**Weekly Seminar & Events Bulletin**  
**October 4th, 2020 - October 10th, 2020**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, October 05, 2020</td>
<td><strong>Special Events</strong> -- Davi Obata (University of Chicago) <strong>Open sets of partially hyperbolic systems having a unique SRB measure.</strong> -- Virtual</td>
<td></td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Algebraic Topology</strong> -- Mark Behrens (University of Notre Dame) <strong>tmf resolutions</strong> -- online Virtual</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Integrable Systems and Random Matrix Theory</strong> -- Yuchen Liao (University of Michigan) <strong>Periodic discrete time parallel TASEP</strong> -- <a href="https://umich.zoom.us/j/91617339235">https://umich.zoom.us/j/91617339235</a> Passcode: 651935 Virtual</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>MCAIM Graduate Seminar</strong> -- Yutong Wang (UMICH EECS) <strong>Multiclass support vector machines and ordered partitions</strong> -- Zoom Meeting ID: 935 4862 5605 . Zoom Link: <a href="https://umich.zoom.us/s/93548625605">https://umich.zoom.us/s/93548625605</a> . Passcode by email. Virtual</td>
<td></td>
</tr>
<tr>
<td>7:00pm-8:00pm</td>
<td><strong>Student Math Finance</strong> -- Berkan Yilmaz (University of Michigan) <strong>Robust Hedging in Continuous Time Through Martingale Optimal Transport: Part 1</strong> -- <a href="https://umich.zoom.us/j/99487325343">https://umich.zoom.us/j/99487325343</a> Virtual</td>
<td></td>
</tr>
<tr>
<td>Tuesday, October 06, 2020</td>
<td><strong>Colloquium Series</strong> -- Colin McLarty (Case Western Reserve University) <strong>Grothendieck’s personal idea of a topos as a space</strong> -- Zoom: 915 0970 4265 Passcode: 754044 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Complex Analysis, Dynamics and Geometry</strong> -- Khashayar Filom (U(M)) <strong>On the topology of dynamical moduli spaces of rational maps</strong> -- virtual East Hall</td>
<td></td>
</tr>
<tr>
<td>Wednesday, October 07, 2020</td>
<td><strong>Financial/Actuarial Mathematics</strong> -- Prakash Chakraborty (UM) <strong>Quenched asymptotics for the parabolic Anderson model with rough spatial noise</strong> -- <a href="https://umich.zoom.us/j/95407665241">https://umich.zoom.us/j/95407665241</a> Virtual</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Algebraic Geometry</strong> -- Michael Groechenig (University of Toronto) <strong>p-adic integration for Hitchin systems and the fundamental lemma</strong> -- Zoom</td>
<td></td>
</tr>
<tr>
<td>Friday, October 09, 2020</td>
<td><strong>Representation Stability</strong> -- Nicholas Wawrykow (UM) <strong>Buildings V: Euclidean buildings</strong> -- Online</td>
<td></td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Applied Interdisciplinary Mathematics (AIM)</strong> -- Alex Townsend (Cornell University) <strong>The ultraspherical spectral method</strong> -- (Zoom) East Hall</td>
<td></td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Student Dynamics/Geometry Topology</strong> -- Malavika Mukundan (University of Michigan) <strong>Lattes maps</strong> -- <a href="https://umich.zoom.us/j/94090012548">https://umich.zoom.us/j/94090012548</a> Virtual</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Preprint Algebraic Geometry</strong> -- Attilio Castano () <strong>The derived category of the abelian category of constructible sheaves</strong> -- Zoom East Hall</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Student AIM Seminar</strong> -- Saibal De (University of Michigan) <strong>A quick tour of the Bayesian approach to low-rank matrix completion</strong> -- Virtual</td>
<td></td>
</tr>
<tr>
<td>5:00pm-6:00pm</td>
<td><strong>Graduate Student Social Event</strong> -- () <strong>Codenames</strong> -- Virtual</td>
<td></td>
</tr>
</tbody>
</table>
Special Events
Monday, October 05, 2020, 3:00pm-4:00pm
Virtual
Davi Obata (University of Chicago)

*Open sets of partially hyperbolic systems having a unique SRB measure.*

For a dynamical system, a physical measure is an ergodic invariant measure that captures the asymptotic statistical behavior of the orbits of a set with positive Lebesgue measure. A natural question in the theory is to know when such measures exist.

