<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, March 26, 2018</td>
<td>4:00pm-5:00pm</td>
<td><strong>Complex Analysis, Dynamics and Geometry</strong> -- Emily Burkhead (Duke) <em>Modeling Virus Dynamics with Stochastic Cellular Automata</em> -- 3096 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td><strong>Integrable Systems and Random Matrix Theory</strong> -- Guilherme Silva (University of Michigan) <em>The Periodic Aztec Diamond - Take III</em> -- 1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:10pm-5:30pm</td>
<td><strong>Group, Lie and Number Theory</strong> -- Brian Smithling (Johns Hopkins University) <em>An arithmetic intersection conjecture</em> -- 4088 East Hall</td>
</tr>
<tr>
<td>Tuesday, March 27, 2018</td>
<td>3:00pm-4:00pm</td>
<td><strong>Student Geometry/Topology</strong> -- Nicholas Wawrykow (University of Michigan) <em>Outer Space</em> -- 3866 East Hall</td>
</tr>
<tr>
<td></td>
<td>3:00pm-4:00pm</td>
<td><strong>Financial/Actuarial Mathematics</strong> -- Jingjie Zhang (UM) <em>TIME CONSISTENT STOPPING FOR THE MEAN-STANDARD DEVIATION PROBLEM</em> -- Blau Jeff Hall 1580 Ross School of Business</td>
</tr>
<tr>
<td></td>
<td>3:10pm-4:10pm</td>
<td><strong>Student Commutative Algebra</strong> -- Patricia Klein (University of Michigan) <em>Examples in Local Cohomology</em> -- 3096 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:10pm-5:00pm</td>
<td><strong>Colloquium Series</strong> -- Xiaojun Huang (Rutgers University) <em>On several rigidity problems in several complex variables and complex geometry</em> -- 1360 East Hall</td>
</tr>
<tr>
<td>Wednesday, March 28, 2018</td>
<td>3:00pm-4:00pm</td>
<td><strong>Student Arithmetic</strong> -- Alex Horawa (UM) <em>TBA</em> -- 1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:30pm</td>
<td><strong>RTG Seminar on Geometry, Dynamics and Topology</strong> -- Wouter Van Limbeek (U Michigan) <em>Quasi-isometric rigidity for symmetric spaces</em> -- 3866 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:10pm-5:30pm</td>
<td><strong>Algebraic Geometry</strong> -- Daniel Litt (Columbia University) <em>Canonical paths and monodromy</em> -- 4096 East Hall</td>
</tr>
<tr>
<td></td>
<td>5:30pm-6:30pm</td>
<td><strong>Special Events</strong> -- Walt Hickey (chief culture writer for FiveThirtyEight) <em>How applied mathematics and journalism change the way we see the world</em> -- 1324 East Hall</td>
</tr>
<tr>
<td>Thursday, March 29, 2018</td>
<td>3:00pm-4:00pm</td>
<td><strong>Topology</strong> -- Rita Gitik (UM) <em>A New Algorithm in Group Theory</em> -- 1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:30pm</td>
<td><strong>Special Events</strong> -- Jamie Tappenden (UM Philosophy) <em>Philosophy of Mathematics - Fruitfulness as an Aesthetic Concept: Frege and His Environment</em> -- 1164 Angell Hall</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td><strong>Student Dynamics</strong> -- Alex Kapiamba (University of Michigan) <em>The continuity of Julia Sets</em> -- 1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:10pm-5:30pm</td>
<td><strong>Preprint Algebraic Geometry Seminar</strong> -- Zili Zhang (UM) <em>Grinberg-Kazhdan theorem and Newton groupoids (following Drinfeld)</em> -- 2866 East Hall</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
<td>Speaker and Details</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>10:00am-11:00am</td>
<td>Symplectic Reading Group -- Jun Li (UM) Hofer Diameter and Lagrangian Intersection -- 1360 East Hall</td>
<td></td>
</tr>
<tr>
<td>12:10pm-2:00pm</td>
<td>Student Homotopy Theory -- Ruian Chen (University of Michigan) A baby step towards $A^1$-homotopy theory -- 1360 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td>Applied Interdisciplinary Mathematics (AIM) -- Joseph Paulsen (Syracuse University) Better living through frustration or: Shaping liquid surfaces with thin elastic sheets -- 1084 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td>Geometry -- Thang Nguyen (NYU) Quasi-isometric embeddings of symmetric spaces and lattices -- 3866 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:10pm-4:00pm</td>
<td>Student Algebraic Geometry -- Attilio Castano (UM) TBA -- 3096 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td>Student AIM Seminar -- Dejiao Zhang (University of Michigan) Convergence of a Grassmannian Gradient Descent Algorithm for Subspace Estimation From Undersampled Data -- 1084 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td>Combinatorics -- Bruce Sagan (Michigan State University) Descent polynomials -- 4088 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td>Group, Lie and Number Theory -- Raman Parimala (Emory University) Zero cycles of degree one on homogeneous spaces (Note special day/room) -- 2866 East Hall</td>
<td></td>
</tr>
</tbody>
</table>
Complex Analysis, Dynamics and Geometry  
Monday, March 26, 2018, 4:00pm-5:00pm  
3096 East Hall  
Emily Burkhead (Duke)  

