Wednesday, January 06, 2016
4:10pm-5:30pm  Algebraic Geometry -- Zili Zhang (Stony Brook)  **Multiplicativity of the perverse filtration for Hilbert schemes of fibered surfaces** -- 4096 East Hall

Thursday, January 07, 2016
3:10pm-5:00pm  Analysis/Probability Learning Seminar -- Feng Wei (University of Michigan)  **Brascamp-Lieb inequality and quantitative versions of Helly’s theorem** -- 3866 East Hall
4:00pm-5:50pm  Preprint Algebraic Geometry Seminar -- Dan Burns (UofM)  **Birational stability of orbifold cotangent bundles, after Campana and Paun** -- 3096 East Hall

Friday, January 08, 2016
3:00pm-4:00pm  Applied Interdisciplinary Mathematics -- Diego Ayala Rodriguez (University of Michigan)  **Extreme vortex states in hydrodynamic systems** -- 1084 East Hall
3:10pm-4:00pm  Combinatorics -- Oliver Pechenik (U. Illinois (Urbana-Champaign))  **Puzzles and equivariant K-theory of Grassmannians** -- 4088 East Hall

Monday, January 11, 2016
1:00pm-2:00pm  Student Arithmetic --  ()  **Planning Meeting** -- 1866 East Hall
4:00pm-5:00pm  Student Combinatorics Seminar --  ()  **Planning Meeting** -- 3866 East Hall
4:10pm-5:30pm  Group, Lie and Number Theory -- Greg Simon (University of Michigan)  **Automorphism-invariant integral forms in Griess algebras** -- 4088 East Hall

Tuesday, January 12, 2016
3:00pm-4:00pm  Student Geometry/Topology --  ()  **Planning Meeting** -- 1866 East Hall
3:00pm-4:00pm  Student Commutative Algebra -- None  ()  **Planning meeting** -- 3096 East Hall
4:10pm-5:00pm  Colloquium Series -- Valentino Tosatti (Northwestern University)  **The Ricci flow on compact Kähler manifolds** -- 1360 East Hall

Wednesday, January 13, 2016
3:00pm-5:00pm  RTG Working Seminar on Geometry, Dynamics and Topology -- Nicholas Vlamis (U Michigan)  **Uniformly hyperbolic arc graphs** -- 3866 East Hall
4:00pm-5:00pm  Financial/Actuarial Mathematics -- Johannes Muhle-Karbe (UM)  **Equilibrium Models with Small Frictions** -- 1360 East Hall
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00pm-4:00pm</td>
<td>Topology -- Grace Work (University of Illinois at Urbana-Champaign)</td>
<td>1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>Gap distribution for slopes of saddle connections on the octagon</td>
<td></td>
</tr>
<tr>
<td>3:10pm-5:00pm</td>
<td>Analysis/Probability Learning Seminar -- Feng Wei (University of Michigan)</td>
<td>3866 East Hall</td>
</tr>
<tr>
<td></td>
<td>Approximated John's decomposition and quantitative versions of Helly's theorem</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td>Math Club -- Andrew Snowden (University of Michigan)</td>
<td>3866 East Hall</td>
</tr>
<tr>
<td></td>
<td>Hilbert's Tenth Problem -- Nesbitt Room</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td>Preprint Algebra Geometry Seminar -- Special AG seminar</td>
<td>1866 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td>Commutative Algebra -- Ragnar Buchweitz (University of Toronto)</td>
<td>1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>Maximal Cohen-Macaulay Modules on Cones over Elliptic Curves</td>
<td></td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td>Algebraic Geometry -- Inna Zakharevich (University of Chicago)</td>
<td>1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>Cutting and pasting using algebraic K-theory</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00pm-4:00pm</td>
<td>Theoretical Computer Science -- Mark Rudelson (U-M)</td>
<td>4941 BBB</td>
</tr>
<tr>
<td></td>
<td>Counting perfect matchings via random matrices</td>
<td></td>
</tr>
<tr>
<td>1:00pm-3:00pm</td>
<td>SPECIAL EVENT -- Adam Kaye (UM)</td>
<td>3096 EH</td>
</tr>
<tr>
<td></td>
<td>Thesis Defense</td>
<td></td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td>Applied Interdisciplinary Mathematics -- Michal Zochowski (University of Michigan)</td>
<td>1084 East Hall</td>
</tr>
<tr>
<td></td>
<td>How can cognitive processes in the brain be regulated by changing properties of individual cells?</td>
<td></td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td>Geometry -- Caglar Uyanik (UIUC)</td>
<td>3096 East Hall</td>
</tr>
<tr>
<td></td>
<td>Dynamics of free group automorphisms and a subgroup alternative for $\text{Out}(F_N)$</td>
<td></td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td>Group, Lie and Number Theory -- Djordjo Milovic (Universiteit Leiden / Universite Paris-Sud 11)</td>
<td>2866 East Hall</td>
</tr>
<tr>
<td></td>
<td>Density results on the 2-part of class groups</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:10pm-5:30pm</td>
<td>Group and Number Theory -- No Talk - ( ) Martin Luther King Jr. Day</td>
<td>4088 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td>Colloquium Series -- Cristina Villalobos (University of Texas-Rio Grande Valley)</td>
<td>1360 East Hall</td>
</tr>
<tr>
<td></td>
<td>Becoming Agents of Change: Building Diverse Communities and Lessons Learned from the Mathematical Modelling of Eye Disease</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00pm-1:30pm</td>
<td>SPECIAL EVENT -- ( ) IBL Lunch</td>
<td>4866 EH</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td>Student Commutative Algebra -- ( ) Macaulay 2 Workshop, part 1</td>
<td>3096 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td>Student Geometry/Topology -- John Kilgore (UM)</td>
<td>1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>What is Hodge Decomposition</td>
<td></td>
</tr>
<tr>
<td>5:00pm-6:00pm</td>
<td>Student Analysis -- ( ) Planning Meeting</td>
<td>4096 EH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00pm-5:00pm</td>
<td>RTG Working Seminar on Geometry, Dynamics and Topology -- Nicholas Vlamis (U Michigan)</td>
<td>4088 East Hall</td>
</tr>
<tr>
<td></td>
<td>Big mapping class groups</td>
<td></td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td>Algebraic Geometry -- Xuanyu Pan (Washington University in St.Louis)</td>
<td>4096 East Hall</td>
</tr>
<tr>
<td></td>
<td>Automorphisms and cohomology</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Time</td>
<td>Event</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Thursday, January 21, 2016</td>
<td>3:10pm-4:00pm</td>
<td><strong>Analysis/Probability Learning Seminar</strong> -- Feng Wei (University of Michigan) <strong>Approximated John’s decomposition and diameter versions of Helly’s theorem</strong> -- 3096 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td><strong>Math Club</strong> -- Steven Damelin (Mathematical Reviews) <strong>Whitney’s Extension Theorem</strong> -- Nesbitt Room</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td><strong>Student Algebraic Geometry</strong> -- Ashwath Rabindranath (University of Michigan) <strong>The N_p Property and Syzygies</strong> -- 4096 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:50pm</td>
<td><strong>Preprint Algebraic Geometry Seminar</strong> -- (Organizational meeting) -- 1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td><strong>Analysis/Probability Learning Seminar</strong> -- Han Huang (University of Michigan) <strong>Talagrand’s L1-L2 Bound</strong> -- 3096 East Hall</td>
</tr>
<tr>
<td>Friday, January 22, 2016</td>
<td>10:00am-11:00am</td>
<td><strong>Theoretical Computer Science</strong> -- Seth Pettie (U-M) <strong>The 4/3 Additive Spanner Exponent is Tight</strong> -- 3725 BBB</td>
</tr>
<tr>
<td></td>
<td>2:30pm-4:00pm</td>
<td><strong>Borcherds Products Learning Seminar</strong> -- (Organizational Meeting) -- 1096 East Hall</td>
</tr>
<tr>
<td></td>
<td>3:00pm-4:00pm</td>
<td><strong>Applied Interdisciplinary Mathematics</strong> -- Robert Kerr (University of Warwick) <strong>Helicity annihilation in trefoil reconnection: simulations</strong> -- 1084 East Hall</td>
</tr>
<tr>
<td></td>
<td>3:00pm-4:00pm</td>
<td><strong>Geometry</strong> -- Rita Gitik (U Michigan) <strong>Weak Width of Subgroups</strong> -- 3096 East Hall</td>
</tr>
<tr>
<td></td>
<td>3:10pm-4:00pm</td>
<td><strong>Combinatorics</strong> -- Jenna Rajchgot (U Michigan) <strong>Three combinatorial formulas for type A quiver polynomials and K-polynomials</strong> -- 4088 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:10pm-5:30pm</td>
<td><strong>Algebraic Geometry</strong> -- Chang-Yeon Chough (UC Berkeley) <strong>Topological types of algebraic stacks</strong> -- 2866 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:10pm-5:00pm</td>
<td><strong>Student AIM Seminar</strong> -- Scott Rich (University of Michigan) <strong>Utilizing Phase Response Curves to understand the activity of large neuronal networks</strong> -- 1084 East Hall</td>
</tr>
<tr>
<td>Monday, January 25, 2016</td>
<td>1:00pm-2:00pm</td>
<td><strong>Student Arithmetic</strong> -- Trevor Hyde (UM) <strong>Regular Polytopes Defined over Q</strong> -- 1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td><strong>Complex Analysis, Dynamics and Geometry</strong> -- Sarah Koch (U(M)) <strong>Postcritical configurations in moduli space</strong> -- 3096 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td><strong>Student Combinatorics Seminar</strong> -- Daniel Barter (UM) <strong>An introduction to tensor categories with examples</strong> -- 3866 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:10pm-5:30pm</td>
<td><strong>Group, Lie and Number Theory</strong> -- CANCELLED William Chen (Penn State University) <strong>Moduli interpretations for noncongruence modular curves</strong> -- 4088 East Hall</td>
</tr>
<tr>
<td></td>
<td>5:00pm-6:00pm</td>
<td><strong>Student Analysis</strong> -- Yan Shuo Tan (UM) <strong>Solving Undetermined Linear Systems using Sparsity</strong> -- 3088 East Hall</td>
</tr>
<tr>
<td></td>
<td>5:15pm-6:30pm</td>
<td><strong>Teaching Mathematics</strong> -- Elaine Lande (Univ Michigan, CRLT) <strong>Small Course Evaluation Project</strong> -- 3096 East Hall</td>
</tr>
<tr>
<td>Tuesday, January 26, 2016</td>
<td>3:00pm-4:00pm</td>
<td><strong>Student Commutative Algebra</strong> -- (Macaulay 2 Workshop, part 2) -- 3096 East Hall</td>
</tr>
<tr>
<td></td>
<td>3:00pm-4:00pm</td>
<td><strong>Student Geometry/Topology</strong> -- Takumi Murayama (UM) <strong>The Lefschetz theorem on (1,1)-classes and the Hodge conjecture</strong> -- 1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:10pm-5:00pm</td>
<td><strong>Colloquium Series</strong> -- Bernd Sturmfels (University of California, Berkeley) <strong>Eigenvectors of Tensors</strong> -- 1360 East Hall</td>
</tr>
</tbody>
</table>
Wednesday, January 27, 2016

3:00pm-5:00pm  RTG Working Seminar on Geometry, Dynamics and Topology -- Richard Canary (UM) An introduction to Anosov representations -- 4088 East Hall

4:10pm-5:00pm  Analysis/Probability -- Alon Nishry (University of Michigan) How many eigenvalues of GUE are positive? -- 2866 East Hall

Thursday, January 28, 2016

3:10pm-5:00pm  Analysis/Probability Learning Seminar -- Alon Nishry (University of Michigan) The eigenvalues of GUE - Rare events -- 3096 East Hall

4:00pm-5:00pm  Math Club -- Anna Gilbert (University of Michigan) Group Testing -- Nesbitt Room

4:00pm-5:00pm  Student Algebraic Geometry -- Harry Richman (UM) What is a Neron model? -- 4096 East Hall

4:00pm-5:30pm  Logic -- David Fernandez Breton (UM) Gruff ultrafilters in the Random model -- CCL 2502

4:30pm-5:30pm  Quant Program Practitioner Seminar -- Sherry Hu (Goldman Sachs) TBA -- 2866 East Hall

5:10pm-6:00pm  Student Representation Theory -- Gabriel Frieden (University of Michigan) Representations of Affine Lie Algebras -- 3096 East Hall

Friday, January 29, 2016

10:00am-11:00am  Theoretical Computer Science -- Shang-En Huang (U-M) Using Expander Graphs to Find Vertex Connectivity -- BBB (Room TBA)

3:00pm-4:00pm  Geometry -- Zhiren Wang (Penn State) x2, x3, x5 invariant sets on the 2-torus -- 3096 East Hall

3:00pm-4:00pm  Applied Interdisciplinary Mathematics -- Andreas Blass (University of Michigan) Some aspects of quantum computation -- 1084 East Hall

3:10pm-4:00pm  Combinatorics -- Jake Levinson (UM) K-Theory and Monodromy of Schubert Curves -- 4088 East Hall

4:00pm-5:50pm  Preprint Algebraic Geometry Seminar -- Igor Dolgachev (University of Michigan) Rationality of S_6-invariant quartic threefolds -- 2866 East Hall

Monday, February 01, 2016

1:00pm-2:00pm  Student Arithmetic -- Gene Kopp (UM) Circle Packings from Imaginary Quadratic Fields -- 1866 East Hall

4:00pm-5:00pm  Complex Analysis, Dynamics and Geometry -- Dan Thompson (OSU) Uniqueness of equilibrium states for geodesic flows in manifolds of nonpositive curvature -- 3096 East Hall

4:00pm-5:00pm  Student Combinatorics Seminar -- Visu Makhambra (UM) Matrix semi-invariants -- 3866 East Hall

4:10pm-5:30pm  Group, Lie and Number Theory -- Bryden Cais (University of Arizona) Kisin modules and crystalline cohomology -- 4088 East Hall

Tuesday, February 02, 2016

3:00pm-4:00pm  Student Commutative Algebra -- Takumi Murayama (University of Michigan) Applications of Local Cohomology I -- 3096 East Hall

4:10pm-5:00pm  Colloquium Series -- Alireza Salehi Golsefidy (UCSD) Super-approximation and its applications. -- 1360 East Hall
Wednesday, February 03, 2016

3:00pm-5:00pm  RTG Working Seminar on Geometry, Dynamics and Topology -- Richard Canary (U Michigan)  TBA
                -- 4088 East Hall