It is expected that a "typical" system with enough hyperbolicity (such as partial hyperbolicity) should have such measures. A special type of physical measure is the so-called hyperbolic SRB (Sinai-Ruelle-Bowen) measure. Since the 70's the study of SRB measures has been a very active topic of research.

In this talk, we will see some new examples of open sets of partially hyperbolic systems with two dimensional centers having a unique SRB measure. One of the key features for these examples is a rigidity result for a special type of measure (the so-called u-Gibbs measure) which allows us to conclude the existence of the SRB measures.

Zoom link: https://iu.zoom.us/j/661711533pwd=RTFVTjMrQ1pYTCTlZzlvVGVvODV2QT09
password it is 076877 if needed.

Algebraic Topology
Monday, October 05, 2020, 4:00pm-5:00pm
online Virtual
Mark Behrens (University of Notre Dame)

*tmf resolutions*

I will discuss new progress on computing with the 2-primary tmf-based Adams spectral sequence. This has been used with JD Quigley to complete a joint project with Mark Mahowald to compute the image of the tmf-Hurewicz homomorphism.
Integrable Systems and Random Matrix Theory  
Monday, October 05, 2020, 4:00pm-5:00pm  
https://umich.zoom.us/j/91617339235       Passcode: 651935 Virtual  
Yuchen Liao (University of Michigan)  
Periodic discrete time parallel TASEP

In this talk I will discuss the work in progress on the study of multi-point joint distribution of the so-called discrete time totally asymmetric simple exclusion process with parallel updates over a spatially periodic domain, which is a typical model in the so-called 1+1 Kardar-Parisi-Zhang universality class with finite-volume space. This is an extension of the recent work of Baik and Liu (and independently Prohlac for one-point case) on the study of continuous-time periodic TASEP which can be obtained by taking a certain continuum limit of our results. In particular we obtain a finite-time multi-point joint distribution formula and perform asymptotic analysis under the so-called relaxation time scale. The limiting distribution function agrees with the one obtained by Baik and Liu which interpolates equilibrium dynamics and KPZ dynamics over infinite-volume spaces (so in particular the one-point marginal interpolates gaussian distribution and certain Tracy-Widom type distribution depending on the initial data). This provides evidence for KPZ universality under finite-volume spaces with periodic boundary conditions.

MCAIM Graduate Seminar  
Monday, October 05, 2020, 4:00pm-5:00pm  
Zoom Meeting ID: 935 4862 5605 . Zoom Link: https://umich.zoom.us/s/93548625605 . Passcode by email. Virtual  
Yutong Wang (UMICH EECS)  
Multiclass support vector machines and ordered partitions

Classification is a central problem in supervised learning, where the goal is to learn a decision function that accurately assigns labels to instances. The support vector machine (SVM) is a learning algorithm that is popular in practice and also has strong theoretical properties. However, most of the theory developed is for the binary classification setting, where there are only two possible labels to choose from. Our work is concerned with the multiclass setting where there are three or more possible labels for the decision function to choose from. Multiclass SVMs have been formulated in a variety of ways. A recent empirical study by Dogan et al. compared nine such formulations and recommended the variant proposed by Weston and Watkins (WW). Despite the superior empirical performance of the WW multiclass SVM, its theoretical properties remain poorly understood. Towards bridging this gap, we establish a connection between the hinge loss used in the WW multiclass SVM with ordered partitions. We use this connection to justify the recent empirical findings.

Student Math Finance  
Monday, October 05, 2020, 7:00pm-8:00pm  
https://umich.zoom.us/j/99487325343 Virtual  
Berkan Yilmaz (University of Michigan)  
Robust Hedging in Continuous Time Through Martingale Optimal Transport: Part 1

We present the work of H. Mete Soner and Yan Dolinsky on the formulation of the robust (i.e. model independent) hedging problem as a martingale optimal transport problem. This talk will be part 1 of a two talk series.
In 33 hours of tape recordings in 1973 Grothendieck described his view of topos beyond what is in the collective volume. Theorie des topos et cohomologie etale (SGA 4). In particular, this shows how Grothendieck got his idea of a "generalized topological space" simultaneously with what became etale cohomology during a 1958 talk by Jean-Pierre Serre.