Modeling Virus Dynamics with Stochastic Cellular Automata

A cellular automaton (CA) is a continuous shift commuting map of a symbolic shift space on a finite alphabet and is a deterministic dynamical system of great interest in mathematics, physics, and computer science. While CAs are used to model complex dynamics, stochastic CA (SCA) are closely related to these and provide better models of physical phenomena when great uncertainty or extreme complexity is involved. SCA are dynamical systems that are homogeneous in time and space, modeling parallel processes like CA, but at each point in time and space, there are multiple local rules to choose from to update a state (always from the same finite list of rules). We discuss topological dynamical properties of SCA in the context of virus dynamics models. The models originally arose using clinical data, but we are able to articulate the differences in their viral dynamics using some topological dynamical properties. We consider surjectivity and topological transitivity, and we apply our definitions and results to existing models of dynamics that exhibit different behavior and capture properties of HIV and Ebola virus, labelling the behavior as H-dynamics (surjective and topologically transitive) and E-dynamics (neither).

Integrable Systems and Random Matrix Theory  
Monday, March 26, 2018, 4:00pm-5:00pm  
1866 East Hall  
Guilherme Silva (University of Michigan)  

The Periodic Aztec Diamond - Take III

The problem of tiling a given planar region is quite classical. A more modern approach is to consider the tilings of a given region under the light of statistical mechanics: given a measure on all possible tiling configurations of a large planar region, can we say how a "typical" tiling looks like? In this series of talks, we consider this problem when the region is the aztec diamond, and the tilings are dominos, distributed in a periodic fashion. It turns out that this model displays a quite rich, yet explicit, structure, and we plan to survey in details some recent developments in this model.
Group, Lie and Number Theory  
Monday, March 26, 2018, 4:10pm-5:30pm  
4088 East Hall  
Brian Smithling (Johns Hopkins University)  
An arithmetic intersection conjecture

The arithmetic Gan-Gross-Prasad conjecture (AGGP) relates the non-vanishing of the special value of the derivative of a certain $L$-function to the non-vanishing of a linear functional on a Chow group of a Shimura variety. AGGP is itself based on conjectures of Beilinson and Bloch which seem to be out reach at the present; accordingly, there are no cases of AGGP known beyond dimension one. I will report on a variant of the hermitian version of AGGP, following previous work of Wei Zhang, which should be more accessible. This is joint work with M. Rapoport and W. Zhang.