4:00pm-5:00pm  Financial/Actuarial Mathematics -- Rohini Kumar (Wayne State University)  Small-time asymptotics
                for fast mean-reverting stochastic volatility models -- 1360 East Hall

4:10pm-5:30pm  Algebraic Geometry -- Lars Kindler (Freie Universitat Berlin, Harvard University)  D-modules in
                positive characteristic and ramification theory -- 4096 East Hall

Thursday, February 04, 2016

3:00pm-4:00pm  Topology -- Matthew Cordes (Brandeis University)  Morse boundaries of geodesic metric spaces
                -- 1866 East Hall

3:10pm-5:00pm  Analysis/Probability Learning Seminar -- Mark Rudelson (University of Michigan)  Royen’s proof of
                the Gaussian correlation inequality -- 3096 East Hall

4:00pm-5:00pm  Math Club -- Patrick Boland (University of Michigan)  Vieta Jumping -- Nesbitt Room

4:00pm-5:00pm  Student Algebraic Geometry -- Matt Stevenson (University of Michigan)  Invariance of plurigenera
                -- 4096 East Hall

4:00pm-5:00pm  Commutative Algebra -- Mel Hochster (University of Michigan)  Singularities associated with
                pencils of quadrics avoiding large linear spaces -- 3866 East Hall

5:10pm-6:00pm  Student Representation Theory -- Drew Ellingson (University of Michigan)  Quiver Representations
                -- 3096 East Hall

Friday, February 05, 2016

10:30am-11:30am  Theoretical Computer Science -- Cupjin Huang (U-M)  Quantum Conditional Mutual Information
                and Ability to Recover -- 3725 BBB

2:30pm-4:00pm  Borchers Products Learning Seminar -- Brandon Carter ()  The Big Picture -- 1096 East Hall

3:00pm-4:00pm  Applied Interdisciplinary Mathematics -- Steve Cundiff (University of Michigan)  Nonlinear pulse
                dynamics in modelocked lasers -- 1084 East Hall

3:00pm-4:00pm  Geometry -- Clark Butler (U Chicago)  Lyapunov exponents and rigidity in negative curvature
                -- 3096 East Hall

3:10pm-4:00pm  Combinatorics -- Gregg Musiker (U Minnesota)  Generalized Snake Graphs for Generalized Cluster
                Algebras -- 4088 East Hall

4:00pm-5:50pm  Preprint Algebraic Geometry Seminar -- Dan Burns (UM)  Characterization of smooth Schubert
                varieties in rational homogeneous manifolds of Picard number 1, after Hong and Mok -- 3096 East Hall

4:00pm-5:00pm  SPECIAL EVENT -- John Schotland (University of Michigan, Departments of Mathematics and Physics)
                Doctoral Committee Seminar - Inverse problems: the good, the bad and the defiant -- 3088 East Hall

4:10pm-5:00pm  Student AIM Seminar -- Derek Wood (University of Michigan)  Sensor Array Imaging in Random
                Media -- 1084 East Hall
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00pm-1:00pm</td>
<td><strong>Mathematical Biology</strong> -- Wylie Stroberg (University of Michigan Physiology) <strong>Microtubule Stability in Blood Platelet Formation and Activation</strong></td>
<td>-- 335 West Hall</td>
<td></td>
</tr>
<tr>
<td>1:00pm-2:00pm</td>
<td><strong>Student Arithmetic</strong> -- Andy Odesky (UM) <strong>Class Field Theory</strong> -- 1866 East Hall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:10pm-4:00pm</td>
<td><strong>Group, Lie and Number Theory</strong> -- William Chen (Penn State University) <strong>Moduli interpretations for noncongruence modular curves</strong></td>
<td>-- 4088 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Student Combinatorics Seminar</strong> -- Harry Richman (UM) <strong>Partition identities, generating functions, and physics</strong></td>
<td>-- 3866 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:20pm-5:30pm</td>
<td><strong>Group, Lie and Number Theory</strong> -- Ronen Mukamel (Rice University) <strong>Kronecker's congruence and Teichmuller curves in positive characteristic</strong></td>
<td>-- 4088 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:20pm-5:30pm</td>
<td><strong>Complex Analysis, Dynamics and Geometry</strong> -- Ronen Mukamel (Rice University) <strong>Kronecker's congruence and Teichmuller curves in positive characteristic</strong></td>
<td>-- 4088 East Hall</td>
<td></td>
</tr>
</tbody>
</table>

**Tuesday, February 09, 2016**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:30pm-4:30pm</td>
<td><strong>SPECIAL EVENT</strong> -- Gregory Simon (UM) <strong>Thesis Defense: Automorphism-Invariant Integral Forms in Griess Algebras</strong></td>
<td>-- AH5180B</td>
<td></td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Student Geometry/Topology</strong> -- John Kilgore (UM) <strong>The Hodge Decomposition and the Index Theorem</strong></td>
<td>-- 1866 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Student Commutative Algebra</strong> -- Takumi Murayama (UM) <strong>Applications of Local Cohomology II</strong></td>
<td>-- 3096 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td><strong>Colloquium Series</strong> -- Howard Masur (University of Chicago) <strong>Billiards in polygons, translation surfaces, and moduli spaces</strong></td>
<td>-- 1360 East Hall</td>
<td></td>
</tr>
</tbody>
</table>

**Wednesday, February 10, 2016**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00pm-5:00pm</td>
<td><strong>RTG Working Seminar on Geometry, Dynamics and Topology</strong> -- David Fisher (Indiana U) <strong>Coarse differentiation, quasi-isometries and solvable groups I</strong></td>
<td>-- 4088 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Financial/Actuarial Mathematics</strong> -- Dylan Possamai (Paris Dauphine) <strong>Dynamic Programming Approach to Principal-Agent Problems</strong></td>
<td>-- 1360 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td><strong>Algebraic Geometry</strong> -- Francesco Cavazzani (Harvard University) <strong>Complete homogeneous varieties</strong></td>
<td>-- 4096 East Hall</td>
<td></td>
</tr>
</tbody>
</table>

**Thursday, February 11, 2016**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Topology</strong> -- Eriko Hironaka (Florida State University &amp; American Mathematical Society) <strong>Coxeter mapping classes and minimum dilatation problem</strong></td>
<td>-- 1866 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:10pm-5:00pm</td>
<td><strong>Analysis/Probability Learning Seminar</strong> -- Roman Vershynin (University of Michigan) <strong>Linear models for non-linear data?</strong></td>
<td>-- 3096 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Math Club</strong> -- Joseph Marker (University of Michigan) <strong>Placing a Price on Risk</strong></td>
<td>-- Nesbitt Room</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Student Algebraic Geometry</strong> -- Eamon Quinlan (University of Michigan) <strong>Constructing orbit spaces</strong></td>
<td>-- 4096 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Commutative Algebra</strong> -- Uwe Nagel (University of Kentucky) <strong>Equivariant Hilbert Series in non-Noetherian Polynomial Rings</strong></td>
<td>-- 3866 East Hall</td>
<td></td>
</tr>
<tr>
<td>5:00pm-6:00pm</td>
<td><strong>Student Representation Theory</strong> -- Visu Makam (University of Michigan) <strong>Quiver representations II: Gabriel and Kac's theorems</strong></td>
<td>-- 3096 East Hall</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
<td>Details</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>10:30am-11:30am</td>
<td>Theoretical Computer Science -- Kevin Sung (U-M)</td>
<td><strong>A cubic algorithm for computing the volume of a convex body</strong> -- 3725 BBB</td>
<td></td>
</tr>
<tr>
<td>2:30pm-4:00pm</td>
<td>Borcherds Products Learning Seminar -- Igor Dolgachev ()</td>
<td><strong>The Weil representation and vector-valued modular forms</strong> -- 1096 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td>Applied Interdisciplinary Mathematics -- Amy Cochran (University of Michigan)</td>
<td><strong>Mathematical classification of bipolar disorder from longitudinal mood data</strong> -- 1084 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td>Commutative Algebra -- Luis Nunez-Betancourt (University of Virginia)</td>
<td><strong>Vanishing of local cohomology and consequences</strong> -- 4096 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:10pm-4:00pm</td>
<td>Combinatorics -- Michael Chmutov (U Minnesota)</td>
<td><strong>Matrix Ball Construction for affine Robinson-Schensted Correspondence</strong> -- 4088 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td>Financial/Actuarial Mathematics -- Sebastian Hermann (ETH)</td>
<td><strong>Model Uncertainty, Recalibration, and the Emergence of Delta-Vega Hedging</strong> -- 1360 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td>Preprint Algebraic Geometry Seminar -- No meeting this week ()</td>
<td><strong>TBA</strong> -- 2866 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td>Student AIM Seminar -- Michael Newman (University of Michigan)</td>
<td><strong>Introduction to Quantum Information</strong> -- 1084 East Hall</td>
<td></td>
</tr>
</tbody>
</table>

**Monday, February 15, 2016**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00pm-2:00pm</td>
<td>Student Arithmetic -- Matt Stevenson (UM)</td>
<td><strong>What is an abelian variety?</strong> -- 1866 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td>Borcherds Products Learning Seminar -- Charlotte Chan (UM)</td>
<td><strong>Heisenberg groups and the Weil representation</strong> -- 4088 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td>Complex Analysis, Dynamics and Geometry -- Moon Duchin (Tufts University)</td>
<td><strong>The Heisenberg group in complex hyperbolic geometry</strong> -- 3096 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td>Student Combinatorics Seminar -- John Wiltshire-Gordon (UM)</td>
<td><strong>A Computational Introduction to Representation Stability</strong> -- 3866 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td>Group, Lie and Number Theory -- John Voight (Dartmouth College)</td>
<td><strong>Explicit modularity for genus 2 curves</strong> -- 4088 East Hall</td>
</tr>
</tbody>
</table>

**Tuesday, February 16, 2016**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00pm-4:00pm</td>
<td>Student Commutative Algebra -- Robert Walker (UM)</td>
<td><strong>Computing select invariants of Normal Toric Rings</strong> -- 3096 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td>Colloquium Series -- Jordan Ellenberg (University of Wisconsin)</td>
<td><strong>Configurations, arithmetic groups, cohomology, and stability</strong> -- 1360 East Hall</td>
</tr>
</tbody>
</table>

**Wednesday, February 17, 2016**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00pm-5:00pm</td>
<td>RTG Working Seminar on Geometry, Dynamics and Topology -- David Fisher (Indiana U)</td>
<td><strong>Coarse differentiation, quasi-isometries and solvable groups II</strong> -- 4088 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td>Financial/Actuarial Mathematics -- Yavor Stoev (UM)</td>
<td><strong>Quickest change-point detection problems for multidimensional Wiener processes</strong> -- 3088 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td>Financial/Actuarial Mathematics -- Abhinav Sinha (EECS, UM)</td>
<td><strong>Network Mechanism Design</strong> -- 1360 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td>Analysis/Probability -- Jun Yin (University of Wisconsin)</td>
<td><strong>Universality of the random matrix with wide band</strong> -- 2866 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td>Algebraic Geometry -- Alexis Bouthier (UC Berkeley)</td>
<td><strong>Around Drinfeld-Grinberg-Kazhdan's</strong></td>
</tr>
</tbody>
</table>
### Seminar & Events Bulletin: All
01-01-2016 to 06-30-2016

**theorem and perverse sheaves on arc spaces** -- 4096 East Hall

---

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday, February 18, 2016</td>
<td><strong>Topology</strong> -- Kevin Schreve (University of Michigan) <strong>TBA</strong> -- 1866 East Hall</td>
<td><strong>Analysis/Probability Learning Seminar</strong> -- Han Huang (UM) <strong>Dvoretzky's theorem in L_p^n and Talagrand's L1-L2 bound</strong> -- 3866 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Math Club</strong> -- Dick Canary (University of Michigan) <strong>Golf in Hyperbolic Space</strong> -- Nesbitt Room</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Student Algebraic Geometry</strong> -- Harold Blum (University of Michigan) <strong>Rationally Connected Varieties</strong> -- 4096 East Hall</td>
<td></td>
</tr>
<tr>
<td>5:00pm-6:00pm</td>
<td><strong>Student Representation Theory</strong> -- Daniel Barter (University of Michigan) <strong>The Weyl Integration Formula</strong> -- 3096 East Hall</td>
<td></td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friday, February 19, 2016</td>
<td><strong>Theoretical Computer Science</strong> -- Carl Miller (U-M) <strong>Random number generation with untrusted quantum devices</strong> -- 3725 BBB</td>
<td><strong>Borcherds Products Learning Seminar</strong> -- Andrew Snowden (UM) <strong>Holomorphic and non-holomorphic Poincare series</strong> -- 1096 East Hall</td>
</tr>
<tr>
<td>10:30am-11:30am</td>
<td><strong>Applied Interdisciplinary Mathematics</strong> -- Andrew Christlieb (Michigan State University) <strong>Steps towards a fast O(N) approach for direct inversion of linear operators with applications to nonlinear partial differential equations</strong> -- 1084 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:10pm-4:00pm</td>
<td><strong>Combinatorics</strong> -- Steven Karp (UC Berkeley) <strong>Sign variation, the Grassmannian, and total positivity</strong> -- 4088 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td><strong>Preprint Algebraic Geometry Seminar</strong> -- Mircea Mustata (UM) <strong>Hodge Theory for Combinatorial Geometries (following Adiprasito-Huh-Katz)</strong> -- 2866 East Hall</td>
<td></td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, February 22, 2016</td>
<td><strong>Student Arithmetic</strong> -- Kyu Jun (UM) <strong>Tate's Isogeny Theorem</strong> -- 1866 East Hall</td>
<td><strong>Borcherds Products Learning Seminar</strong> -- Andrew Snowden (UM) <strong>Holomorphic and non-holomorphic Poincare series (continued)</strong> -- 4088 East Hall</td>
</tr>
<tr>
<td>1:00pm-2:00pm</td>
<td><strong>Complex Analysis, Dynamics and Geometry</strong> -- Matthieu Astorg (U(M)) <strong>Summability condition and rigidity for finite type maps</strong> -- 3096 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Student Combinatorics Seminar</strong> -- Jacob Haley (UM) <strong>The Octahedron Recurrence and Aztec Diamonds</strong> -- 3866 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td><strong>Group, Lie and Number Theory</strong> -- Erez Nesharium (Tel Aviv) <strong>Cassels' constant for inhomogeneous approximation in function fields</strong> -- 4088 East Hall</td>
<td></td>
</tr>
<tr>
<td>5:00pm-6:00pm</td>
<td><strong>Student Analysis</strong> -- Yan Shuo Tan (UM) <strong>Solving Undetermined Linear Systems using Sparsity</strong> -- 3088 East Hall</td>
<td></td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuesday, February 23, 2016</td>
<td><strong>SPECIAL EVENT</strong> -- (UM) <strong>IBL Lunch</strong> -- 4866 East Hall</td>
<td><strong>Student Commutative Algebra</strong> -- Robert Walker (UM) <strong>Computing select invariants of Normal Toric Rings</strong> -- 3096 East Hall</td>
</tr>
<tr>
<td>11:30am-1:00pm</td>
<td><strong>Colloquium Series</strong> -- Guoliang Yu (Texas A &amp; M University) <strong>Geometry of groups and rigidity of manifolds</strong> -- 1360 East Hall</td>
<td></td>
</tr>
</tbody>
</table>

