### Monday, November 25, 2019

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<tr>
<th>Time</th>
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<th>Speaker(s)</th>
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<td>11:00am-11:50am</td>
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<td>Andrew Snowden (UM)</td>
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<td>Gilyoung Cheong (UM)</td>
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<td>Bhargav Bhatt (University of Michigan)</td>
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<td>Leyva Luis (Vanderbilt University)</td>
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Abstracts for the week of November 24th, 2019 - November 30th, 2019

**Representation Stability**  
**Monday, November 25, 2019, 11:00am-11:50am**  
3866 East Hall  
**Andrew Snowden (UM)**  
*Periodicity in the cohomology of finite general linear groups via q-divided powers*

I'll explain how to construct a derivation on the cohomology of the symmetric group, or general linear group, and how to use this to get periodicity results in cohomology.  
The talk will be based on this paper:  

**Student Combinatorics**  
**Monday, November 25, 2019, 3:00pm-4:00pm**  
3096 East Hall  
**Gilyoung Cheong (UM)**  
*Pólya theory*

I will talk about a beautiful counting principle, called Polya theory, which allows us to count objects up to permutation group actions. Classically, this principle has been studied to count graphs and chemical compounds. Then I will tell you how to think about Polya theory in the language of permutation representations, an extremely useful viewpoint I learned from John Stembridge.

If time permits, I will briefly explain how Polya theory also arises in topology and algebraic geometry, from work in progress for my PhD thesis and (much harder) joint work in progress with Yinan (Nancy) Wang.

**Student Dynamics**  
**Monday, November 25, 2019, 3:00pm-4:00pm**  
3866 East Hall  
**Salman Siddiqi (UM)**  
*Measures and foliations in dynamical systems*

The structure and regularity of the stable and unstable foliations, along with the regularity of the measure along these foliations, play fundamental roles in many arguments in dynamics. I will point out some of the important features of both foliations and measures in a sketch of the Hopf argument for ergodicity in hyperbolic systems, and then describe some pathological phenomena that can arise for partially hyperbolic systems. I will assume some basic familiarity with measure theory.
RTG Seminar on Number Theory  
Monday, November 25, 2019, 3:00pm-4:00pm  
4088 East Hall  
Bhargav Bhatt (University of Michigan)  
\(p\)-adic cohomology theories

In this talk, I will survey what we currently understand about cohomology theories for algebraic varieties in characteristic \(p\), focusing mainly on the case of \(p\)-adic coefficients.

Student Algebraic Geometry  
Monday, November 25, 2019, 4:00pm-5:00pm  
B745 East Hall  
David Schwein (UM)  
Unramified Geometric Class Field Theory

Hilbert conjectured in 1902 and Furtwängler proved four years later that the maximal unramified abelian extension of a number field is isomorphic to the class group of the number field. In this talk we will use ideas from algebraic geometry to reformulate Furtwängler's classical result. These ideas have proved useful in studying the nonabelian version of Hilbert's problem, and as such, this talk will serve as an introduction to several fundamental tools of the Langlands Program.

Integrable Systems and Random Matrix Theory  
Monday, November 25, 2019, 4:00pm-5:00pm  
1866 East Hall  
Karl Liechty (DePaul University)  
Extreme value statistics for the Airy process with wanderers

I will discuss some ongoing work with Daniel Remenik and Gia Bao Nguyen. It is well known that the maximum value of the Airy process minus a parabola is given by the GOE Tracy-Widom distribution which describes the largest eigenvalue on real symmetric random matrix ensembles. I will talk about the same statistic for the Airy processes with wanderer(s), a deformation of the Airy process whose marginal distributions are given by the distribution of the largest eigenvalue of the spiked GUE ensemble. Naturally this statistic is described by some deformation of the GOE Tracy-Widom distribution. I will describe this statistic in terms of Fredholm determinants and Painleve transcendents, and try to understand how it is related to the spiked GOE.
Group, Lie and Number Theory  
Monday, November 25, 2019, 4:10pm-5:00pm  
4088 East Hall  
Wanlin Li (MIT)  

Newton Polygon Stratification of the Torelli Locus in PEL-type Shimura Varieties

A fundamental problem in arithmetic geometry is to determine which abelian varieties arise as Jacobians of (smooth) curves. In positive characteristic \( p \), we study this problem from the moduli perspective by asking which Newton strata intersect the Torelli locus in the moduli of abelian varieties. In this talk, I will introduce a general picture where we try to answer his question by replacing \( \mathcal{A}_g \) with a Shimura variety of PEL-type, and \( \mathcal{M}_g \) with a Hurwitz space of cyclic covers of \( P^1 \). Using an inductive method, when \( p = 2 \mod 3 \), for all \( g \), we prove the existence of a smooth curve of genus \( g \) whose Newton polygon has about \( 2g/3 \) slopes of \( 1/2 \). This work is joint with Mantovan, Pries and Tang.

Teaching Mathematics  
Monday, November 25, 2019, 5:15pm-6:30pm  
3866 East Hall  
Leyva Luis (Vanderbilt University)  

Characterizing Historically Marginalized Students’ Perceptions of Racialized and Gendered Mechanisms in Undergraduate Pre-Calculus and Calculus Instruction

Undergraduate mathematics education can be experienced in discouraging and socially disaffirming ways among Black students, Latinx students, and white women. Pre-calculus and calculus courses, in particular, operate as gatekeepers that contribute to racialized and/or gendered attrition in these historically marginalized populations’ persistence with mathematics coursework and pursuits in STEM (science, technology, engineering, and mathematics). However, historically marginalized students’ perceptions of instruction in these entry-level mathematics courses have yet to be systematically examined as a contributor to such attrition. In this presentation, I share findings from a study of 20 historically marginalized students’ perceptions of discouraging and/or socially affirming aspects of undergraduate pre-calculus and calculus instruction. I specifically focus on how students, spanning different intersections of racial and gender identities, invoked stereotypes and issues of representation in characterizing two discouraging and/or socially mechanisms of instruction. I conclude the presentation with implications for research and practice in undergraduate mathematics education.

Chromatic Homotopy Theory  
Monday, November 25, 2019, 5:30pm-6:30pm  
3088 East Hall  
Ruian Chen (UM)  

Phantom Maps and even periodic cohomology theory.

Teaching Mathematics
Tuesday, November 26, 2019, 11:30am-1:00pm
4866 East Hall
LCIT Discussion

Learning Community on Inclusive Teaching Discussion

Details about the Learning Community may be found at http://www.math.lsa.umich.edu/~glarose/dept/teaching/lcit.html.

Student Geometry/Topology
Tuesday, November 26, 2019, 3:00pm-4:00pm
3866 East Hall
Carsten Peterson (UM)
General relativity for mathematicians

General relativity is a physical theory which links the geometry of spacetime to gravity. In this talk we'll introduce and attempt to motivate some of the fundamental ideas of general relativity including the Lorentzian metric, the stress-energy tensor, and the Einstein field equation. No background in physics will be assumed, but some background in differential geometry may be useful.

Colloquium Series
Tuesday, November 26, 2019, 4:00pm-5:00pm
1360 East Hall
Andrew Snowden (University of Michigan)
Polynomials in many variables

Classical results of Hilbert, such as the Hilbert basis theorem and Hilbert's syzygy theorem, show that polynomials in a fixed number $n$ of variables are not too complicated. Recent work of a number of people have established a complementary principle: polynomials of a fixed degree $d$, but in an arbitrary number of variables, are also not too complicated. I will give an overview of this recent work.