to give a talk in the Algebra Seminar this semester is requested to contact the organizers at least one week ahead of time, to provide a title and abstract. If a speaker prefers to give a zoom talk, the organizers will need to be notified at least one week ahead of time, and a link will be posted on this page.

If needed, the following link would be used for a zoom meeting (Meeting ID: 93487611842) of the Algebra Seminar:

Algebra Seminar Zoom Meeting Link

Organizers: Alex Feingold, Daniel Studenmund and Hung Tong-Viet

To receive announcements of seminar talks by email, please email one of the organizers with your name, email address and reason for joining this list if you are external to Binghamton University.

Spring 2025

- **January 21**
  Organizational Meeting

  Please think about giving a talk in the Algebra Seminar, or inviting an outside speaker.

- **January 28**
  Daniel Studenmund (Binghamton University)
  Piecewise isometry groups arising from Weyl groups

  Abstract: Here's a fun way to build a group by cutting and pasting: Start with a Euclidean, spherical, or hyperbolic model geometry X carrying a collection $\mathcal{H}$ of totally geodesic codimension-1 submanifolds determining a regular tessellation Δ of X. A piecewise isometry of Δ is defined by cutting out finitely many subspaces $S_1,\dotsc, S_k \in \mathcal{H}$ and isometrically mapping the components of what remains to the components obtained by cutting out another finite collection of subspaces $T_1,\dotsc, T_k \in \mathcal{H}$. The collection of all piecewise isometries is a group $PI(\Delta)$. When Δ is a tessellation

of $\mathbb{R}$ by isometric line segments, $PI(\Delta)$ is an extension of Houghton's group H_2. When Δ is a tessellation of the hyperbolic plane by ideal triangles, $PI(\Delta)$ naturally extends Thompson's group V. Bieri and Sach studied $PI(\mathbb{Z}^n)$, where $\mathbb{Z}^n$ is the standard tessellation of Euclidean space by isometric cubes, obtaining lower bounds on their finiteness lengths and presenting a careful analysis of their normal subgroup structure. Our story will start with the piecewise isometry group of the tessellation of the Euclidean plane by equilateral triangles, and generalize to piecewise isometry groups of Euclidean tessellations associated with affine Weyl groups of type A_n. Pictures will be drawn and preliminary results on algebraic structure and finiteness properties will be discussed. Time permitting, we will connect our discussion to the tessellation of hyperbolic 3-space by regular ideal tetrahedra. This talk covers work in progress with Robert Bieri and Alex Feingold.

- **February 4**
  Dikran Karagueuzian (Binghamton University)
  You Need a Yoneda

  Abstract: The Yoneda Lemma is widely regarded as the most-commonly-quoted result of category theory. This (expository) talk will discuss instances of the lemma appearing in the undergraduate mathematics curriculum, particularly linear algebra.

- **February 11**
  Hung Tong-Viet (Binghamton University)
  Orders of commutators in finite groups

  Abstract: In this talk, I will discuss some problems concerning the orders of some commutators in finite groups and how they affect the structure of the group.

- **February 18**
  No Speaker, No Meeting

- **February 25**
  No Speaker, No Meeting

- **March 4**
  Thu Quan (Binghamton University)
  Squaring a conjugacy class in a finite group

  Abstract: Let G be a finite group and K be a conjugacy class of G. Then K^2 consists of the products of any two elements in K. In this talk, we consider some equivalent conditions for K^2 to be a conjugacy class of G. This talk is based on the paper by Guralnick and Navarro in 2015.

- **March 11**
  No Meeting, Spring Break

- **March 18**
  James Hyde (Binghamton University)
  Small generating sets for groups of homeomorphisms of the Cantor set

  Abstract: I will give the definition of Chabauty's space of marked groups and use it to give a nicer proof of a result from my thesis. I will then discuss joint work with Collin Bleak, Casey Donoven, Scott Harper on stronger

notions of small generating sets for groups of homeomorphisms of the Cantor set.

- **March 25**
  Chris Schroeder (Binghamton University)
  Finite groups whose maximal subgroups have almost odd index

  Abstract: A recurring theme in finite group theory is understanding how the structure of a finite group is determined by the arithmetic properties of group invariants. There are results in the literature determining the structure of finite groups whose irreducible character degrees, conjugacy class sizes or indices of maximal subgroups are odd. These results have been extended to include those finite groups whose character degrees or conjugacy class sizes are not divisible by 4. In this paper, we determine the structure of finite groups whose maximal subgroups have index not divisible by 4. As a consequence, we obtain some new 2-nilpotency criteria. This is joint work with Prof. Hung Tong-Viet.

- **April 1**
  Andrew Velasquez-Berroteran (Binghamton University)
  Coverings of Groups and Rings

  Abstract: Given a group G, a covering of G is a collection of proper subgroups of G whose set-theoretic union is G. The first part of my talk will be dedicated to some history of coverings of groups and providing some results on which finite groups have an equal covering, which is a type of covering where each subgroup is of the same order. The second part of my talk will be dedicated to extending the notion of coverings of groups to that of rings. One result of this extension is determining necessary conditions for a ring R so that the ring of polynomials R[X] has a special type of covering.

- **April 8**
  Edgar A Bering IV (San Jose State University)
  Two-generator subgroups of free-by-cyclic groups

  Abstract: In general, the classification of finitely generated subgroups of a given group is intractable. Even restricting to two-generator subgroups is not enough. However, in a geometric setting classification is possible. For example, a two-generator subgroup of a right-angled Artin group is either free or free abelian. Jaco and Shalen proved that a two-generator subgroup of the fundamental group of an orientable atoroidal irreducible 3-manifold is either free, free-abelian, or finite-index. In this talk I will present recent work proving a similar classification theorem for two generator mapping-torus groups of free group endomorphisms: every two generator subgroup is either free or conjugate to a sub-mapping-torus group. As an application we obtain an analog of the Jaco-Shalen result for free-by-cyclic groups with fully irreducible atoroidal monodromy. While the statement is algebraic, the proof technique uses the topology of finite graphs, a la Stallings. This is joint work with Naomi Andrew, Ilya Kapovich, and Stefano Vidussi.

- **April 15**
  No Algebra Seminar

- **April 22**
  No Algebra Seminar - Monday Classes Meet

- **April 29**
  Hanlim Jang (Binghamton University)

Dehn function and the van Kampen diagram

Abstract: Historically, the word problem leads to the definition of the Dehn function which measures the difficulty of solving the word problem. We will discuss how questions concerning Dehn functions turn into questions concerning the geometry of certain planar 2-complexes called van Kampen diagrams. This translation also explains a link between Riemannian filling problems and word problems. Also, we will discuss the lower bounds on Dehn functions for semi-direct products of Z^n and Z. These results are classical and our approach is based on the work of Bridson and Gersten.

- **May 6**
  No Algebra Seminar

  Have a good summer! Talks will resume in the fall.

- Pre-2014 semesters
- Fall 2014
- Spring 2015
- Fall 2015
- Spring 2016
- Fall 2016
- Spring 2017
- Fall 2017
- Spring 2018
- Fall 2018
- Spring 2019
- Fall 2019
- Spring 2020
- Fall 2020
- Spring 2021
- Fall 2021
- Spring 2022
- Fall 2022
- Spring 2023
- Fall 2023
- Spring 2024
- Fall 2024