---

http://www.math.lsa.umich.edu/seminars_events/ - Page 8/123
### Wednesday, February 24, 2016

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00pm-4:00pm</td>
<td>Financial/Actuarial Mathematics -- Asaf Cohen (UM) <strong>Risk Sensitive Control of the Lifetime Ruin Problem</strong> -- 4096 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:00pm-5:00pm</td>
<td>RTG Working Seminar on Geometry, Dynamics and Topology -- David Fisher (U Indiana) <strong>Coarse differentiation, quasi-isometries and solvable groups III</strong> -- 4088 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td>Algebraic Geometry -- Christopher Dodd (Perimeter Institute For Theoretical Physics) <strong>Quantization, reduction mod p, and autoequivalences of the Weyl algebra</strong> -- 4096 East Hall</td>
<td></td>
</tr>
</tbody>
</table>

### Thursday, February 25, 2016

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00pm-4:00pm</td>
<td>Topology -- Grigori Avramidi (The Ohio State University) <strong>L^2 methods, topology of manifolds, and rational homotopy</strong> -- 1866 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:10pm-5:00pm</td>
<td>Analysis/Probability Learning Seminar -- Yan Shuo Tan (UM) <strong>Clustering for Gaussian Mixture Models Using Isoperimetric Distance Concentration</strong> -- 3096 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td>Math Club -- Nicholas Vlamis (University of Michigan) <strong>A Torus Farey Tale</strong> -- Nesbitt Room</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td>Student Algebraic Geometry -- Emanuel Reinecke (University of Michigan) <strong>The irreducibility of the moduli space of curves of given genus</strong> -- 4096 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td>Commutative Algebra -- Daniel Erman (University of Wisconsin-Madison) <strong>Noether normalization over the integers</strong> -- 3866 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:30pm</td>
<td>Logic -- David Fernandez Breton (University of Michigan) <strong>d=c implies that there are gruff ultrafilters</strong> -- CC Little 2502</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td>Differential Equations -- Matthew Creek (Univ. of Chicago) <strong>Global Well-Posedness Results for Generalizations of the Nonlinear Sigma Model</strong> -- 4088 East Hall</td>
<td></td>
</tr>
<tr>
<td>5:00pm-6:00pm</td>
<td>Student Representation Theory -- Phil Tosteson (University of Michigan) <strong>D Modules on Flag Varieties and Localization</strong> -- 3096 East Hall</td>
<td></td>
</tr>
</tbody>
</table>

### Friday, February 26, 2016

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:30pm-4:00pm</td>
<td>Borcherds Products Learning Seminar -- Charlotte Chan (UM) <strong>The regularized theta lift</strong> -- 1096 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td>Applied Interdisciplinary Mathematics -- Karl Liechty (DePaul University) <strong>The Fourier continuation method and discrete orthogonal polynomials on an arc</strong> -- 1084 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:10pm-4:00pm</td>
<td>Combinatorics -- Visu Makam (U. Michigan) <strong>Polynomial degree bounds for matrix semi-invariants</strong> -- 4088 East Hall</td>
<td></td>
</tr>
</tbody>
</table>

### Monday, February 29, 2016

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:10pm-5:30pm</td>
<td>Group, Lie and Number Theory -- - No Talk - () <strong>Winter Break</strong> -- 4088 East Hall</td>
<td></td>
</tr>
</tbody>
</table>

### Tuesday, March 01, 2016

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:10pm-5:00pm</td>
<td>Colloquium Series -- Winter Break () <strong>Winter Break</strong> -- 1360 East Hall</td>
<td></td>
</tr>
</tbody>
</table>

### Thursday, March 03, 2016

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:00pm-5:00pm</td>
<td>Math Club -- () <strong>No Math Club-Winter Break</strong> -- Nesbitt Room</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Time</td>
<td>Event</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Friday, March 04, 2016</strong></td>
<td>4:00pm-5:50pm</td>
<td>Preprint Algebraic Geometry Seminar -- Winter break</td>
</tr>
<tr>
<td><strong>Monday, March 07, 2016</strong></td>
<td>12:00pm-1:00pm</td>
<td>Mathematical Biology -- Madhav Mani (Northwestern University)</td>
</tr>
<tr>
<td></td>
<td>1:00pm-2:00pm</td>
<td>Student Arithmetic -- Angus Chung (UM)</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td>Complex Analysis, Dynamics and Geometry -- Luke Edholm (OSU)</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td>Student Combinatorics Seminar -- Umang Varma (UM)</td>
</tr>
<tr>
<td></td>
<td>4:10pm-5:30pm</td>
<td>Group, Lie and Number Theory -- Paul Pollack (University of Georgia)</td>
</tr>
<tr>
<td><strong>Tuesday, March 08, 2016</strong></td>
<td>3:00pm-4:00pm</td>
<td>Student Geometry/Topology -- Mark Greenfield (UM)</td>
</tr>
<tr>
<td></td>
<td>3:00pm-4:00pm</td>
<td>Student Commutative Algebra -- Rebecca R.G. (UM)</td>
</tr>
<tr>
<td></td>
<td>4:10pm-5:00pm</td>
<td>Colloquium Series -- Philip Maini (University of Oxford)</td>
</tr>
<tr>
<td><strong>Wednesday, March 09, 2016</strong></td>
<td>12:00pm-1:00pm</td>
<td>SPECIAL EVENT -- Philip Maini (University of Oxford)</td>
</tr>
<tr>
<td></td>
<td>3:00pm-5:00pm</td>
<td>RTG Working Seminar on Geometry, Dynamics and Topology -- Kevin Schreve (U Michigan)</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td>Financial/Actuarial Mathematics -- Chris Miller (UC Berkeley)</td>
</tr>
<tr>
<td><strong>Thursday, March 10, 2016</strong></td>
<td>2:00pm-3:00pm</td>
<td>SPECIAL EVENT -- Philip Maini (University of Oxford)</td>
</tr>
<tr>
<td></td>
<td>3:00pm-4:00pm</td>
<td>Topology -- Jon Chaika (University of Utah)</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td>Math Club -- Igor Kriz (University of Michigan)</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td>Student Algebraic Geometry -- Ming Zhang (University of Michigan)</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td>Differential Equations -- Liliana Borcea (Univ. of Michigan)</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:30pm</td>
<td>Logic -- Peter Cholak (Notre Dame University)</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
<td>Location</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>10:30am-11:30am</td>
<td><strong>Theoretical Computer Science</strong> -- Grant Schoenebeck (U-M) <em>Complex Contagions on Social Networks</em> -- 3725 BBB</td>
<td></td>
</tr>
<tr>
<td>1:10pm-2:00pm</td>
<td><strong>SPECIAL EVENT</strong> -- Roman Vershynin (UM) <em>Graduate Recruitment Symposium: Some open problems in high dimensional probability</em> -- 1360 East Hall</td>
<td></td>
</tr>
<tr>
<td>1:10pm-2:00pm</td>
<td><strong>SPECIAL EVENT</strong> -- Ralf Spatzier (UM) <em>Graduate Recruitment Symposium: Rigidity in Geometry and Dynamics</em> -- 3088 East Hall</td>
<td></td>
</tr>
<tr>
<td>2:10pm-3:00pm</td>
<td><strong>SPECIAL EVENT</strong> -- Charlie Doering (UM) <em>Graduate Recruitment Symposium: Heat Rises - 100 Years of Rayleigh-Bénard Convection</em> -- 3088 East Hall</td>
<td></td>
</tr>
<tr>
<td>2:10pm-3:00pm</td>
<td><strong>SPECIAL EVENT</strong> -- Andrew Snowden (UM) <em>Graduate Recruitment Symposium: Arithmetic of curves</em> -- B844 East Hall</td>
<td></td>
</tr>
<tr>
<td>2:10pm-3:00pm</td>
<td><strong>SPECIAL EVENT</strong> -- Dick Canary (UM) <em>Graduate Recruitment Symposium: Rubber band geometry</em> -- 1360 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Applied Interdisciplinary Mathematics</strong> -- Eitan Tadmor (University of Maryland, College Park) <em>Collective dynamics: from emergence of consensus to social hydrodynamics</em> -- 1084 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:00pm-5:00pm</td>
<td><strong>Geometry</strong> -- <em>no event today - Graduate Student Weekend</em> -- 3096 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:10pm-4:00pm</td>
<td><strong>Combinatorics</strong> -- Andrew Berget (West Washington University) <em>A representation of B_n that restricts to the regular representation of B_{n-1}.</em> -- 4088 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:10pm-4:00pm</td>
<td><strong>SPECIAL EVENT</strong> -- Karen Smith (UM) <em>Graduate Recruitment Symposium: Measuring Singularities</em> -- B844 East Hall</td>
<td></td>
</tr>
<tr>
<td>3:10pm-4:00pm</td>
<td><strong>SPECIAL EVENT</strong> -- Jinho Baik (UM) <em>Graduate Recruitment Symposium: Tracy-Widom distributions</em> -- 1360 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>SPECIAL EVENT</strong> -- <em>Graduate Recruitment Symposium: Department Tea</em> -- Mathematics Common Room</td>
<td></td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Financial/Actuarial Mathematics</strong> -- Martin Herdegen (ETH) <em>Economically consistent valuations and put-call parity</em> -- 1866 East Hall</td>
<td></td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td><strong>Preprint Algebraic Geometry Seminar</strong> -- Takumi Murayama (UM) <em>Explicit Brill-Noether-Petri general curves (following Arbarello, Bruno, Farkas, Sacca)</em> -- 2866 East Hall</td>
<td></td>
</tr>
<tr>
<td>5:10pm-6:00pm</td>
<td><strong>SPECIAL EVENT</strong> -- Daniel Forger (UM) <em>Graduate Recruitment Symposium: From a network of 10,000 neurons to a smartphone app with 125,000 users - Mathematical approaches to study circadian rhythms</em> -- 1084 East Hall</td>
<td></td>
</tr>
<tr>
<td>5:10pm-6:00pm</td>
<td><strong>SPECIAL EVENT</strong> -- Kartik Prasanna (UM) <em>Graduate Recruitment Symposium: Cycles, motives and the Langlands program</em> -- B844 East Hall</td>
<td></td>
</tr>
<tr>
<td>5:10pm-6:00pm</td>
<td><strong>SPECIAL EVENT</strong> -- Thomas Lam (UM) <em>Graduate Recruitment Symposium: Electrical networks and group theory</em> -- 1360 East Hall</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
<td>Speaker(s)</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>12:00pm-1:00pm</td>
<td><strong>Mathematical Biology</strong> -- Jeff Hasty (University of California San Diego)  <strong>Engineered Genetic Clocks:</strong> From degrade and fire to integrate and fire dynamics</td>
<td>-- 335 West Hall</td>
</tr>
<tr>
<td>1:00pm-2:00pm</td>
<td><strong>Student Arithmetic</strong> -- Brandon Carter (TBA)</td>
<td>-- 1866 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Borechders Products Learning Seminar</strong> -- Charlotte Chan (TBA)  <strong>Borechders products</strong></td>
<td>-- 4088 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Complex Analysis, Dynamics and Geometry</strong> -- Michael Kelly (U(M))  <strong>BD Equivalence for Return times of Linear Flows on the Torus</strong></td>
<td>-- 3096 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td><strong>Group, Lie and Number Theory</strong> -- Ari Shnidman (Boston College)  <strong>Cubic twist families of elliptic curves and parameterizing cubic fields</strong></td>
<td>-- 4088 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Student Geometry/Topology</strong> -- Feng Zhu (UM)  <strong>Towards the Virtually Haken theorem</strong></td>
<td>-- 1866 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td><strong>Colloquium Series</strong> -- Percy Deift (Courant Institute, NYU)  <strong>Ziwet lecture I: Universality in numerical computations with random data. Case studies</strong></td>
<td>-- 1360 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Financial/Actuarial Mathematics</strong> -- Jinniao Qiu (UM)  <strong>Weak Solution for Fully Nonlinear Stochastic Hamilton-Jacobi-Bellman Equations and its Applications</strong></td>
<td>-- 3088 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>SPECIAL EVENT</strong> -- Tim Ferguson (University of Alabama)  <strong>Extremal Problems for Analytic Functions and Their Connections to Other Topics</strong></td>
<td>-- 4086 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Financial/Actuarial Mathematics</strong> -- Matin Herdegen (ETH)  <strong>Sensitivity of Optimal Consumption Streams</strong></td>
<td>-- 1360 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td><strong>Analysis/Probability</strong> -- Percy Deift (Courant Institute, NYU)  <strong>Ziwet Lecture 2: Riemann-Hilbert problems</strong></td>
<td>-- 2866 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Topology</strong> -- Viveka Erlandsson (University of Fribourg)  <strong>Counting curves on hyperbolic surfaces</strong></td>
<td>-- 1866 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Math Club</strong> -- Malke Rosenfeld (Math Educator/ Percussive Dance Teaching Artist)  <strong>Math in Unexpected Spaces</strong></td>
<td>-- Nesbitt Room</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Differential Equations</strong> -- Percy Deift (Courant Institute, NYU)  <strong>Ziwet Lecture 3: The Toda eigenvalue algorithm: Universality of fluctuations of halting times</strong></td>
<td>-- 4088 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Student Algebraic Geometry</strong> -- Takumi Murayama (University of Michigan)  <strong>TBA</strong></td>
<td>-- 4096 East Hall</td>
</tr>
</tbody>
</table>
Friday, March 18, 2016

10:30am-11:30am  **Theoretical Computer Science** -- Sina Shiehian (U-M)  **Multi-Key FHE from LWE, Revisited** -- 3725 BBB

2:30pm-4:00pm  **Borcherds Products Learning Seminar** -- Andrew Snowden ()  **Heegner divisors and Borcherds products** -- 1096 East Hall

