



The Algebra Seminar

If we have a normal semester, 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. If the COVID Delta variant resurgence causes us to change the plan, we would go back to having only zoom talks. Currently we are required to use masks for all indoor campus events, so all speakers and attendees must wear masks in the Algebra Seminar.

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: 981 8719 2351) of the Algebra Seminar:

Algebra Seminar Zoom Meeting Link

Organizers: [Alex Feingold](#) and [Hung Tong-Viet](#)

To receive announcements of seminar talks by email, please join the seminar's mailing list.

Fall 2021

▪ August 24

[Organizational Meeting](#)

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

▪ August 31

[Fikreab Admasu \(Binghamton University\)](#)

Plane partitions, Schur functions, and representation theory of SS_n

Abstract: This is an expository talk on how the theory of symmetric functions, such as Schur functions, ties in with the theory of plane partitions and the representation theory of SS_n . We will conclude with some open problems that have connections with number theory and discuss current attempts at extensions of the above

relations.

▪ **September 7**

[No Seminar](#)

▪ **September 14**

[Fikreab Admasu \(Binghamton University\)](#)

Plane partitions, Schur functions, and representation theory of S_n

Abstract: This is a continuation of the first talk on Aug. 31.

▪ **September 21**

[Alex Feingold \(Binghamton University\)](#)

Combinatorics related to representations of Clifford and Lie algebras

Abstract: I will give an introduction to Clifford algebras and Lie algebras, and give examples showing how their representation theory is connected in certain cases to combinatorics. In particular, I will discuss the bosonic representation of an infinite dimensional Heisenberg Lie algebra whose weight spaces have dimensions given by the classical partition function. In contrast, Clifford algebras have fermionic representations whose weight spaces have dimensions given by certain restricted partitions (into distinct parts). These provide simple models of two kinds of fundamental particles in physics, bosons and fermions.

▪ **September 28**

[Anthony Ercolano \(Binghamton University\)](#)

Cellular Automata, The Garden of Eden Theorem and Surjunctive Groups

Abstract: In this talk we will introduce the theory of cellular automata, beginning with a simple explanation of the most famous cellular automaton, John Conway's Game of Life. We will then generalize the Game of Life, putting the theory on more rigorous mathematical footing so we can discuss important classes of groups related to the theory, namely surjunctive groups, residually finite groups, and Hopfian groups. Our talk will conclude with a discussion of some of the open problems related to them.

▪ **October 5**

[Daniel Studenmund \(Binghamton University\)](#)

Finite-index subgroups of infinite nilpotent groups

Abstract: Finitely generated infinite nilpotent groups, such as the discrete Heisenberg group, possess rich geometric structure while having algebraic structure amenable to a variety of computational techniques. We will review some established results about word growth and subgroup growth in nilpotent groups due to Milnor, Bass, Guivarc'h, Gromov, Grunewald, du Sautoy, and others. We then introduce a metric space structure on the collection of finite-index subgroups, and state results on growth of metric balls in this space. This covers work joint with Khalid Bou-Rabee of CCNY.

▪ **October 12**

[Sailun Zhan \(Binghamton University\)](#)

Hilbert schemes of points of algebraic surfaces

Abstract: Moduli spaces parametrizing objects associated with a given space are a rich source of spaces with

interesting structures. A Hilbert scheme of n points of a projective/quasi-projective variety is the moduli space parametrizing 0-dimensional subschemes of length n . It parametrizes “ n points” on the space and is highly related to the n -th symmetric product. But it contains more information than that. The local structure is also related to partition functions and Young diagrams. We will use concrete examples (e.g. the space being $\mathbb{C}$ or $\mathbb{C}^2$) and give an expository talk on the topic.

▪ **October 19**

[Jonathan Doane \(Binghamton University\)](#)

Varieties with constants

Abstract: Rings and groups are among the many classes of (universal) algebras, called varieties, which contain constant(s) as part of their structure. In fact, the ring with unity $\text{R} = \langle 0, 1 \rangle; +, \cdot, 0, 1 \rangle$ whose only elements are constants, generates a variety interesting in its own right, namely Boolean rings. Notably, R is 0-generated as it is required to contain both 0 and 1. This talk aims to provide a small, general theory for those varieties which are generated by a single 0-generated algebra.

▪ **October 26**

[Zach Costanzo \(Binghamton University\)](#)

Real-valued character degree patterns of finite groups

Abstract: Given a finite group G , we can consider the influence the set of character degrees has on the structure of the group. In this talk, we will restrict our view to the characters which take their values over $\mathbb{R}$, and examine groups whose real-valued character degrees satisfy certain patterns.

▪ **November 2**

[Hung Tong-Viet \(Binghamton University\)](#)

Character degrees and conjugacy class sizes

Abstract: There is a strong but mysterious connection between the complex character degrees and conjugacy class sizes of finite groups. Many important results on character degrees admit a dual version for conjugacy class sizes and vice versa. Both of these numerical invariants have strong influence on the structure of the groups. In this expository talk, I will survey some known results and open problems concerning these two invariants.

▪ **November 9**

[Christopher Schroeder \(Binghamton University\)](#)

The structure of finite groups via relative character degrees

Abstract: A fruitful line of research in the representation theory of finite groups is to relate group structure and the degrees of ordinary irreducible characters (that is, the dimensions of the irreducible complex representations). For example, the celebrated Itô-Michler theorem says that a finite group has normal, abelian Sylow p -subgroups if and only if all its ordinary irreducible character degrees are coprime to p . In this talk, we discuss a more general setting in which only the relative degrees of characters over a normal subgroup are considered.

▪ **November 16**

[Tung T. Nguyen \(Western University/Nature Claim\)](#)

Join of circulant matrices

Abstract: Circulants matrices provide a nontrivial, beautiful, and simple set of objects in matrix theory. They

appear quite naturally in many problems in network theory and non-linear dynamics. The circulant diagonalization theorem describes the eigenspectrum and eigenspaces of a circulant matrix explicitly via the fast Fourier transform. Consequently, many problems involving circulant matrices have closed-form or analytical solutions. In this talk, we generalize the circulant diagonalization theorem to the join of several circulant matrices. We then discuss some applications of our theorems to computational neuroscience and spectral graph theory. A panopto recording of the talk by Tung T. Nguyen is available through the following link: Algebra Seminar talk by Tung T. Nguyen

- **November 23**

[No Seminar](#)

- **November 30**

[Yiyong Yan \(Binghamton University\)](#)

Is there a classification of finite nilpotent groups?

Abstract: We define $f(n)$ to be the number of groups of order n up to isomorphism. As n increases, the problem of classifying groups of order n becomes hard. Charles Sims [86] proved in 1965 that there is a upper bound for the number of groups of order n up to isomorphism. This talk will show that the error term in the Sims bound for the number of p -groups of order p^m may be improved if we restrict our enumeration to p -groups of nilpotency class at most 3. Indeed, our aim is to show that the number of such groups is at most $p^{\{(2m^3/27+O(m^2))\}}$.

- **December 7**

[No Seminar](#)

- Pre-2014 semesters

- [Fall 2014](#)
- [Spring 2015](#)
- [Fall 2015](#)
- [Spring 2016](#)
- [Fall 2016](#)
- [Spring 2017](#)
- [Fall 2017](#)
- [Spring 2018](#)
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- [Spring 2019](#)
- [Fall 2019](#)
- [Spring 2020](#)
- [Fall 2020](#)
- [Spring 2021](#)

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Last update: **2021/12/19 16:43**

