Fall 2019

- **August 27 (Tuesday)**
  Speaker: N/A
  Title: Organizational Meeting
  Abstract: We will discuss schedule and speakers for this semester

- **September 10 (Tuesday)**
  Speaker: Alexander Borisov (Binghamton University)
  Title: Geometrically nilpotent subvarieties for polynomial maps over finite fields
  Abstract: For every dominant self-map of an affine space over a finite field, periodic orbits are Zariski dense. In particular, it is not possible that all points over the algebraic closure of the field are sent to one fixed point by some iteration of this polynomial map. However there may exist a proper subvariety of the affine space such that all its points over the algebraic closure are sent to a fixed point by some iteration of the map, yet the variety itself is not. I will give several examples of this phenomenon and discuss some related questions.

- **September 17 (Tuesday)**
  Speaker: Alexander Borisov (Binghamton University)
  Title: Lattices in Euclidean Spaces, Part 1
  Abstract: This is a first part of a series of two talks on lattices in Euclidean Spaces and their invariants.

- **September 24 (Tuesday)**
  Speaker: Alexander Borisov (Binghamton University)
  Title: Lattices in Euclidean Spaces, Part 2
  Abstract: This is a continuation of the talk from September 17. We will follow the recent preprint of Bost to prove the Banaszczyk's remarkable “Transference Inequality”.

- **October 7 (Monday)**
  Speaker: Huy Dang (University of Virginia)
  Title: The refined Swan conductor and deformation of Artin-Schreier covers
  Abstract: An Artin-Schreier curve is a G:=Z/p-branched cover of the projective line over a field of characteristic p>0. A unique aspect of characteristic p is that there exist flat deformations of a wildly ramified cover so that the number of branch points changes but the genus does not. Using refined Swan conductor, we give the necessary and sufficient conditions for the existence of a deformation between given Artin-Schreier curves. As an application, we show that the moduli space of Artin-Schreier covers of fixed genus g is connected when g is sufficiently large.

- **October 15 (Tuesday)**
  Speaker: Inna Sysoeva (Pittsburgh)
  Title: Irreducible representations of braid groups
  Abstract: In this talk I'm going to discuss the classification of the irreducible representations of Artin braid group B_n on n strings. All irreducible representations of B_n of dimension less or equal to $n-1$ were classified by Ed Formanek in 1996; the irreducible representations of B_n dimension n for $n\geq 9$ were classified by the speaker in 1999, and for $n\leq 8$ they were classified by Formanek, Lee, Vazirani and the speaker in 2003. I will give the overview of the known results, and I will talk about the work in progress aimed to classify all the irreducible representations of B_n of dimension less than or equal to $2n-9$ for $n\geq 10.$

- **October 22 (Tuesday)**

Speaker: Fikreab Solomon Admasu (Binghamton University)
Title: Zeta functions of classical groups and class two nilpotent groups
Abstract: We will discuss zeta functions and generating series associated with two families of groups that are intimately connected with each other: classical groups and class two nilpotent groups. Indeed, the zeta functions of classical groups count some special subgroups in class two nilpotent groups. In particular, we will look at a simpler but less extensive approach to the zeta functions computed by J. Igusa and later generalized by M. du Sautoy and A. Lubotzky.

- **October 29 (Tuesday) (Note: this is joint with Combinatorics Seminar)**
Speaker: Jaiung Jun (SUNY New Paltz)
Title: The Hall algebra of the category of matroids
Abstract: To an abelian category A satisfying certain finiteness conditions, one can associate an algebra H_A (the Hall algebra of A) which encodes the structures of the space of extensions between objects in A. For a non-additive setting, Dyckerhoff and Kapranov introduced the notion of proto-exact categories, as a non-additive generalization of an exact category, which is shown to suffice for the construction of an associative Hall algebra. In this talk, I will discuss the category of matroids in this perspective.

- **November 5 (Tuesday)**
Speaker: Fikreab Solomon Admasu (Binghamton University)
Title: Zeta functions of classical groups via Hecke series
Abstract: We continue the talk from two weeks ago and look at two ways of deriving the zeta functions of classical groups. Making use of computations of Hecke series by A. N. Andrianov, T. Hina and T. Sugano, we express zeta functions of symplectic groups and even orthogonal groups in terms of the cotype zeta function of the integer lattice. This may lead to an alternate proof of properties of the zeta functions of the above classical groups such as local functional equations and the existence of natural boundaries.

- **November 11 (Monday)**
Speaker: Andrew Kobin (University of Virginia)
Title: A stacky compactification of the ring of Witt vectors
Abstract: The ring of Witt vectors is an essential tool for understanding relationships between the worlds of characteristic 0 and finite characteristic algebra. In this talk, I will recall how the ring (scheme) of Witt vectors allows one to lift field extensions and covers of curves from characteristic p to characteristic 0. The latter situation motivated Garuti to define a projective scheme which compactifies the ring (scheme) of Witt vectors "equivariantly" (with respect to Witt vector addition). After describing Garuti's construction and its application to the study of covers of curves, I will introduce a new compactification in the category of algebraic stacks that I am currently using to describe the local structure of stacky curves in characteristic p.

- **November 18/19**
Speaker: Dikran Karagueuzian (Binghamton University)
Title: Coalescence of Polynomials over Finite Fields
Abstract: A polynomial over a finite field can be regarded as a map of the finite field to itself. The coalescence, or variance of the inverse image sizes, has been studied in connection with whether such maps are a good substitute for random maps. We are able to show that polynomial maps are not random in the sense that the coalescence must be an integer, in an asymptotic sense as the size of the finite field becomes large. This is based on joint work with Per Kurlberg.

- **November 25 (Monday)**
Speaker: Caleb McWhorter (Syracuse University)

Title: Mordell-Weil Groups of Elliptic Curves

Abstract: The Mordell-Weil Theorem states that for a number field K, the group of K-rational points on an elliptic curve form a finitely generated abelian group, i.e. $E(K) \cong \mathbb{Z}^{r_K} \oplus E(K)_{\text{tors}}$, where r_K is the rank and $E(K)_{\text{tors}}$ is the torsion subgroup. Despite the apparent simplicity of $E(K)$, there is little known about the possible Mordell-Weil groups, especially in understanding the possible r_K. This talk will discuss the progress in understanding each of these pieces. We will briefly discuss the heuristics of Park-Poonen-Voight-Wood and Lozano-Robledo regarding the possible ranks r_K, and then discuss the work of Bhargava-Shankar regarding the average rank of elliptic curves. Then we will discuss the progress in classifying the possible torsion subgroups of elliptic curves over global fields, where there is much more progress. Finally, we will discuss the specific determination of the possibilities for $E(K)_{\text{tors}}$ when E is a rational elliptic curve and K is a nonic Galois field.