3:00pm-4:00pm  **Applied Interdisciplinary Mathematics** -- Ihsan Topaloglu (McMaster University)  **Nonlocal energies defined via attractive-repulsive interaction potentials** -- 1084 East Hall

3:10pm-4:00pm  **Combinatorics** -- Mihai Ciucu (U. Indiana)  **Lozenge tilings with gaps in a 90 degree wedge domain with mixed boundary conditions** -- 4088 East Hall

4:00pm-5:00pm  **Geometry** -- Dylan Thurston (Indiana University)  **Energies for maps between graphs** -- 3096 East Hall

4:10pm-5:30pm  **Preprint Algebraic Geometry Seminar** -- Matt Stevenson (UM)  **The gonality conjecture on syzygies of algebraic curves of large degree (following Ein and Lazarsfeld)** -- 2866 East Hall

Monday, March 21, 2016

1:00pm-2:00pm  **Student Arithmetic** -- Harry Richman ()  **TBA** -- 1866 East Hall

4:00pm-5:00pm  **Complex Analysis, Dynamics and Geometry** -- Holly Krieger (MIT)  **TBA** -- 3096 East Hall

4:10pm-5:30pm  **Group, Lie and Number Theory** -- Ian Petrow (EPFL)  **TBA** -- 4088 East Hall

Tuesday, March 22, 2016

3:10pm-4:00pm  **Colloquium Series** -- Zaher Hani (Georgia Tech)  **Long-time dynamics and turbulence of nonlinear waves. Part I**  -- 4096 East Hall

4:10pm-5:00pm  **Colloquium Series** -- Kyle Ormsby (Reed College)  **Tensor triangular geometry of stable homotopy categories** -- 1360 East Hall

Wednesday, March 23, 2016

4:00pm-5:00pm  **Financial/Actuarial Mathematics** -- Gustavo Schwenkler (Boston University)  **The Systemic Effects of Benchmarking** -- 1360 East Hall

4:10pm-5:30pm  **Algebraic Geometry** -- Teruhisa Koshikawa (University of Chicago)  **Hodge bundles and heights of motives** -- 4096 East Hall

4:10pm-5:00pm  **Analysis/Probability** -- Zaher Hani (Georgia Tech)  **Long-time dynamics and turbulence of nonlinear waves: Part II. Statistical mechanics approach** -- 2866 East Hall

Thursday, March 24, 2016

3:00pm-4:00pm  **Topology** -- Federica Fanoni (Warwick University)  **Filling sets of curves and systoles** -- 1866 East Hall

4:00pm-5:00pm  **Math Club** -- David Speyer (University of Michigan)  **You can't gift wrap a basketball** -- Nesbitt Room

4:00pm-5:00pm  **Differential Equations** -- Zaher Hani (Georgia Tech)  **Long-time dynamics and turbulence of nonlinear waves: Part III. Dynamical Approach** -- 4088 East Hall

4:00pm-5:00pm  **Student Algebraic Geometry** -- Jake Levinson (University of Michigan)  **TBA** -- 4096 East Hall

4:00pm-5:00pm  **Commutative Algebra** -- Haydee Lindo (University of Utah)  **TBA** -- 3866 East Hall

http://www.math.lsa.umich.edu/seminars_events/ - Page 13/123
<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Event</th>
<th>Speaker/Details</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friday, March 25, 2016</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 2:30pm-4:00pm      | Borcherds Products Learning Seminar | Kartik Prasanna  
Chern classes of Heegner divisors | 1096 East Hall                                                                 |
| 3:00pm-4:00pm      | Applied Interdisciplinary Mathematics | Rita Gitik (University of Michigan)  
Generation theory: application to the genography problem | 1084 East Hall                                                                 |
| 3:00pm-5:00pm      | Geometry      | John Kilgore (U Michigan)  
Weyl's law for singular projective algebraic varieties | 3096 East Hall                                                                 |
| 3:10pm-4:00pm      | Combinatorics | Emily Barnard (NCSU)  
Coxeter-biCatalan Combinatorics | 4088 East Hall                                                                 |
| 4:10pm-5:30pm      | Preprint Algebraic Geometry Seminar | Ashwath Rabindranath (UM)  
A vanishing theorem for weight one syzygies (following Ein, Lazarsfeld, and Yang) | 2866 East Hall                                                                            |
| Monday, March 28, 2016 |
| 1:00pm-2:00pm      | Student Arithmetic | Corey Everlove  
TBA | 1866 East Hall                                                               |
| 3:00pm-4:00pm      | Borcherds Products Learning Seminar | Igor Dolgachev  
Examples of Borcherds products in algebraic geometry | 4088 East Hall                                                                 |
| 4:00pm-5:00pm      | Complex Analysis, Dynamics and Geometry | Margaret Stawiska-Friedland  
A characterization of polynomials in complex and non-archimedean dynamics | 3096 East Hall                                                                 |
| 4:10pm-5:30pm      | Group, Lie and Number Theory | Luis Garcia (University of Toronto)  
TBA | 4088 East Hall                                                                 |
| Tuesday, March 29, 2016 |
| 4:10pm-5:00pm      | Colloquium Series | Faculty meeting with the Dean  
Faculty meeting with Dean Martin | 1360 East Hall                                                                  |
| Wednesday, March 30, 2016 |
| 4:00pm-5:00pm      | Financial/Actuarial Mathematics | Christian Keller (UM)  
TBA | 1360 East Hall                                                                  |
| 4:10pm-5:00pm      | Analysis/Probability | Wei-Kuo Chen (University of Minnesota)  
TBA | 2866 East Hall                                                                  |
| Thursday, March 31, 2016 |
| 4:00pm-5:00pm      | Math Club | Andreas Blass (University of Michigan)  
Shared Secrets | Nesbitt Room                                                                  |
| 4:00pm-5:00pm      | Student Algebraic Geometry | Rob Silversmith (University of Michigan)  
TBA | 4096 East Hall                                                                 |
| 4:00pm-5:00pm      | Differential Equations | Volker Elling (Univ. of Michigan)  
TBA | 4088 East Hall                                                                 |
| Friday, April 01, 2016 |
| 3:00pm-4:00pm      | Applied Interdisciplinary Mathematics | Howard Stone (Princeton University (Mech. Eng.))  
Elementary channel flows with surprising response: (i) Biofilms and flow and (ii) Trapping of bubbles in stagnation point flows | 1084 East Hall                                                                 |
| 3:00pm-4:00pm      | Geometry | Jun Zhang (Psychology, UM (junz@umich.edu))  
Kahler and para-Kahler structure in information geometry | 3096 East Hall                                                                 |
| 3:10pm-4:00pm      | Combinatorics | David Speyer (U Michigan)  
Kasteleyn's method and positroids | 4088 East Hall                                                                 |
| 4:00pm-5:00pm      | Quant Program Practitioner Seminar | Pete Benson (University of Michigan Quant Program)  
TBA | B844 East Hall                                                                 |
| 4:10pm-5:30pm      | Preprint Algebraic Geometry Seminar | Emanuel Reinecke (UM)  
Level structures on abelian varieties, Kodaira dimensions, and Lang's conjecture (following Abramovich and Várilly-Alvarado) | 2866 East Hall                                                                 |
<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, April 4</td>
<td>4:00pm</td>
<td>Complex Analysis, Dynamics and Geometry -- Misha Hlushchanka (Jacobs</td>
<td>3096 East Hall</td>
</tr>
<tr>
<td></td>
<td>- 5:00pm</td>
<td>University)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4:10pm</td>
<td>Group, Lie and Number Theory -- (TBA)</td>
<td>4088 East Hall</td>
</tr>
<tr>
<td>Tuesday, April 5</td>
<td>4:10pm</td>
<td>Colloquium Series -- Sumner Myers Prize (University of Michigan)</td>
<td>1360 East Hall</td>
</tr>
<tr>
<td></td>
<td>- 5:00pm</td>
<td>Sumner Myers Prize</td>
<td></td>
</tr>
<tr>
<td>Wednesday, April 6</td>
<td>4:00pm</td>
<td>Financial/Actuarial Mathematics -- Tom Bielecki (IIT)</td>
<td>1360 East Hall</td>
</tr>
<tr>
<td></td>
<td>- 5:00pm</td>
<td>Dependence between components of multivariate conditional Markov</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>chains: Markov consistency and Markov Copulae</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4:10pm</td>
<td>Algebraic Geometry -- Chi Li (Purdue University)</td>
<td>4096 East Hall</td>
</tr>
<tr>
<td></td>
<td>- 5:30pm</td>
<td>Analysis/Probability -- Palina Salanevich (Jacobs University Bremen)</td>
<td>2866 East Hall</td>
</tr>
<tr>
<td>Thursday, April 7</td>
<td>4:00pm</td>
<td>Math Club -- John Schotland (University of Michigan)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 5:00pm</td>
<td>Discrete Tomography</td>
<td>Nesbitt Room</td>
</tr>
<tr>
<td>Friday, April 8</td>
<td>3:00pm</td>
<td>Applied Interdisciplinary Mathematics -- AVAILABLE ()</td>
<td>1084 East Hall</td>
</tr>
<tr>
<td></td>
<td>- 4:00pm</td>
<td>Combinatorics -- Vivek Shende (UC Berkeley)</td>
<td>TBA -- 4088 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:00pm</td>
<td>Geometry -- Simion Filip (U Chicago)</td>
<td>TBA -- 3096 East Hall</td>
</tr>
<tr>
<td></td>
<td>- 5:30pm</td>
<td>Preprint Algebraic Geometry Seminar -- Tyler Foster (UM)</td>
<td>Contractibility of the space of rational maps (following Gaitsgory) -- 2866 East Hall</td>
</tr>
<tr>
<td>Monday, April 11</td>
<td>1:00pm</td>
<td>Student Arithmetic -- Emanuel Reinecke ()</td>
<td>1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>- 2:00pm</td>
<td></td>
<td>TBA -- 1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:00pm</td>
<td>Complex Analysis, Dynamics and Geometry -- Sandrine Daurat (U(M))</td>
<td>TBA -- 3096 East Hall</td>
</tr>
<tr>
<td></td>
<td>- 5:00pm</td>
<td>Group, Lie and Number Theory -- Frank Thorne (University of South</td>
<td>TBA -- 4088 East Hall</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carolina)</td>
<td></td>
</tr>
<tr>
<td>Tuesday, April 12</td>
<td>3:10pm</td>
<td>Colloquium Series -- Arnaud Beauville (Université de Nice)</td>
<td>Special AG lecture series in Spring -- 1360 East Hall</td>
</tr>
<tr>
<td></td>
<td>- 4:00pm</td>
<td>Special AG lecture series in Spring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4:10pm</td>
<td>Colloquium Series -- Alex Eskin (University of Chicago)</td>
<td>Polygonal Billiards and Dynamics on Moduli Spaces -- 1360 East Hall</td>
</tr>
<tr>
<td>Wednesday, April 13</td>
<td>4:00pm</td>
<td>Financial/Actuarial Mathematics -- Vadim Linetsky (Northwestern)</td>
<td>Long Forward Measure, Recovery, and the Term Structure of Bond Risk Premiums -- 1360 East Hall</td>
</tr>
<tr>
<td></td>
<td>- 5:00pm</td>
<td>Long Forward Measure, Recovery, and the Term Structure of Bond Risk</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Premiums</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4:10pm</td>
<td>Algebraic Geometry -- Arnaud Beauville (University of Nice)</td>
<td>Spring Lectures -- 4096 East Hall</td>
</tr>
<tr>
<td></td>
<td>- 5:30pm</td>
<td>Spring Lectures</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Time</td>
<td>Event</td>
<td>Location</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------</td>
<td>--------------------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Thursday, April 14</td>
<td>4:00pm-5:00pm</td>
<td><strong>Math Club</strong> -- ()  <strong>TBA</strong> -- Nesbitt Room</td>
<td><strong>TBA</strong> -- Nesbitt Room</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td><strong>Math Club</strong> -- Jennifer Park (University of Michigan)  <strong>TBA</strong> -- Nesbitt Room</td>
<td><strong>TBA</strong> -- Nesbitt Room</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td><strong>Commutative Algebra</strong> -- Florian Enescu (Georgia State University)  <strong>TBA</strong> -- 3866 East Hall</td>
<td><strong>TBA</strong> -- 3866 East Hall</td>
</tr>
<tr>
<td>Friday, April 15</td>
<td>3:00pm-4:00pm</td>
<td><strong>Applied Interdisciplinary Mathematics</strong> -- Joel Tropp (Caltech)  <strong>TBA</strong> -- 1084 East Hall</td>
<td><strong>TBA</strong> -- 1084 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:50pm</td>
<td><strong>Preprint Algebraic Geometry Seminar</strong> -- Arnaud Beauville (University of Nice)  <strong>Spring Lectures</strong> -- 2866 East Hall</td>
<td><strong>TBA</strong> -- 2866 East Hall</td>
</tr>
<tr>
<td>Monday, April 18</td>
<td>1:00pm-2:00pm</td>
<td><strong>Student Arithmetic</strong> -- Takumi Murayama ()  <strong>TBA</strong> -- 1866 East Hall</td>
<td><strong>TBA</strong> -- 1866 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td><strong>Complex Analysis, Dynamics and Geometry</strong> -- Alastair Fletcher (Northern Illinois University)  <strong>TBA</strong> -- 3096 East Hall</td>
<td><strong>TBA</strong> -- 3096 East Hall</td>
</tr>
<tr>
<td></td>
<td>4:10pm-5:30pm</td>
<td><strong>Group, Lie and Number Theory</strong> -- Jerry Wang (Princeton University)  <strong>TBA</strong> -- 4088 East Hall</td>
<td><strong>TBA</strong> -- 4088 East Hall</td>
</tr>
<tr>
<td>Tuesday, April 19</td>
<td>4:10pm-5:00pm</td>
<td><strong>Colloquium Series</strong> -- Federico Rodriguez Hertz (Penn State) <strong>Stationary measures, P-invariant measures and invariant measures for group actions.</strong> -- 1360 East Hall</td>
<td><strong>TBA</strong> -- 1360 East Hall</td>
</tr>
<tr>
<td>Friday, April 22</td>
<td>4:10pm-5:30pm</td>
<td><strong>Preprint Algebraic Geometry Seminar</strong> -- No meeting this week ()  -- 2866 East Hall</td>
<td><strong>TBA</strong> -- 2866 East Hall</td>
</tr>
</tbody>
</table>

http://www.math.lsa.umich.edu/seminars_events/ - Page 16/123
Abstracts

Algebraic Geometry
Wednesday, January 06, 2016, 4:10pm-5:30pm
4096 East Hall
Zili Zhang (Stony Brook)

Multiplicativity of the perverse filtration for Hilbert schemes of fibered surfaces

Given a proper morphism between algebraic varieties, the rational cohomology groups of the source are endowed with the perverse filtration. Unlike the classical Leray filtration, the perverse filtration may fail to be multiplicative for the cup product, even for proper maps between smooth projective varieties. In this talk, I will introduce five families of Hitchin (completely integrable) systems which are Hilbert schemes of points on surfaces. I will discuss why the perverse filtrations associated with these five families of Hitchin maps are multiplicative. The same method works for Hilbert schemes of points of elliptic K3 surfaces. I will also discuss the connection between the multiplicativity of the perverse filtration and the P=W conjecture for reductive groups. This talk is not aimed at specialists.

