### Monday, January 25, 2021

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Algebraic Topology</strong> -- Igor Kriz (University of Michigan) Equivariant Lazard rings, cobordism, and deformation -- online Virtual</td>
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<tr>
<td>4:00pm-5:00pm</td>
<td><strong>MCAIM Graduate Seminar</strong> -- Saibal De (University of Michigan) Quantum Computing for Continuous Optimization Problems -- Virtual</td>
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<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Midwest Dynamics and Group Actions</strong> -- Lewis Bowen (The University of Texas at Austin) A New Infinite-Dimensional Multiplicative Ergodic Theorem -- Virtual</td>
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<tr>
<td>5:00pm-5:50pm</td>
<td><strong>Student Analysis</strong> -- () Planning Meeting -- Virtual</td>
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<tr>
<td>5:30pm-7:00pm</td>
<td><strong>Faculty Spotlight</strong> -- Ho and Perry () Algebraic Geometry and Number Theory --</td>
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<td><strong>Student Combinatorics</strong> -- Alana Huszar (University of Michigan) Invariant Polynomials and Quiver Representations -- Virtual</td>
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<td>4:00pm-5:00pm</td>
<td><strong>Algebraic Geometry</strong> -- Tudor Padurariu (IAS) Noncommutative resolutions and intersection cohomology for quotient singularities -- 4096 East Hall</td>
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<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Financial/Actuarial Mathematics</strong> -- Xin Zhang (UM) k-core in percolated dense graph sequences -- Virtual</td>
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<tr>
<td>4:00pm-5:30am</td>
<td><strong>RTG Seminar on Geometry, Dynamics and Topology</strong> -- Thang Nguyen (U Michigan) Measure rigidity for actions of unipotent subgroups -- <a href="https://umich.zoom.us/j/91734725787">https://umich.zoom.us/j/91734725787</a> East Hall</td>
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### Thursday, January 28, 2021

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<td><strong>Topology</strong> -- Ciprian Manolescu (Stanford University) Khovanov homology and the search for exotic 4-spheres -- Virtual</td>
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<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Differential Equations</strong> -- Vera Hur (UIUC) Unstable Stokes waves: a new Evans function approach -- zoom id: 960 8261 6441</td>
<td></td>
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<tr>
<td>4:00pm-5:30pm</td>
<td><strong>Arithmetic Geometry Learning</strong> -- Bhargav Bhatt () Faisceaux pervers - Introduction -- East Hall</td>
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<td><strong>Representation Stability</strong> -- Nick Wawrykow (UM) Secondary Representation Stability and the Ordered Configuration Space of the Once-Punctured Torus -- Online</td>
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<tr>
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<td><strong>Combinatorics</strong> -- Gregory Bodwin (University of Michigan) On the structure of unique shortest paths in graphs -- Virtual</td>
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<tr>
<td>4:00pm-5:30pm</td>
<td><strong>Preprint Algebraic Geometry</strong> -- Mircea Mustata (UM) Denef-Loeser: Germs of arcs on singular algebraic varieties and motivic integration (part II) -- East Hall</td>
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http://www.math.lsa.umich.edu/seminars_events/  -  Page 1/8
**Algebraic Topology**  
**Monday, January 25, 2021, 3:00pm-4:00pm**  
online Virtual  
**Igor Kriz (University of Michigan)**  
*Equivariant Lazard rings, cobordism, and deformation*

I will talk about my joint work with Yunze Lu. While my talk will be self-contained, it can be considered a follow-up of the talk by Markus Hausmann in the sense that I will discuss a different proof of universality of the equivariant formal group laws on stable complex cobordism rings. Our proof leads to a presentation of equivariant Lazard rings as "deformations" of the non-equivariant Lazard ring. There is surprisingly little overlap with the presentations found by Po Hu or with the global homotopy theory approach to universality.

**MCAIM Graduate Seminar**  
**Monday, January 25, 2021, 4:00pm-5:00pm**  
Virtual  
**Saibal De (University of Michigan)**  
*Quantum Computing for Continuous Optimization Problems*

Abstract: Optimization is one of the most common learning tasks in many scientific and industrial applications. However, in many cases, these problems are so large and complex that it takes days, if not weeks, to obtain an answer even with the fastest supercomputers. Quantum computing has recently attracted a lot of attention based on its potential for accelerating specific computational tasks well beyond classical means. For instance, last year Google AI announced their achievement of quantum supremacy; they performed a computation that would take tens of thousands of years on even the fastest classical supercomputer. In this talk, I will introduce some of the basic concepts of quantum computing and focus on how we can potentially use it to solve optimization problems.