Student Geometry/Topology  
Tuesday, March 27, 2018, 3:00pm-4:00pm  
3866 East Hall  
Nicholas Wawrykow (University of Michigan)  
Outer Space

The group of automorphisms of the free group has been an object of study since the start of the twentieth century; however, much of its structure remained elusive until 1986 when Culler and Vogtmann introduced Outer Space. This space is comprised equivalence class of metric graphs with fundamental group $F_n$, and $Out(F_n)$ acts on it, in a manner analogous to that of a mapping class group on the Teichmuller space of a surface. In this talk I will introduce Outer Space as well as describe its geometry when endowed with the Lipschitz metric. This metric provides classification of the elements of $Out(F_n)$ as parabolic, elliptic, or hyperbolic.
Financial/Actuarial Mathematics  
Tuesday, March 27, 2018, 3:00pm-4:00pm  
Blau Jeff Hall 1580 Ross School of Business  
Jingjie Zhang (UM)  
TIME CONSISTENT STOPPING FOR THE MEAN-STANDARD DEVIATION PROBLEM—THE DISCRETE TIME CASE

Inspired by Strotz’s consistent planning strategy, we formulate the infinite horizon mean-variance stopping problem as a subgame perfect Nash equilibrium in order to determine time consistent strategies with no regret. Equilibria among stopping times or randomized stopping times may not exist. This motivates us to consider the notion of liquidation strategies, which lets the stopping right to be divisible. We then argue that the mean-standard deviation variant of this problem makes more sense for this type of strategies in terms of time consistency. It turns out that an equilibrium liquidation strategy always exists. We then analyze whether optimal equilibrium liquidation strategies exist and whether they are unique and observe that neither may hold.

Joint work with Erhan Bayraktar (UM) and Zhou Zhou (University of Sydney).

Student Commutative Algebra  
Tuesday, March 27, 2018, 3:10pm-4:10pm  
3096 East Hall  
Patricia Klein (University of Michigan)  
Examples in Local Cohomology

We will consider some interesting examples of local cohomology computations. This talk is intended to be appropriate for anyone currently enrolled in Math 615.
In 1907, Poincare proved that any non-constant holomorphic map sending a piece of the boundary of the unit ball in a complex space of dimension two into the boundary of the unit ball extends to an automorphism of the ball. This result fails for holomorphic functions of one variable and reveals a strong rigidity property for holomorphic functions of several variables. The program of Poincare that started in 1907 was later pursued further by Segre (1930’s), Cartan (1940’s) and Chern-Moser (1974). The theory of Segre-Cartan-Chern-Moser shows that real hypersurfaces in a complex space of higher dimension possess many holomorphic invariants and holomorphic maps between hypersurfaces need to preserve those invariants and thus must be very rigid. Based on these invariants, Webster and the speaker established a several complex analysis version of the W. L. Chow theorem in 1977 (equi-dimensional case) and in 1994 (any codimensional case), respectively. These invariant and rigidity results have found many applications in the study of other rigidity problems in several complex variables, CR geometry, isolated complex singularity theory and complex geometry. The main goal of this talk is to give a survey on these lines of investigation in which the author has been involved in the past 20 years. The topics include: Gap rigidity for proper holomorphic maps between balls; rigidity problems for Milnor links and isolated normal complex singularities; rigidity of local holomorphic volume preserving maps between Hermitian symmetric spaces.

Student Arithmetic
Wednesday, March 28, 2018, 3:00pm-4:00pm
1866 East Hall
Alex Horawa (UM)
TBA

RTG Seminar on Geometry, Dynamics and Topology
Wednesday, March 28, 2018, 4:00pm-5:30pm
3866 East Hall
Wouter Van Limbeek (U Michigan)
Quasi-isometric rigidity for symmetric spaces

We will discuss the classification of lattices in semisimple Lie groups up to quasi-isometry, which was obtained (independently) by Eskin-Farb and Kleiner-Leeb. As part of this classification, we will show any quasi-isometry between irreducible higher rank symmetric spaces is bounded distance from an isometry, which proves a conjecture of Margulis and which implies Mostow rigidity for these spaces. This talk can be seen as context for Friday’s Geometry seminar by Thang Nguyen.
Let $K$ be a local field (archimedean or non-archimedean) and $X$ a normal variety over $X$. Then, in several settings, there exist canonical linear combinations of paths between any two points in $X$. I'll explain several applications of this observation: (1) a monodromy-free theory of iterated integration on complex varieties, (2) some structural results about Galois actions on pro-$\ell$ geometric fundamental groups of varieties over $p$-adic local fields, for $p$ different from $\ell$, and (3) results on the representation theory of arithmetic fundamental groups.