Analysis/Probability Learning Seminar
Thursday, January 07, 2016, 3:10pm-5:00pm
3866 East Hall
Feng Wei (University of Michigan)

Brascamp-Lieb inequality and quantitative versions of Helly's theorem

Helly's theorem states that if $P$ is a finite family of convex sets and each $n+1$ of them has a non-empty intersection, then the whole family has none-empty intersection. We will discuss a solution to the quantitative version of this theorem and generalize the result. The method combines approximated John's decomposition with few vectors and variants of Ball's argument for the reverse isoperimetric inequality. We will also give an intermediate result about Brascamp-Lieb inequality for approximated John's decomposition which can be a useful tool of independent interest.

This talk is based on recent results of Silouanos Brazitikos.

Preprint Algebraic Geometry Seminar
Thursday, January 07, 2016, 4:00pm-5:50pm
3096 East Hall
Dan Burns (UoFM)

Birational stability of orbifold cotangent bundles, after Campana and Paun
Applied Interdisciplinary Mathematics  
Friday, January 08, 2016, 3:00pm-4:00pm  
1084 East Hall  
Diego Ayala Rodriguez (University of Michigan)  
*Extreme vortex states in hydrodynamic systems*

By numerically solving suitable constrained optimization problems, we assess the sharpness of analytic estimates for the instantaneous rate of growth and the finite-time growth of certain norms of solutions to the Navier-Stokes equation in 2 and 3 dimensions. Connections with the problem of finite-time singularity formation in the three-dimensional case are addressed.

Combinatorics  
Friday, January 08, 2016, 3:10pm-4:00pm  
4088 East Hall  
Oliver Pechenik (U. Illinois (Urbana-Champaign))  
*Puzzles and equivariant K-theory of Grassmannians*

The cohomology of the Grassmannian has a basis of Schubert classes. The structure constants for this basis, the celebrated Littlewood-Richardson coefficients, are calculated by any of the Littlewood-Richardson rules. This story has been extended to K-theory by A. Buch (2002) and to torus-equivariant cohomology by A. Knutson-T. Tao (2003). It is natural to unify these theories via a combinatorial rule for structure coefficients in equivariant K-theory. In 2005, A. Knutson-R. Vakil used puzzles to conjecture such a rule. Recently we proved the first combinatorial rule for these coefficients. Using our new rule, we construct a counterexample to the Knutson-Vakil conjecture and prove a mild correction to it. (Joint work with Alexander Yong)

Student Arithmetic  
Monday, January 11, 2016, 1:00pm-2:00pm  
1866 East Hall  
()  
*Planning Meeting*

Student Combinatorics Seminar  
Monday, January 11, 2016, 4:00pm-5:00pm  
3866 East Hall  
()  
*Planning Meeting*

We will brainstorm and vote for topics for this semester. There will be cookies!
Motivated by the existence of monster-invariant integral forms in the moonshine module VOA, I will present a study of automorphism-invariant integral forms in some small-dimensional Griess algebras, which are certain finite-dimensional commutative, nonassociative algebras generated by idempotents. An 'integral form' of a rational algebra is the integer span of a basis of the algebra that is closed under the algebra product. I will present methods that can be used to find and classify the maximal automorphism-invariant integral forms in a rational algebra. Each of the Griess algebras we have analyzed - the eight dihedral Griess algebras and two others - have unique maximal automorphism-invariant integral forms. This research has been undertaken as part of my Ph.D. thesis under the guidance of Robert L. Griess, Jr.
Colloquium Series  
Tuesday, January 12, 2016, 4:10pm-5:00pm  
1360 East Hall  
Valentino Tosatti (Northwestern University)  
*The Ricci flow on compact Kähler manifolds*

The behavior of the Ricci flow on compact Kähler manifolds is intimately related to the complex structure of the manifold. In particular on projective manifolds it has direct connections with the minimal model program in algebraic geometry. It is known that the maximal existence time of the flow can be computed from simple cohomological data. In the case when this is finite, I will give a geometric description of the set where the singularities occur. When the maximal existence time is infinite, I will discuss what is known about metric behavior as time goes to infinity.

---

RTG Working Seminar on Geometry, Dynamics and Topology  
Wednesday, January 13, 2016, 3:00pm-5:00pm  
3866 East Hall  
Nicholas Vlamis (U Michigan)  
*Uniformly hyperbolic arc graphs*

I will present the work of Hensel-Przytycki-Webb showing that the arc graph associated to a compact surface with nonempty boundary is 7-hyperbolic and the curve graph associated to a finite-type surface is 17-hyperbolic. As an application, I will also present the work Aramayona-Fossas-Parlier describing a connected infinite-diameter 7-hyperbolic arc graph for a large class of infinite-type surfaces.
Financial/Actuarial Mathematics
Wednesday, January 13, 2016, 4:00pm-5:00pm
1360 East Hall
Johannes Muhle-Karbe (UM)
Equilibrium Models with Small Frictions

How would the introduction of a small trading friction such as a transaction tax affect financial markets? To answer questions of this kind, one needs to consider equilibrium models, where prices are determined endogenously. Indeed, taxes change agents’ individual decision making, which in turn affects the market prices determined by their interactions. The new market environment then again alters the agents’ behavior, leading to a notoriously intractable fixed point problem.

In this talk we report on recent progress using asymptotic techniques for small trading frictions. In this practically relevant limiting regime, explicit solutions become available for many of the arising singular control problems, bringing analytical results for the equilibrium problem within reach.

(The talk is based on joint works with Martin Herdegen and Jan Killeen)

Topology
Thursday, January 14, 2016, 3:00pm-4:00pm
1866 East Hall
Grace Work (University of Illinois at Urbana-Champaign)
Gap distribution for slopes of saddle connections on the octagon

Following a strategy developed by Athreya and Cheung, we compute the gap distribution of the slopes of saddle connections on the translation surface associated to the regular octagon by translating the problem to a question about return times of the horocycle flow to an appropriate Poincare Section. This same strategy was used by Athreya, Chaika, and Lelievre to compute the gap distribution on the Golden L. The octagon is the first example of this type of computation where the Veech group has two cusps. Joint work with Caglar Uyanik.
Analysis/Probability Learning Seminar  
Thursday, January 14, 2016, 3:10pm-5:00pm  
3866 East Hall  
Feng Wei (University of Michigan)  
Approximated John's decomposition and quantitative versions of Helly's theorem  

Helly's theorem states that if $P$ is a finite family of convex sets and each $n+1$ of them has a non-empty intersection, then the whole family has none-empty intersection. It is a natural question whether we can generalize it to a quantitative version. In this talk, we will discuss both volume and diameter version of quantitative Helly's theorem. The method is based on approximated John's decomposition. Part of the proof is also related to Brascamp-Lieb inequality and Ball's argument for reverse isoperimetric inequality. No background is needed for this talk although this is second part of a discussion for Helly's theorem.  

This talk is based on recent results of Silouanos Brazitikos.

Math Club  
Thursday, January 14, 2016, 4:00pm-5:00pm  
Nesbitt Room  
Andrew Snowden (University of Michigan)  
Hilbert's Tenth Problem  

In 1900, David Hilbert posed the following problem (number 10 on his famous list of 23 problems): devise an algorithm that decides if a polynomial equation $f(x_1, ..., x_n) = 0$ admits a solution in the integers. Surprisingly, building on the efforts of several people, it was proven in 1970 by Yuri Matiyasevich that no such algorithm exists! I will present the main ideas of the proof.

Preprint Algebraic Geometry Seminar  
Thursday, January 14, 2016, 4:00pm-5:50pm  
1866 East Hall  
()  
Special AG seminar  

There is no preprint seminar talk today. Instead, there will be a special talk in AG seminar by Inna Zakharevich.
Let $E$ be an elliptic curve and $L$ a line bundle of positive degree on it. The ring $R$ of sections of all powers of $L$ is then a graded normal Gorenstein domain of Krull dimension 2 and the aim here is to describe all graded maximal Cohen-Macaulay (= reflexive) modules over this ring.

A fundamental result by Orlov from 2005 implies as a special case that isomorphism classes of non-free indecomposable such graded maximal Cohen-Macaulay modules are in a natural, though still largely mysterious bijection with the isomorphism classes of indecomposable objects in the derived category of coherent sheaves on that elliptic curve. The structure of the latter is essentially known since Atiyah's famous classification of such sheaves in 1957.

After recalling the background just described, I will present results by my student Sasha Pavlov who uses this machinery to determine all possibilities for the graded Betti numbers. These results take a particularly nice form for smooth cubic curves as we will explain.

As a practical application, Sasha and I determined recently presentations of all Ulrich bundles of rank 1 or 2 on a smooth cubic curve in Hesse form through "Moore matrices" that are intimately linked to the representation theory of the finite Heisenberg groups.
Algebraic Geometry
Thursday, January 14, 2016, 4:10pm-5:30pm
1866 East Hall
Inna Zakharevich (University of Chicago)
Cutting and pasting using algebraic K-theory

Scissors congruence is about cutting objects up and rearranging the pieces into other objects. For example, any two polygons with the same area are always scissors congruent. Hilbert's third problem asked if there exist polyhedra with the same volume which are not scissors congruent. In 1901 Dehn showed that yes, there do: a cube and a regular tetrahedron with the same volume are not scissors congruent. Analogous questions can be asked in other geometries and other dimensions, and the answers discovered have amazing connections to geometry, algebra and K-theory.

We can also consider this question in the context of algebraic varieties. Determining scissors congruence classes of varieties is generally prohibitively difficult, but analyzing algebraic scissors congruence invariants (such as point counting or Euler characteristic) can give interesting non-trivial information about the class of a variety.

In this talk we introduce a general framework for analyzing scissors congruence problems and discuss the new information that this framework reveals. We will also introduce algebraic K-theory and discuss why it might be useful for analyzing such problems, and conclude with some theorems which arise from this perspective.

Theoretical Computer Science
Friday, January 15, 2016, 10:00am-11:00am
4941 BBB
Mark Rudelson (U-M)
Counting perfect matchings via random matrices

Estimating the number of perfect matchings in a bipartite graph is a well-known computer science problem, and there is a number of algorithms tackling it. Much less is known about estimating this number for a general graphs with an even number of vertices. Essentially, the only known probabilistic estimator for this problem was constructed by Barvinok, who represented the number of perfect matchings via the determinant of a random matrix associated to the graph. Barvinok proved that the multiplicative error of this estimator is at most exponential, and this result cannot be improved for general graphs. We provide conditions on the matrix, under which the Barvinok estimator yields a subexponential error.
Joint work with Alex Samorodnitsky and Ofer Zeitouni.

SPECIAL EVENT
Friday, January 15, 2016, 1:00pm-3:00pm
3096 EH
Adam Kaye (UM)
Thesis Defense
Applied Interdisciplinary Mathematics  
Friday, January 15, 2016, 3:00pm-4:00pm  
1084 East Hall  
Michal Zochowski (University of Michigan)  

How can cognitive processes in the brain be regulated by changing properties of individual cells?

The brain is a complex and evolving network. While a lot is known about its biology, the dynamical principles underlying information processing in the brain remain elusive. However, it becomes apparent that to understand dynamics of brain function one has investigate the effects of dynamical properties of individual cells on network-wide spatio-temporal pattern formation. In this talk I will use example of neuromodulatory effects of Achetylcholine (Ach) on individual neurons, to underscore the link between changing cellular properties and evolving network dynamics with their possible implication for brain function. Ach, being one of multitude of neuromodulators in the brain, has multifaceted effects of neuronal excitabilty that thought to be especially important during regulation of sleep/wake cycle and also during attention. I will use network models to detangle these effects on the network level, and highlight their possible respective roles for information processing.

Geometry  
Friday, January 15, 2016, 3:00pm-4:00pm  
3096 East Hall  
Caglar Uyanik (UIUC)  

Dynamics of free group automorphisms and a subgroup alternative for $Out(F_N)$.

The study of outer automorphism group of a free group $Out(F_N)$ is closely related to the study of Mapping Class Group of a surface. We will discuss various free group analogs of pseudo-Anosov homeomorphisms of hyperbolic surfaces. We will focus mostly on dynamics of their actions on the space of currents and deduce several structural results about subgroups of $Out(F_N)$. Part of this talk is based on joint work with Martin Lustig and Matt Clay.
Group, Lie and Number Theory  
Friday, January 15, 2016, 4:10pm-5:30pm  
2866 East Hall  
Djordjo Milovic (Universiteit Leiden / Universite Paris-Sud 11)  
*Density results on the 2-part of class groups*

We will discuss some new density results about the 2-primary part of class groups of quadratic number fields and how they fit into the framework of the Cohen-Lenstra heuristics. The first result is that the density of the set of prime numbers $p = -1 \mod 4$ for which the class group of the quadratic number field of discriminant $-8p$ has an element of order 16 is equal to $1/16$. This is the first density result about the 16-rank of class groups in a natural family of number fields. The second result is about the 8-rank in the family of imaginary (resp. real) quadratic number fields parametrized by discriminants of the form $-4pq$ (resp. $8pq$), where $p = q = 1 \mod 4$ are distinct prime numbers. We will briefly explain the ideas behind the proofs of these results and emphasize the role played by general bilinear sum estimates.