Zoom Link:  https://umich.zoom.us/j/91509704265
Passcode: 754044

In the first talk, I give a background on the dynamical moduli spaces $M_d$, i.e. the quotient of the parameter space $\text{Rat}_d$ of degree $d$ holomorphic self-maps of the Riemann sphere to the Mobius conjugation. This includes the work of Milnor on the moduli space $M_2$, the work of Segal on the topology of parameter spaces of rational maps, and certain "marked" variants of $M_d$. The second talk outlines a joint work with Maxime Bergeron and Sam Nariman on the topology of the moduli space $M_d$. We compute its Betti numbers and fundamental group. As an application, we obtain the ranks of some higher homotopy groups of the parameter space $\text{Rat}_d$ beyond the previously known range.

We consider the parabolic Anderson model in one spatial dimension driven by a time-independent Gaussian noise, which has the covariance structure of a fractional Brownian motion with Hurst parameter $H$. We consider the case $H < 1/2$ and establish existence and uniqueness of solution. In order to find the quenched asymptotics for the solution we consider its Feynman-Kac representation and explore the asymptotics of the principal eigenvalue for the random Anderson operator.
The fundamental lemma is an identity of integrals central to the Langlands programme which was proved by Ngo in 2008. His proof infers the fundamental lemma from a statement about the cohomology of moduli spaces of Higgs bundles, called geometric stabilisation. In this talk I'll discuss a new perspective on geometric stabilisation, provided by $p$-adic integration. We will see that there exists a close philosophical link between mirror symmetry for moduli spaces of Higgs bundles (a la Hausel-Thaddeus) and the fundamental lemma. This is joint work with Wyss and Ziegler.

Pseudospectral methods, based on high degree polynomials, have spectral accuracy when solving differential equations but typically lead to dense and ill-conditioned matrices. The ultraspherical spectral method is a numerical technique to solve ordinary and partial differential equations, leading to almost banded well-conditioned linear systems while maintaining spectral accuracy. In this talk, we introduce the ultraspherical spectral method and develop it into a spectral element method using a modification to a hierarchical Poincare-Steklov domain decomposition method.
Student Dynamics/Geometry Topology  
Friday, October 09, 2020, 3:00pm-4:00pm  
https://umich.zoom.us/j/94090012548 Virtual  
Malavika Mukundan (University of Michigan)  
Lattes maps

Lattes maps are finite quotients of affine maps with chaotic dynamics on the entire Riemann sphere (i.e., the Fatou set is empty). In this talk, we go over the characterization of Lattes maps, and discuss their dynamics. We will also discuss flexible Lattes maps and the Fundamental Conjecture, which asserts that these are the only class of rational maps with an 'invariant line field' on the Julia set. This conjecture, if true, would prove that every rational map can be approximated by hyperbolic maps.

Preprint Algebraic Geometry  
Friday, October 09, 2020, 4:00pm-5:00pm  
Zoom East Hall  
Attilio Castano ()

The derived category of the abelian category of constructible sheaves


Student AIM Seminar  
Friday, October 09, 2020, 4:00pm-5:00pm  
Virtual  
Saibal De (University of Michigan)  
A quick tour of the Bayesian approach to low-rank matrix completion

Recovering a low-rank matrix from incomplete observations is a common task in many practical applications. A famous example is the Netflix Prize problem. From 27 million ratings applied to 58 thousand movies by 280 thousand users, the goal is to predict ratings for all movies for a user and design a recommendation system. The Bayesian setup provides a robust framework to address such data-driven prediction problems. In this talk, I will introduce the basic premise of Bayesian inference and some of the standard techniques used in this field. I will then explore some of the challenges for implementing a fully Bayesian framework in the context of matrix completion. I will conclude by presenting a new result that addresses some of these challenges.

Graduate Student Social Event  
Friday, October 09, 2020, 5:00pm-6:00pm  
Virtual  
Codenames

Come virtually play Codenames with your fellow grad students! Codenames is a team word game, where the "spymasters" give clues to their team's "operatives" without alerting the other team. You do not have to have played the game before to join! If you have questions, contact Alana Huszar.