Zoom link: https://umich.zoom.us/j/93548625605 (passcode 461066)
Midwest Dynamics and Group Actions
Monday, January 25, 2021, 4:00pm-5:00pm

Lewis Bowen (The University of Texas at Austin)
A New Infinite-Dimensional Multiplicative Ergodic Theorem

In 1960, Furstenberg and Kesten introduced the problem of describing the asymptotic behavior of products of random matrices as the number of factors tends to infinity. Oseledec's proved that such products, after normalization, converge almost surely. This theorem has wide-ranging applications to smooth ergodic theory and rigidity theory. It has been generalized to products of random operators on Banach spaces by Ruelle and others. I will explain a new infinite-dimensional generalization based on von Neumann algebra theory which accommodates continuous Lyapunov distribution. This will be a gentle introductory-style talk; no knowledge of von Neumann algebras will be assumed. This is joint work with Ben Hayes (U. Virginia) and Yuqing Frank Lin (Ben-Gurion U.).

Zoom link: https://iu.zoom.us/j/661711533?pwd=RTFVTjMrQ1pYTCtZZzlvVGVvODV2QT09
password is 076877 if needed.

Student Analysis
Monday, January 25, 2021, 5:00pm-5:50pm
Virtual

Planning Meeting

Please join us as we gather virtually to plan our next semester of Student Analysis Seminar. All graduate students are welcome and beginning graduate students are especially encouraged to participate!

Faculty Spotlight
Monday, January 25, 2021, 5:30pm-7:00pm

Ho and Perry ()
Algebraic Geometry and Number Theory

This Faculty spotlight even will feature Professors Wei Ho and Alex Perry
Colloquium Series  
Tuesday, January 26, 2021, 4:30pm-5:30pm  
Virtual  
Luis Silvestre (University of Chicago)  
*Integro-differential diffusion and the Boltzmann equation*

Integro-differential equations have been a very active area of research in the last 20 years. In this talk we will explain what they are and in what sense they are similar to more classical parabolic partial differential equations. We will discuss results on regularity estimates for the Boltzmann equation in this context.

NOTE SPECIAL TIME: Talk begins at 4:30pm.

https://msu.zoom.us/j/96177703281

Meeting ID: 961 7770 3281  
Passcode: 018847

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Student Combinatorics  
Tuesday, January 26, 2021, 5:00pm-6:00pm  
Virtual  
Alana Huszar (University of Michigan)  
*Invariant Polynomials and Quiver Representations*

We will chat about invariant polynomials through examples, and then we will give some quiver representation definitions. We will see how invariants can be sometimes useful and sometimes not so useful for quiver representations, and what tweaks can be done when they aren't so useful.

Zoom link: https://umich.zoom.us/j/95088797965  
Password: cookies
Algebraic Geometry  
Wednesday, January 27, 2021, 4:00pm-5:00pm  
4096 East Hall  
Tudor Padurariu (IAS)  
Noncommutative resolutions and intersection cohomology for quotient singularities

It is an important problem to define a K-theoretic version of intersection cohomology, with expected applications in representation theory. One step further is to look for a categorification of intersection cohomology. For good moduli spaces $X$ of Artin stack $Y$ (as defined by Alper), we construct some noncommutative resolutions $D(X)$ inside the category $D^b(Y)$. Further, we construct subcategories $I(X)$ of $D(X)$ whose periodic cyclic homology is given by the intersection cohomology of $X$. In particular, the K-theory of $I(X)$ is a natural definition of intersection K-theory for the variety $X$.

Financial/Actuarial Mathematics  
Wednesday, January 27, 2021, 4:00pm-5:00pm  
Virtual  
Xin Zhang (UM)  
$k$-core in percolated dense graph sequences

Let $G_n$ be a sequence of undirected, $n$-vertex dense graphs, and $G_n(1/n)$ be the associated percolated random graphs. In this talk, we determine the size of $k$-core of $G_n(1/n)$ using branching process and theory of dense graph limits. We use two different techniques to show the upper and lower bounds of the size of $k$-core. Our result can also be used to obtain the threshold of appearance of a $k$-core of order $n$. In addition, we obtain a probabilistic result concerning cut-norm and branching process which might be of independent interest. Based on the joint work with Erhan Bayraktar and Suman Chakraborty.