Group, Lie and Number Theory  
Monday, January 18, 2016, 4:10pm-5:30pm  
4088 East Hall  
- No Talk - ()  
*Martin Luther King Jr. Day*
Colloquium Series  
Monday, January 18, 2016, 4:10pm-5:00pm  
1360 East Hall  
Cristina Villalobos (University of Texas-Rio Grande Valley)  

**Becoming Agents of Change: Building Diverse Communities and Lessons Learned from the Mathematical Modelling of Eye Disease**

The mathematical modeling of the photoreceptor interactions in the presence of retinitis pigmentosa will be presented and discussed in this talk. Retinitis pigmentosa is an eye-disease that affects approximately 1 in 4000 individuals and can lead to blindness. Currently, there is no treatment to halt the degeneration of the photoreceptors. However, the discovery of the RdCVF protein has shed light to possible therapies to slow the degeneration. Existence of an optimal control along with numerical results will be presented that show the experimentally observed rescue effect that RdCVF has on the cones. Based on some of the lessons learned from the mathematical model, the speaker will transition and discuss her invitation to students and faculty to become agents of change in their own communities. With that purpose in mind, the presenter will share her own career path to her present position and her efforts in "becoming an agent of change" in mentoring faculty and students which has led to the creation of a Center of Excellence in STEM Education that has allowed her to inspire and to help Latino students to enroll and obtain PhD degrees.

SPECIAL EVENT  
Tuesday, January 19, 2016, 12:00pm-1:30pm  
4866 EH  

**IBL Lunch**

**Student Commutative Algebra**  
Tuesday, January 19, 2016, 3:00pm-4:00pm  
3096 East Hall  

**Macaulay 2 Workshop, part 1**

We will be sharing Macaulay 2 tips and sample code to help each other with current projects. Please bring a computer with Macaulay 2 installed if you can; if you don't have one, we can share, and if you're having trouble installing Macaulay 2, we can help you with that. If you want to bring in a question, please Google it before the seminar to save time. You can also e-mail topics to Rebecca R.G. (rirg) ahead of time.
Student Geometry/Topology  
Tuesday, January 19, 2016, 3:00pm-4:00pm  
1866 East Hall  
John Kilgore (UM)  
What is Hodge Decomposition

Student Analysis  
Tuesday, January 19, 2016, 5:00pm-6:00pm  
4096 EH  
()  
Planning Meeting

RTG Working Seminar on Geometry, Dynamics and Topology  
Wednesday, January 20, 2016, 3:00pm-5:00pm  
4088 East Hall  
Nicholas Vlamis (U Michigan)  
Big mapping class groups

Continuing from last week, I will present the work of Aramayona-Fossas-Parlier describing a connected infinite-diameter 7-hyperbolic arc graph for a large class of infinite-type surfaces; however, the mapping class group of such a surface does not act acylindrically on this arc graph. A natural question is whether there exists a more suitable hyperbolic graph such that the mapping class group of an infinite-type surface acts acylindrically. I will present work of Bavard-Genvois answering this in the negative. Time permitting, I will discuss some properties and questions of the so-called big mapping class groups (i.e. mapping class groups of infinite-type surfaces).
Algebraic Geometry
Wednesday, January 20, 2016, 4:10pm-5:30pm
4096 East Hall
Xuanyu Pan (Washington University in St.Louis)

Automorphisms and cohomology

In this talk, I will talk about the work of mine and joint work with Xi Chen and Dingxing Zhang on automorphisms and cohomology of Fano varieties of lines of cubics and complete intersections.

More precisely, we prove the automorphism groups act faithfully on the cohomology groups. As a result, we classify the automorphism groups of cubic fourfolds of small Hodge groups. The proof involves equivariant Kodaira-Spencer maps, equivariant deformations, Hyperkahler structure on Fano variety of lines, Bloch's semi-regularity in mixed characteristic, vanishing cycles and lattice theory. At the end, I will talk about the work of infinitesimal Torelli theorem in positive characteristic.

Analysis/Probability Learning Seminar
Thursday, January 21, 2016, 3:10pm-4:00pm
3096 East Hall
Feng Wei (University of Michigan)

Approximated John's decomposition and diameter versions of Helly's theorem

Helly's theorem states that if $P$ is a finite family of convex sets and each $n+1$ of them has a non-empty intersection, then the whole family has none-empty intersection. It is a natural question whether we can generalize it to a quantitative version. In this talk, we will discuss the diameter version of quantitative Helly's theorem. The method is based on approximated John's decomposition. No background is needed for this talk.

This talk is based on recent results of Silouanos Brazitikos.

Math Club
Thursday, January 21, 2016, 4:00pm-5:00pm
Nesbitt Room
Steven Damelin (Mathematical Reviews)

Whitney's Extension Theorem

Whitney's Extension Theorem, proved in 1934, is a partial converse to Taylor's theorem. It determines conditions when a function defined on a closed set of the real line can be extended to a smooth function on the whole line. Whitney's theorem is related to the problem of determining a function from finitely many measurements of its values (interpolation). It comes up in matching of data in computer vision, for use in face recognition. The talk will explain the theorem, describe some generalizations, and give some applications.
Student Algebraic Geometry
Thursday, January 21, 2016, 4:00pm-5:00pm
4096 East Hall
Ashwath Rabindranath (University of Michigan)
The $N_p$ Property and Syzygies

I will introduce the property $N_p$ for projective varieties, which relates to projective normality and syzygies of the defining ideal (notably the property of being generated by quadrics). I will discuss various theorems about when the syzygies of an embedding satisfy this property. This talk assumes 631 and 632.

Preprint Algebraic Geometry Seminar
Thursday, January 21, 2016, 4:00pm-5:50pm
1866 East Hall

() Organizational meeting

This seminar will meet on *Fridays* at 4:10pm (with the exception of the organizational meeting)!

Analysis/Probability Learning Seminar
Thursday, January 21, 2016, 4:00pm-5:00pm
3096 East Hall
Han Huang (University of Michigan)
Talagrand's $L1-L2$ Bound

This result of Talagrand is applicable to function of independent Gaussian random variables. Similar to Poincare inequality, it bounds the variance with $L1$ and $L2$ norms of the partial derivative. In particular, it is also a refinement of the Poincare inequality. Moreover, the method is very popular method for proving super concentration. In this talk, we will go through the proof of Talagrand's $L1-L2$ bound.

This talk is based on recent results of Silouanos Brazitikos.
A spanner is a sparse subgraph that approximately preserves the pairwise distances of the original graph. It is well known that there is a smooth tradeoff between the sparsity of a spanner and the quality of its approximation, so long as distance error is measured multiplicatively. A central open question in the field is to prove or disprove whether such a tradeoff exists also in the regime of additive error. That is, is it true that for all $e>0$, there is a constant $k_e$ such that every graph has a spanner on $O(n^{1+eps})$ edges that preserves its pairwise distances up to $+c(eps)$. Previous lower bounds are consistent with a positive resolution to this question, while previous upper bounds exhibit the beginning of a tradeoff curve: all graphs have +2 spanners on $O(n^{3/2})$ edges, +4 spanners on $O(n^{7/5})$ edges, and +6 spanners on $O(n^{4/3})$ edges. However, progress has mysteriously halted at the $n^{4/3}$ bound, and despite significant effort from the community, the question has remained open for all $0$.

Our main result is a surprising negative resolution of the open question, even in a highly generalized setting. We show a new information theoretic incompressibility bound: there is no mathematical function that compresses graphs into $O(n^{4/3-eps})$ bits so that distance information can be recovered within $+n^{o(1)}$ error.

Applied Interdisciplinary Mathematics  
Friday, January 22, 2016, 3:00pm-4:00pm  
1084 East Hall  
Robert Kerr (University of Warwick)  
_Helicity annihilation in trefoil reconnection: simulations_

The simulated evolution and self-reconnection of a perturbed trefoil vortex knot is compared to the Scheeler et al, PNAS 111 (2014) experiment. To have a single initial reconnection, as in the experiments, the trefoil is perturbed by 4 weak vortex rings. Visualizations show that the simulations and experiments undergo similar topological changes. Quantitative comparisons using the helicity and global topological number show that both are preserved for a long period before reconnection begins, as in the experiments. Unlike the experiments, once reconnection begins, a significant fraction of the helicity is dissipated and the global topological number changes by a discrete amount in a fixed time. Helicity spectra and physical space correlations show that the change in helicity is associated with the appearance of negative helicity at lower wavenumbers and in the outer regions of the trefoil. Furthermore, using a range of Reynolds numbers, with the highest comparable to the experiments, it is demonstrated that a Reynolds number independent fraction of the initial helicity is dissipated in a finite time. This observation does not violate any current mathematics restricting the strong growth of Navier-Stokes norms as the viscosity goes to zero due to the structure of the trefoil. In addition, because the self-linking is exactly the integral of the velocity of one parallel trajectory on the other, is the sum of the writhe+twist of the single trajectory and is conserved until reconnection, it says that the proper self-induced Biot-Savart velocity of a trajectory is not the usual Biot-Savart integral plus a local induction correction. Instead it is the writhe+twist, that is the Biot-Savart integral plus the twist and in this form, there might be a singularity.

Geometry  
Friday, January 22, 2016, 3:00pm-4:00pm  
3096 East Hall  
Rita Gitik (U Michigan)  
_Weak Width of Subgroups_

Height and width of a subgroup H of a group G have been introduced by the speaker some time ago. These invariants play an important role in recent Agol's proof of Thurston's conjectures. We introduce a new invariant of H in G, which we call the weak width, planning to check if this invariant might simplify Agol's proof. We prove that a quasiconvex subgroup of a negatively curved group has finite weak width in the ambient group and provide a relationship between weak width and width. We also give examples demonstrating that height, width, and weak width are different invariants of a subgroup.
Combinatorics  
Friday, January 22, 2016, 3:10pm-4:00pm  
4088 East Hall  
Jenna Rajchgot (U Michigan)  

*Three combinatorial formulas for type A quiver polynomials and K-polynomials*  

I’ll describe a closed immersion from each representation space of a type A quiver with bipartite (i.e., alternating) orientation to a certain opposite Schubert cell of a partial flag variety. This “bipartite Zelevinsky map” restricts to an isomorphism from each orbit closure to a Schubert variety intersected with the above-mentioned opposite Schubert cell. For type A quivers of arbitrary orientation, I’ll discuss a similar result up to some factors of general linear groups.  

Using these identifications, I’ll explain how one can obtain various combinatorial formulas for the quiver polynomial and K-polynomial of an arbitrarily oriented type A quiver locus embedded inside of its representation space. These formulas are generalizations of three of Knutson-Miller-Shimozono’s formulas from the equioriented type A setting.  

This is joint work with Ryan Kinser and Allen Knutson.

Algebraic Geometry  
Friday, January 22, 2016, 4:10pm-5:30pm  
2866 East Hall  
Chang-Yeon Chough (UC Berkeley)  

*Topological types of algebraic stacks*  

In developing homotopy theory in algebraic geometry, Michael Artin and Barry Mazur studied the \(\acute{e}tale\) homotopy types of schemes. Later, Eric Friedlander generalized them to the \(\acute{e}tale\) topological types of simplicial schemes. The aim of this talk is to extend further these theories to algebraic stacks by using the derived functor approach for schemes by Ilan Barnea and Tomer Schlank. I’ll then use this general framework for the theory of topological types to give an alternative proof of Arnab Tripathy’s theorem on the commutativity of \(\acute{e}tale\) homotopy types and symmetric powers.
Student AIM Seminar  
Friday, January 22, 2016, 4:10pm-5:00pm  
1084 East Hall  
Scott Rich (University of Michigan)  
*Utilizing Phase Response Curves to understand the activity of large neuronal networks*

Since the era of Hodgkin and Huxley in the 1950s, the neurons in your brain have been modeled with various degrees of accuracy and complexity as systems of differential equations. Since these models typically exhibit oscillatory properties, a common way to analyze their properties is with the Phase Response Curve (PRC). PRCs illustrate how a perturbation delivered at various phases of an oscillation differentially advance or delay the timing of subsequent oscillations. For neurons, the perturbations are synaptic activity and the oscillations are action potential firings.

In this talk, I will first provide a background of the mathematics underlying the PRC and its application to analyzing systems of connected oscillators. I will then provide results from my current research that show how the properties of a neuron's PRC can change the overall behavior of a large neuronal network and briefly discuss the biological importance of these results.

---

Student Arithmetic  
Monday, January 25, 2016, 1:00pm-2:00pm  
1866 East Hall  
Trevor Hyde (UM)  
*Regular Polytopes Defined over Q*

Regular polytopes are the natural generalization of Platonic solids to n-dimensions. A concrete realization of a polytope P is a collection of points in affine space which form the vertices of P. To write down points, we need to use numbers from some field. This leads to the question of which polytopes can be realized with rational vertices. In this talk, we'll completely answer this question for regular polytopes in any dimension. No prerequisites assumed beyond the definition of a field.
Complex Analysis, Dynamics and Geometry  
Monday, January 25, 2016, 4:00pm-5:00pm  
3096 East Hall  
Sarah Koch (U(M))  
Postcritical configurations in moduli space

A postcritically finite rational map with n postcritical points determines a point in the moduli space $M_{0,n}$. We explore the question: which configurations of n points on the Riemann sphere arise as postcritical configurations? It follows from Thurston rigidity that postcritical configurations are algebraic points of moduli space. We prove that the set of postcritical configurations is dense (in the analytic topology) using postcritically finite endomorphisms of projective space and some results from dynamics in several complex variables. This is joint work with L. DeMarco.

Student Combinatorics Seminar  
Monday, January 25, 2016, 4:00pm-5:00pm  
3866 East Hall  
Daniel Barter (UM)  
An introduction to tensor categories with examples

Semisimple tensor categories live at the intersection of representation theory, physics, low dimensional topology and most importantly, combinatorics. Examples include the representations of a compact group, the representations of a quantum group at a root of unity and vector bundles over a finite group $G$ twisted by a cohomology class in $H^3(G,k^\times \{\times\})$. To go with the examples, there is a deep theory. We shall scratch the surface by exploring in detail the representations of quantum $SL(2)$, one of the most fundamental semisimple tensor categories.

Group, Lie and Number Theory  
Monday, January 25, 2016, 4:10pm-5:30pm  
4088 East Hall  
CANCELLED William Chen (Penn State University)  
Moduli interpretations for noncongruence modular curves

Quotients of the upper half plane $H$ by congruence subgroups of $SL(2,\mathbb{Z})$ are well known to be moduli spaces parametrizing elliptic curves equipped with "abelian" level structures. In my talk I will consider Teichmuller level structures on elliptic curves attached to finite groups $G$, and show that when $G$ is sufficiently nonabelian, the resulting moduli spaces are noncongruence modular curves (quotients of $H$ by noncongruence subgroups of $SL(2,\mathbb{Z})$). When $G$ is abelian, we recover standard congruence level structures. I will also discuss connections with the inverse Galois problem, as well as the unbounded denominators conjecture for noncongruence modular forms.
Student Analysis  
**Monday, January 25, 2016, 5:00pm-6:00pm**  
3088 East Hall  
Yan Shuo Tan (UM)  
*Solving Undetermined Linear Systems using Sparsity*

In a 2005 paper, Candes and Tao showed how one can solve an undetermined linear system using Basis Pursuit when the input vector is sparse and provided the measurement matrix satisfies a "Restricted Isometry Property". They also showed that Gaussian random matrices satisfy this property with overwhelming probability. In this talk we will cover the first part of their paper. The second part will be covered in the following week.