Special Events

Wednesday, March 28, 2018, 5:30pm-6:30pm
1324 East Hall
Walt Hickey (chief culture writer for FiveThirtyEight)

How applied mathematics and journalism change the way we see the world

What does it mean to be good at math? Walt Hickey, the culture writer for Nate Silver's FiveThirtyEight, talks about what opportunities you truly have with a STEM degree, how stats and data journalism can help us understand the world, and why your ability to coherently talk about numbers is way more important than your ability to crunch them. You'll have an exclusive look on how numbers change the world and why they change us.

Topology

Thursday, March 29, 2018, 3:00pm-4:00pm
1866 East Hall
Rita Gitik (UM)

A New Algorithm in Group Theory

We describe a new algorithm which determines if the intersection of a quasiconvex subgroup of a negatively curved group with any of its conjugates is infinite. The algorithm is based on the concepts of a coset graph and a weakly Nielsen generating set of a subgroup. We also give a new proof of decidability of a membership problem for quasiconvex subgroups of negatively curved groups.

Special Events

Thursday, March 29, 2018, 4:00pm-5:30pm
1164 Angell Hall
Jamie Tappenden (UM Philosophy)

Philosophy of Mathematics - Fruitfulness as an Aesthetic Concept: Frege and His Environment
Student Dynamics
Thursday, March 29, 2018, 4:00pm-5:00pm
1866 East Hall
Alex Kapiamba (University of Michigan)

The continuity of Julia Sets

Given a rational map $f$ on the Riemann sphere, its Julia set $J(f)$ forms a compact subset of the sphere. Equipping the set of compact subsets with the Hausdorff metric allows us to ask about the continuity of the map $f \mapsto J(f)$. In this talk we will explore how the dynamical properties of $f$ determine the continuity of this map.

Preprint Algebraic Geometry Seminar
Thursday, March 29, 2018, 4:10pm-5:30pm
2866 East Hall
Zili Zhang (UM)

Grinberg-Kazhdan theorem and Newton groupoids (following Drinfeld)

https://arxiv.org/abs/1801.01046

Symplectic Reading Group
Friday, March 30, 2018, 10:00am-11:00am
1360 East Hall
Jun Li (UM)

Hofer Diameter and Lagrangian Intersection

We'll cover Polterovich's proof that the Hamiltonian diffeomorphism group of $S^2$ has infinite diameter with respect to the Hofer metric. Time permitting, we'll sketch the relation between the Hofer diameter conjecture and non-displaceable Lagrangian submanifolds.
Student Homotopy Theory  
Friday, March 30, 2018, 12:10pm-2:00pm  
1360 East Hall  
Ruian Chen (University of Michigan)  
*A baby step towards $A^1$-homotopy theory*

It is no secret that algebraic varieties, or more generally schemes, yearn to have a homotopy theory. Perhaps the most naive approach is to mimic the theory in topological spaces, using the affine line $A^1$ in place of the interval $[0,1]$. To carry out such a simple idea, however, requires heavy homotopy theoretical machinery, in addition to algebraic geometric insights and some abstract nonsense.

In this talk, we will take a baby step towards understanding why Morel-Voevodsky's (motivic) homotopy theory, as well as its stabilization following Jardine, gives a natural setting to do homotopy theory on schemes. In particular, we will see that certain cohomology theories familiar in algebraic geometry, including Chow groups and algebraic K-theory, are representable by spectra, just like their topological counterparts. Time permitting, I will say a few words on Voevodsky’s Fields medal-winning work on the Milnor conjecture and the (motivic) Bloch-Kato conjecture.

This is intended to be a "soft" talk, and anyone with some exposure to homotopy theory and/or scheme theory (695/632) should be able to get something out of it.