RTG Seminar on Geometry, Dynamics and Topology  
Wednesday, January 27, 2021, 4:00pm-5:30am  
https://umich.zoom.us/j/91734725787 East Hall  
Thang Nguyen (U Michigan)  
Measure rigidity for actions of unipotent subgroups

In a sequence of celebrated works, Ratner classified invariant ergodic measures and orbit closures of actions of groups generated by unipotent elements on a homogeneous space. Namely, such an orbit closure must be a single orbit by a closed subgroup, and the invariant ergodic measure is the Haar measure on that orbit. In this talk, we go over a special case of Ratner’s measure classification theorem when the action group is semisimple. We will follow the exhibition given by Einsiedler.  
Zoom Info:  
https://umich.zoom.us/j/91734725787
Weeks Seminar & Events Bulletin
January 24th, 2021 - January 30th, 2021

Topological
Thursday, January 28, 2021, 3:00pm-4:00pm
Virtual
Ciprian Manolescu (Stanford University)
Khovanov homology and the search for exotic 4-spheres

A well-known strategy to disprove the smooth 4D Poincare conjecture is to find a knot that bounds a disk in a homotopy 4-ball but not in the standard 4-ball. Freedman, Gompf, Morrison and Walker suggested that Rasmussen’s invariant from Khovanov homology could be useful for this purpose. I will describe three recent results about this strategy: that it fails for Gluck twists (joint work with Marengon, Sarkar and Willis); that an analogue works for other 4-manifolds (joint work with Marengon and Piccirillo); and that 0-surgery homeomorphisms provide a large class of potential examples (joint work with Piccirillo). In particular, I will show 21 algebraically slice knots such that if any of them were slice, then an exotic 4-sphere would exist.

Differential Equations
Thursday, January 28, 2021, 4:00pm-5:00pm
zoom id: 960 8261 6441
Vera Hur (UIUC)
Unstable Stokes waves: a new Evans function approach

I will discuss a new periodic Evans function approach for cylindrical domains, and its application to the spectral instability of Stokes waves in the finite depth. Numerical evidence suggests instability whenever the unperturbed wave is ‘resonant’ with its infinitesimal perturbation waves. This has not been studied analytically except the Benjamin-Feir instability, near the origin of the spectral plane, when (wave number) x (depth) > 1.3627... for small amplitude. I will discuss an alternative proof of the Benjamin-Feir instability and, also, the first proof of spectral instability away from the origin, when 0.86430... < (wave number) x (depth) < 1.00804..., elucidating numerical findings. Joint work with Z. Yang.

Arithmetic Geometry Learning
Thursday, January 28, 2021, 4:00pm-5:30pm
East Hall
Bhargav Bhatt
Faisceaux pervers - Introduction

This is the first talk of a semester long seminar on the book "Faisceaux pervers"
Representation Stability
Friday, January 29, 2021, 11:00am-11:50am
Online
Nick Wawrykow (UM)
Secondary Representation Stability and the Ordered Configuration Space of the Once-Punctured Torus

In this talk we discuss a notion of secondary representation stability introduced by Miller and Wilson. They proved that there was a stability pattern in the homology of ordered configuration space of noncompact manifolds in a range beyond the traditional first order representation stability range of Church–Ellenberg–Farb. We discuss their results, and describe an example of secondary representation stability, namely the homology of the ordered configuration space of the once-punctured torus, where the FIM^+ structure is neither free nor stably zero.

Combinatorics
Friday, January 29, 2021, 3:00pm-4:00pm
Virtual
Gregory Bodwin (University of Michigan)
On the structure of unique shortest paths in graphs

Let P be a system of unique shortest paths through a graph with real edge weights. A well-known fact is that P must be "consistent," meaning that no two of these paths can intersect each other, split apart, and then intersect again later. But is that all the guaranteed structure? Can any consistent path system be realized as unique shortest paths in some graph? Or are there more forbidden combinatorial intersection patterns that can be found?

In this talk, we will complete the list of forbidden intersection patterns for systems of unique shortest paths, characterizing the set of unique shortest path systems via forbidden patterns. We will then say a little about some connections between graph metrics and topology that enable our characterization theorem.

Student Algebraic Geometry
Friday, January 29, 2021, 3:00pm-4:00pm
()
Planning meeting

We'll plan the rest of the semester- bring any topics you'd like to talk about or hear a talk on. First year students are especially encouraged to attend!

https://umich.zoom.us/j/96685625210
Preprint Algebraic Geometry
Friday, January 29, 2021, 4:00pm-5:30pm
East Hall
Mircea Mustata (UM)

*Denef-Loeser: Germs of arcs on singular algebraic varieties and motivic integration (part II)*