Teaching Mathematics  
**Monday, January 25, 2016, 5:15pm-6:30pm**  
3096 East Hall  
Elaine Lande (Univ Michigan, CRLT)  
*Small Course Evaluation Project*

In Fall 2015, class-sizes in Math 105, 115 and 116 were reduced as part of the University's small class-size effort. The Mathematics Department has been working with the Center for Research on Learning and Teaching to evaluate the effectiveness of this class-size reduction. In this presentation I will discuss the goals and design of the evaluation project, the data collected, and some preliminary finding.

Student Commutative Algebra  
**Tuesday, January 26, 2016, 3:00pm-4:00pm**  
3096 East Hall  
*Macaulay 2 Workshop, part 2*

We will be sharing Macaulay 2 tips and sample code to help each other with current projects. Please bring a computer with Macaulay 2 installed if you can; if you don't have one, we can share. This week, we will be sharing examples of more complex code in Macaulay 2.

If you want to bring in a question, please Google it before the seminar to save time. You can also e-mail topics to Rebecca R.G. (rirg) ahead of time.
Student Geometry/Topology  
Tuesday, January 26, 2016, 3:00pm-4:00pm  
1866 East Hall  
Takumi Murayama (UM)  
*The Lefschetz theorem on (1,1)-classes and the Hodge conjecture*

Let $X$ be a complex projective manifold. By the so-called "Poincare duality" theorem, every cohomology class corresponds to a homology class of complementary dimension, and so is it natural to ask: do all cohomology classes arise as the "Poincare dual" of an analytic submanifold of $X$? The Hodge conjecture states that, properly formulated, the answer is yes.

We will show the Lefschetz theorem on $(1,1)$-classes as an application of the Hodge decomposition theorem, and discuss its relationship to the Hodge conjecture. This is the second seminar talk in a series on Hodge theory in the Student Geometry/Topology seminar, but relevant material from the first talk will be restated.

---

Colloquium Series  
Tuesday, January 26, 2016, 4:10pm-5:00pm  
1360 East Hall  
Bernd Sturmfels (University of California, Berkeley)  
*Eigenvectors of Tensors*

Eigenvectors of square matrices are central to linear algebra. Eigenvectors of tensors are a natural generalization. The spectral theory of tensors was pioneered by Lim and Qi a decade ago, and it has found numerous applications. We present an introduction to this theory, with focus on results on eigenconfigurations due to Abo, Cartwright, Robeva, Seigal and the author. We also discuss a count of singular vectors due to Friedland and Ottaviani.

---

RTG Working Seminar on Geometry, Dynamics and Topology  
Wednesday, January 27, 2016, 3:00pm-5:00pm  
4088 East Hall  
Richard Canary (UM)  
*An introduction to Anosov representations*

Anosov representations are higher rank analogues of convex cocompact representations into rank one Lie groups. Labourie introduced them in his study of the Hitchin component and they have since become an organizing principle in higher Teichmuller theory. We will give a gentle introduction to this theory.
Analysis/Probability

Wednesday, January 27, 2016, 4:10pm-5:00pm
2866 East Hall
Alon Nishry (University of Michigan)

How many eigenvalues of GUE are positive?

It is well-known, that the limiting distribution for the eigenvalues of the Gaussian unitary ensemble (GUE) is given by the Wigner semi-circle law. Thus, for large matrices of this type, the number of positive and negative eigenvalues is about the same. Now, consider the (very) rare event where all the eigenvalues are positive. What is the probability of this event?

I'll sketch an approach for answering this question and other related problems, using potential theory.

The talk is motivated by the results of G. Ben Arous and A. Guionnet and the physics paper by D. S. Dean and S. N. Majumdar.

Analysis/Probability Learning Seminar

Thursday, January 28, 2016, 3:10pm-5:00pm
3096 East Hall
Alon Nishry (University of Michigan)

The eigenvalues of GUE - Rare events

Consider the rare event, where the eigenvalues of the Gaussian unitary ensemble (GUE) significantly differ from their limiting distribution, the Wigner semi-circle law. A typical example is when there are no eigenvalues in an interval of non-microscopic size, centered at 0. We are interested in determining the asymptotics of the probability of these rare events, and also in the distribution of the eigenvalues in case these rare events occur.

Using large deviations theory for the empirical distributions of the eigenvalues, I will try to give some answers for these type of problems. No previous knowledge of large deviations theory is required.

The talk is mainly based on the results of G. Ben Arous and A. Guionnet.
I'll sketch an approach for answering this question and other related problems, using potential theory.

The talk is motivated by the results of G. Ben Arous and A. Guionnet and the physics paper by D. S. Dean and S. N. Majumdar.
Math Club
Thursday, January 28, 2016, 4:00pm-5:00pm
Nesbitt Room
Anna Gilbert (University of Michigan)
Group Testing

In the 1940’s, several economists in the Public Health Service devised pooling designs for testing soldiers drafted to serve in the military for syphilis. These designs (and the more general problem of testing large populations of items) became known as combinatorial group testing. I'll describe some modern applications in genetics and illustrate several designs which come from error correcting codes.

Student Algebraic Geometry
Thursday, January 28, 2016, 4:00pm-5:00pm
4096 East Hall
Harry Richman (UM)
What is a Neron model?

In number theory, one way to study the rational points of an elliptic curve $E$ is to relate these to the points of $E$ over various finite fields and local fields. In algebraic geometry, one way to understand a two-dimensional surface is to view it as a family of 1-dimensional curves, varying over a 1-dimensional base. The Neron model for an elliptic curve over $\mathbb{Q}$ is the "best possible" extension of this curve, along with its group law, to a scheme over $\mathbb{Z}$ (which we then think of as a surface). We will describe what "best possible" means here, giving concrete examples along the way. No serious background will be assumed, if you are willing to accept intuitive "moral" definitions of the following geometric words: proper, regular, and smooth.

Logic
Thursday, January 28, 2016, 4:00pm-5:30pm
CCL 2502
David Fernandez Breton (UM)
Gruff ultrafilters in the Random model

A gruff ultrafilter (a concept introduced by van Douwen) is an ultrafilter on the rational numbers with a base of perfect subsets (where perfect means both closed (in the topology inherited from the usual Euclidean one from the reals) and crowded (without isolated points)). The main question regarding these objects is whether one can prove their existence in ZFC. Partial progress towards the answer of this question so far includes that their existence follows from $\text{cov}(M)=c$ (van Douwen), from $b=c$ (Copakova-Hart) and holds in Sacks model (Millan) and in Miller's model (F.B. and Hrusak). In this talk I will show a very recent piece of further partial progress: a proof that there exists a gruff ultrafilter in the Random model.
Quant Program Practitioner Seminar  
**Thursday, January 28, 2016, 4:30pm-5:30pm**  
2866 East Hall  
Sherry Hu (Goldman Sachs)  
*TBA*

---

**Student Representation Theory**  
**Thursday, January 28, 2016, 5:10pm-6:00pm**  
3096 East Hall  
Gabriel Frieden (University of Michigan)  
*Representations of Affine Lie Algebras*

For each simple Lie algebra, there is an associated infinite-dimensional "affine" Lie algebra. For example, in the case of the Lie algebra $sl_n$ (the set of trace zero $n \times n$ matrices with entries in $\mathbb{C}$), the corresponding affine Lie algebra $\hat{sl}_n$ can be realized as the set of trace zero $n \times n$ matrices with entries in the ring of Laurent polynomials $\mathbb{C}[t,t^{-1}]$ (plus a little bit of extra stuff).

In this talk, I will describe two different ways of thinking about affine Lie algebras, and then I will discuss two important categories of representations of these algebras: the highest weight representations, which are analogous to the irreducible representations of simple Lie algebras, and the level zero representations, which are an "affine" phenomenon.

---

**Theoretical Computer Science**  
**Friday, January 29, 2016, 10:00am-11:00am**  
BBB (Room TBA)  
Shang-En Huang (U-M)  
*Using Expander Graphs to Find Vertex Connectivity*

The (vertex) connectivity $\overline{\kappa}$ of a graph is the smallest number of vertices whose deletion separates the graph or makes it trivial. We present the fastest known algorithm for finding $\overline{\kappa}$. For a digraph with $n$ vertices, $m$ edges and connectivity $\overline{\kappa}$ the time bound is $O((n + \min(\sqrt[5]{\overline{\kappa}^5/2}, \sqrt[3]{n^3/4}))m)$. This improves the previous best bound of $O((n + \min(\sqrt[5]{\overline{\kappa}^5}, \sqrt[3]{n}))m)$. For an undirected graph both of these bounds hold with $m$ replaced by $\overline{\kappa}n$. Expander graphs are useful for solving the following subproblem that arises in connectivity computation: A known set $R$ of vertices contains two large but unknown subsets that are separated by some unknown set $S$ of $\overline{\kappa}$ vertices; we must find two vertices of $R$ that are separated by $S$.

This work is by Harold N Gabow (2006).
Furstenberg's theorem says every orbit closure under the semigroup generated by the maps $x^2$, $x^3$ on the circle is either finite or dense. In this talk, we discuss the analogous question on the two dimensional torus. In particular, we will see that every $x^2$, $x^3$, $x^5$ orbit closure is homogeneous in a certain sense. This is a joint work with Elon Lindenstrauss.

In principle, some computational problems can be solved more effectively if computers take advantage of quantum phenomena. Superposition of states in quantum mechanics allows for a sort of large-scale parallel computation. In practice, there are major obstacles on the road to physical realization of quantum computation on a useful scale. Nevertheless, work is proceeding on the design of quantum algorithms and on ways to implement them while dodging the errors that afflict any manipulation of extremely small entities. I'll first summarize the relevant background and then describe some of the work that I've either been involved in or observed at close hand.
Combinatorics  
Friday, January 29, 2016, 3:10pm-4:00pm  
4088 East Hall  
Jake Levinson (UM)  
*K-Theory and Monodromy of Schubert Curves*  

I will describe the combinatorics of Schubert curves, which are one-dimensional Schubert problems defined with respect to flags osculating the rational normal curve. The real geometry of such curves is described by orbits of a map $\omega$ on skew tableaux, defined as the commutator of jeu de taquin rectification and promotion. In particular, the real locus of the Schubert curve naturally covers $\mathbb{RP}^1$, with $\omega$ as the monodromy operator.

I will give a local, faster algorithm for computing $\omega$ without rectifying the tableau. Certain steps in the algorithm are in bijection with Pechenik and Yong’s ‘genomic tableaux’, which enumerate the K-theoretic Littlewood-Richardson coefficient of the Schubert curve. As a corollary, I give purely combinatorial proofs of several numerical results relating the K-theory and real geometry of the curve. This is joint work with Maria Monks Gillespie.

Preprint Algebraic Geometry Seminar  
Friday, January 29, 2016, 4:00pm-5:50pm  
2866 East Hall  
Igor Dolgachev (University of Michigan)  
*Rationality of $S_6$-invariant quartic threefolds*  

Following the recent preprints of A. Beauville, I. Cheltsov, C. Shramov, I. Karzhemanov, I will discuss the problem of rationality of quartic threefolds with nodes under an additional condition when the hypersurface is invariant with respect to the group of projective transformations isomorphic to the permutation group in six letters.
A Schmidt-Stange arrangement is a dense collection of circles in the complex plane, described as the orbit of the real line under the action of a Bianchi group. Bounding the curvature of the circles below a cutoff produces a stunning picture. For example, the Schmidt-Stange arrangement of the Gaussian integers contains all integral Apollonian circle packings. A Schmidt-Stange arrangement captures important arithmetic properties of the field that produced it. This talk will be visual, elementary, and interactive.

Complex Analysis, Dynamics and Geometry
Monday, February 01, 2016, 4:00pm-5:00pm
3096 East Hall
Dan Thompson (OSU)
Uniqueness of equilibrium states for geodesic flows in manifolds of nonpositive curvature

We establish results on uniqueness of equilibrium states for geodesic flows on rank one manifolds. This is an application of machinery developed by Vaughn Climenhaga and myself, which applies when systems satisfy suitably weakened versions of expansivity and the specification property. The geodesic flow on a rank one manifold is a canonical example of a non-uniformly hyperbolic flow and I'll explain why it satisfies our hypotheses. Our methods are completely different from those used by Knieper in his seminal proof that there is a unique measure of maximal entropy in this setting. This is joint work with Keith Burns (Northwestern), Vaughn Climenhaga (Houston) and Todd Fisher (Brigham Young).

Student Combinatorics Seminar
Monday, February 01, 2016, 4:00pm-5:00pm
3866 East Hall
Visu Makhambra (UM)
Matrix semi-invariants

Matrix semi-invariants are the polynomial invariants for the left-right action of $\text{SL}_n \times \text{SL}_n$ on $m$-tuples of $n$ by $n$ matrices. I'll talk about the history and significance of matrix semi-invariants, and present a lower bound for the degree of generators using Kronecker products and the Littlewood-Richardson rule.
Group, Lie and Number Theory  
Monday, February 01, 2016, 4:10pm-5:30pm  
4088 East Hall  
Bryden Cais (University of Arizona)  
*Kisin modules and crystalline cohomology*

The theory of Kisin modules provides a powerful classification of stable lattices in crystalline p-adic Galois representations via certain semi-linear algebra structures over power series rings. On the other hand, the integral p-adic etale cohomology of a smooth and proper scheme over the ring of integers in a p-adic field provides a stable lattice in a crystalline p-adic Galois representation, and so has a Kisin module attached to it. In this case, it is natural to ask if the associated Kisin module can be described in terms of the cohomology of the scheme. In this talk, I will answer this question in the affirmative for abelian schemes (and more generally for p-divisible groups), and speculate on what happens in general. This is joint work with Tong Liu.