Applied Interdisciplinary Mathematics (AIM)  
Friday, March 30, 2018, 3:00pm-4:00pm  
1084 East Hall  
Joseph Paulsen (Syracuse University)  
*Better living through frustration or: Shaping liquid surfaces with thin elastic sheets*

Gauss's Theorema Egregium is the source of many annoyances: flat bandages don't stick as well to curved knuckles or elbows, maps of the earth exaggerate areas near the poles, and automotive metal must be pounded to make a doubly-curved fender. We are investigating such "geometric frustration" in a class of extremely bendable materials that are nonetheless hard to stretch. I will discuss recent experiments in three settings, where we wrap, poke, and squeeze ultrathin polymer films on liquid surfaces. Surprisingly, even in the limit of zero bending rigidity, a thin sheet can sculpt a liquid surface into a variety of shapes. Moreover, I will show how these overall shapes can be understood without describing any of the small-scale wrinkles, folds, or crumples. These results demonstrate a novel route for modifying the mechanical or chemical properties of interfaces using thin films, and they shed light on a new class of isometries that arise in a "wrinkly" limit.
Quasi-isometries of symmetric spaces and lattices have been long studied satisfactorily by works of Mostow, Schwartz, Farb-Schwartz, Kleiner-Leeb, Eskin-Farb, Eskin, Drutu. On the other hand, quasi-isometric (QI) embeddings has not been well studied yet. In this talk we will discuss about what has been known for QI embeddings of higher rank symmetric spaces and lattices. I will go over some necessary conditions, non-rigid examples, rigidity results as well as some difficulties and ideas to study QI embedings. Some results are from a joint work with David Fisher.

Student Algebraic Geometry
Friday, March 30, 2018, 3:10pm-4:00pm
3096 East Hall
Attilio Castano (UM)
TBA
Convergence of a Grassmannian Gradient Descent Algorithm for Subspace Estimation From Undersampled Data

Subspace learning and matrix factorization problems have great many applications in science and engineering, and efficient algorithms are critical as dataset sizes continue to grow. Many relevant problem formulations are non-convex, and in a variety of contexts it has been observed that solving the non-convex problem directly is not only efficient but reliably accurate. We discuss convergence theory for a particular method: first order incremental gradient descent constrained to the Grassmannian. The output of the algorithm is an orthonormal basis for a $d$-dimensional subspace spanned by an input streaming data matrix. We study two sampling cases: where each data vector of the streaming matrix is fully sampled, or where it is undersampled by a sampling matrix $A_t \in \mathbb{R}^{m \times n}$ with $m \ll n$. We propose an adaptive stepsize scheme that depends only on the sampled data and algorithm outputs. We prove that with fully sampled data, the stepsize scheme maximizes the improvement of our convergence metric at each iteration, and this method converges from any random initialization to the true subspace, despite the non-convex formulation and orthogonality constraints. For the case of undersampled data, we establish monotonic improvement on the defined convergence metric for each iteration with high probability.

Descent polynomials

A permutation $\pi=\pi_1 \ldots \pi_n$ in the symmetric group $S_n$ has descent set \{i : \pi_i > \pi_{i+1}\}. Given a set $I$ of positive integers and $n > \max I$, the descent polynomial of $I$ is the number of $\pi$ in $S_n$ with descent set $I$.

In 1915, MacMahon proved, using the Principle of Inclusion and Exclusion, that this is a polynomial in $n$. Amazingly, since then properties of this polynomial do not seem to have been studied at all in the literature. We will investigate the descent polynomial in terms of its degree, coefficients when expanded in a basis of binomial coefficients, and roots. This is joint work with Alexander Diaz-Lopez, Pamela Harris, Erik Insko, and Mohamed Omar.
Let $G$ be a connected linear algebraic group defined over a field. We shall discuss the following question posed by Totaro: If a principal homogeneous space under $G$ admits a zero cycle of degree $d$, does the space admit a closed point of degree dividing $d$? If $d$ is equal to one, the question is due to Serre and is still open in general.