Student Commutative Algebra  
Tuesday, February 02, 2016, 3:00pm-4:00pm  
3096 East Hall  
Takumi Murayama (University of Michigan)  
*Applications of Local Cohomology I*

Local cohomology was discovered in the 1960s as a tool to study sheaves and their cohomology in algebraic geometry, but have since seen wide use in commutative algebra. An example of their use is to answer the question: how many elements are necessary to generate a given ideal, up to radical? For example, consider two planes in 4-space meeting at a point. The vanishing ideal \( I = (x,y)^* (u,v) \) in \( k[x,y,u,v] \) can be generated up to radical by \( xu,yv,xv+yu \). Krull's Hauptidealsatz implies that one element is not enough, but local cohomology is used to show two elements also do not work. This is the first half of a two-week workshop series focusing on applications of local cohomology. This week, we will introduce local cohomology with the goal of getting familiar with doing computations. Next week, we will present applications of Hartshorne-Lichtenbaum Vanishing Theorem. We have in mind Kalkbrenner/Sturmfel's theorem concerning Groebner bases of prime ideals, and Fulton/Hansen's theorem on connectedness of intersections of projective varieties, but the speaker is open to suggestions via e-mail.
Colloquium Series  
Tuesday, February 02, 2016, 4:10pm-5:00pm  
1360 East Hall  
Alireza Salehi Golsefidy (UCSD)  
Super-approximation and its applications.

Let $G$ be a finitely generated subgroup of $\text{GL}(n,\mathbb{Q})$. Under certain algebraic conditions, strong approximation describes the closure of $G$ with respect to its congruence topology. Super-approximation essentially tells us how dense $G$ is in its closure! Here is my plan for this talk:

1. I will start with the precise formulation of this property.

2. Some of the main results on this subject will be mentioned.

3. Some of the (unexpected) applications of super-approximation will be mentioned, e.g. Banach-Ruziewicz problem, orbit equivalence rigidity, variation of Galois representations.

4. Some of the auxiliary results that were needed in the proof of super-approximation will be mentioned: sum-product phenomena, existence of small solutions.

RTG Working Seminar on Geometry, Dynamics and Topology  
Wednesday, February 03, 2016, 3:00pm-5:00pm  
4088 East Hall  
Richard Canary (U Michigan)  
TBA
Financial/Actuarial Mathematics
Wednesday, February 03, 2016, 4:00pm-5:00pm
1360 East Hall
Rohini Kumar (Wayne State University)
Small-time asymptotics for fast mean-reverting stochastic volatility models

We use stochastic volatility models, with fast mean-reverting volatility, to price out-of-the-money (OTM) European call options near maturity. The regime of interest is when time to maturity is small, but large compared to the mean-reversion time of the stochastic volatility. The different time scales of mean-reversion and time to maturity makes this a multi scale problem. To obtain asymptotics of the OTM option price and the corresponding implied volatility, we first prove a large deviation principle for stock price, as time to maturity approaches zero. The large deviation principle is obtained by PDE techniques rather than probabilistic methods. Due to the multi-scale nature of the problem, the PDE techniques involve averaging viscosity solutions of nonlinear PDEs.

This is joint work with Jean-Pierre Fouque, Jin Feng and Lea Popovic.

Algebraic Geometry
Wednesday, February 03, 2016, 4:10pm-5:30pm
4096 East Hall
Lars Kindler (Freie Universitat Berlin, Harvard University)
D-modules in positive characteristic and ramification theory

On a smooth variety in positive characteristic, a vector bundle carrying an action of the sheaf of differential operators is called a stratified bundle. I will give a brief introduction into the theory of these objects and I will explain the notion of regular singularity for stratified bundles. This notion is closely related to tame ramification of Ã©tale coverings. For stratified bundles on a curve, I will sketch the beginning of a theory of higher ramification.
Topology
Thursday, February 04, 2016, 3:00pm-4:00pm
1866 East Hall
Matthew Cordes (Brandeis University)
Morse boundaries of geodesic metric spaces

I will introduce a new type of boundary for proper geodesic spaces, called the Morse boundary, that is constructed with equivalence classes of geodesic rays that identify the "hyperbolic directions" in that space. (A ray is Morse if quasi-geodesics with endpoints on the ray stay bounded distance from the ray.) This boundary is a quasi-isometry invariant and a visibility space. In the case of a proper CAT(0) space the Morse boundary generalizes the contracting boundary of Charney and Sultan and in the case of a proper Gromov hyperbolic space this boundary is the Gromov boundary. Time permitting I will also discuss some results on the Morse boundary of the mapping class group or briefly describe joint work with David Hume developing the metric Morse boundary.

Analysis/Probability Learning Seminar
Thursday, February 04, 2016, 3:10pm-5:00pm
3096 East Hall
Mark Rudelson (University of Michigan)
Royen's proof of the Gaussian correlation inequality

The Gaussian correlation inequality asserts that the Gaussian measure of the intersection of two n-dimensional convex symmetric bodies is bounded below by the product of the Gaussian measures of the bodies. This inequality conjectured about forty years ago has been recently proved by Thomas Royen. We will present a simplified version of his proof following a paper of Latala and Matlak.

Math Club
Thursday, February 04, 2016, 4:00pm-5:00pm
Nesbitt Room
Patrick Boland (University of Michigan)
Vieta Jumping

Can you find any integral solutions to the equation \(x^2+y^2+z^2=3xyz\)? Come learn how to find them all! While we're at it, we will name a "problem-which-must-not-be-tried" and explain connections to the work of Fields Medalist Maryam Mirzakhani.
Student Algebraic Geometry  
Thursday, February 04, 2016, 4:00pm-5:00pm  
4096 East Hall  
Matt Stevenson (University of Michigan)  
Invariance of plurigenera

The m-th plurigenus of a complex projective variety is the dimension of the global sections of the m-th power of the canonical bundle. It is well known that this is a birational invariant, but how the plurigenera vary in a family is a much more subtle question. In 1997, Siu proved that they are in fact constant, when the fibres are of general type. We will discuss two strategies that were used to answer this problem, one analytic and one algebraic.

Commutative Algebra  
Thursday, February 04, 2016, 4:00pm-5:00pm  
3866 East Hall  
Mel Hochster (University of Michigan)  
Singularities associated with pencils of quadrics avoiding large linear spaces

The results described are joint work with Tigran Ananyan and grew out of the study of the problem of bounding, independent of the number of variables, the projective dimension of an ideal generated by a fixed number of polynomials of fixed degrees.

We show that if F and G are linearly independent quadratic forms over an algebraically closed field K such that no nonzero element of the pencil KF + KG of quadrics they determine contains a linear space of codimension k, then the singular locus in X = V(KF+KG) has codimension at least 2k-1. The proof is elementary. Many related questions are open.

Student Representation Theory  
Thursday, February 04, 2016, 5:10pm-6:00pm  
3096 East Hall  
Drew Ellingson (University of Michigan)  
Quiver Representations

A quiver is a finite directed graph with allowed multi-edges and self-edges. By choosing the correct definitions, it is possible to build a representation theory of quivers in analog to the representation theory of finite groups. In this talk, we give basic definitions and examples of quiver representations, and discuss how these objects arise naturally in several disparate areas of mathematics. If time permits, we will discuss Gabriel's Theorem, which gives a condition on quivers of finite representation type in terms of extended Dynkin graphs.
**Theoretical Computer Science**  
**Friday, February 05, 2016, 10:30am-11:30am**  
**3725 BBB**  
**Cupjin Huang (U-M)**  
*Quantum Conditional Mutual Information and Ability to Recover*

The quantum conditional mutual information (QCMI) $I(A;C|B)$ of a tripartite state is meant to qualify the correlations between $A$ and $C$ from the point of view of $B$. Recently it has found applications in computer science and physics, for example, communication and information complexity, de Finetti type theorems, and also the study of quantum many-body systems.

Despite the fact QCMI can be regarded as the expected mutual information from the point of view of $B$ in classical situations, non-negativity in fully quantum case is a highly nontrivial fact, and it was not proved until 1973. It has become an interesting task since then to find operational importance for QCMI. A recent breakthrough by Fawzi and Renner has successfully related QCMI to recoverability. It has been proved that the less the value $I(A;C|B)$ is, the better $C$ can be recovered from $B$ without knowing $C$.

There have been several following-up works dealing with recoverability in this year's QIP. It is an interesting fact that many completely different mathematical tools can be exploited to get similar results. In the talk I will briefly introduce the problems being studied in these papers, and try to draw some relation between QCMI with classical computer science problems.

---

**Borcherds Products Learning Seminar**  
**Friday, February 05, 2016, 2:30pm-4:00pm**  
**1096 East Hall**  
**Brandon Carter ()**  
*The Big Picture*

I will give an overview of some classical lifts from modular forms to Hilbert modular forms, and discuss how these generalize to lifts to modular forms on orthogonal groups.
Modelocked lasers can serve as an ideal "playground" for studying nonlinear pulse dynamics. I will first introduce modelocked lasers and their description as a realization of a dissipative soliton. I will then present three phenomena that have been experimentally observed in modelocked lasers: polarization locked vector solitons, exploding solitons and verification of the "area" theorem for dispersion managed solitons. Finally, I will introduce the concepts of frequency combs and the nonlinear dynamics are driven by quantum noise to determine the quality of the combs produced by modelocked lasers.

We show that if the Lyapunov spectrum of the geodesic flow of a closed negatively curved manifold has the same "shape" as that of a locally symmetric space, then these manifolds are isometric. We discuss several generalizations of this principle in the class of Anosov flows, including a surprising result in joint work with Disheng Xu which allows one to also obtain rigidity for perturbations of the time-one map of the geodesic flow of a constant negative curvature manifolds. Techniques used in the proofs include the invariance principle of Avila-Santamaria-Viana, the quasiconformal mapping theory of Carnot groups, and new smoothness results for certain types of invariant splitting for an Anosov flow.

I will discuss work in progress with Annie-Sophie Gleitz providing combinatorial interpretations of Laurent polynomials appearing in certain Generalized Cluster Algebras (as defined by Chekhov and Shapiro). This talk will not assume prior background on generalized cluster algebras.
Preprint Algebraic Geometry Seminar
Friday, February 05, 2016, 4:00pm-5:50pm
3096 East Hall
Dan Burns (UM)
Characterization of smooth Schubert varieties in rational homogeneous manifolds of Picard number 1, after Hong and Mok

SPECIAL EVENT
Friday, February 05, 2016, 4:00pm-5:00pm
3088 East Hall
John Schotland (University of Michigan, Departments of Mathematics and Physics)
Doctoral Committee Seminar - Inverse problems: the good, the bad and the defiant

I will discuss inverse problems for partial differential equations that arise in a variety of physical and geometrical settings. Some are well-posed (good), some are ill-posed (bad) and some are neither.

Student AIM Seminar
Friday, February 05, 2016, 4:10pm-5:00pm
1084 East Hall
Derek Wood (University of Michigan)
Sensor Array Imaging in Random Media
Terminal platelet production and platelet activation involve considerable cytoskeletal reorganization. The morphological changes brought about by this remodeling are essential for proper platelet function. Recent discoveries suggest that the marginal bands of microtubules found at the equator of platelets and platelet precursors undergo similar instabilities during platelet biogenesis and activation. This buckling instability serves, in one case, as the final differentiator of platelet production, and in the other, as an essential early step in the activation pathway. We aim to understand the mechanical principles governing these processes. To accomplish this, we construct a theoretical framework describing a growing, elastic ring confined within a flexible vesicle. With this method we construct two phase diagrams. The first corresponds to an instability due the curvature elasticity of the membrane, and the second to the same instability, but resulting from the strain energy of the membrane cortex. Next, we develop a coarse-grained Monte Carlo model of a growing marginal band within the platelet/preplatelet cytoskeleton. With this model we observe that the confining membrane suppresses the instability more readily for smaller marginal bands, thereby increasing the stability of platelets compared to their precursors. Our analysis, in combination with experimental observations, indicates that, although marginal band stability is highly sensitive to platelet diameter, this alone is not enough to explain the size of circulating platelets.

Student Arithmetic
Monday, February 08, 2016, 1:00pm-2:00pm
1866 East Hall
Andy Odesky (UM)
Class Field Theory
This will be an introductory talk on class field theory. We will state (without proof) one of the main theorems concerning the abelian extensions of a fixed field using the idele group. After seeing the definitions and the main theorem we will prove the Kronecker-Weber theorem as an easy corollary: all abelian extensions of the rationals are contained in cyclotomic extensions. I will attempt to keep the talk as elementary as possible to make it accessible to a larger audience by only assuming knowledge of the p-adic integers and basic Galois theory.
Quotients of the upper half plane $H$ by congruence subgroups of $\text{SL}(2,\mathbb{Z})$ are well known to be moduli spaces parametrizing elliptic curves equipped with "abelian" level structures. In my talk I will consider Teichmuller level structures on elliptic curves attached to finite groups $G$, and show that when $G$ is sufficiently nonabelian, the resulting moduli spaces are noncongruence modular curves (quotients of $H$ by noncongruence subgroups of $\text{SL}(2,\mathbb{Z})$). When $G$ is abelian, we recover standard congruence level structures. I will also discuss connections with the inverse Galois problem, as well as the unbounded denominators conjecture for noncongruence modular forms.

A basic result in partition theory, sometimes called "Euler's identity", is that

$\#(\text{partitions into distinct parts}) = \#(\text{partitions into odd parts})$

A less-basic result that generalizes this, the "Rogers-Ramanujan identity", is that

$\#(\text{partitions into "very distinct" parts}) = \#(\text{partitions into parts }= 1 \text{ or } 4 \text{ mod } 5)$,

where "very distinct" means the parts differ by 2 or more. In this talk I will explain how to prove these identities using generating functions, and in particular generating functions that come from counting "physics-inspired" models, i.e. configurations of particles and their associated statistics.

By Kronecker's congruence relation, the modular polynomial of level $n$ is reducible mod primes dividing $n$. This fact is closely related to the bad reduction of modular curves at primes dividing the level, and is the first hint that modular curves and their cousins Shimura curves have a rich theory of integral models. In this talk, we will present a similar story for Teichmuller curves, i.e., isometric curves in higher genus moduli spaces.
Complex Analysis, Dynamics and Geometry  
Monday, February 08, 2016, 4:20pm-5:30pm  
4088 East Hall  
**Ronen Mukamel (Rice University)**  
*Knörrer's congruence and Teichmüller curves in positive characteristic*

By Kronecker's congruence relation, the modular polynomial of level $n$ is reducible mod primes dividing $n$. This fact is closely related to the bad reduction of modular curves at primes dividing the level, and is the first hint that modular curves and their cousins Shimura curves have a rich theory of integral models. In this talk, we will present a similar story for Teichmüller curves, i.e., isometric curves in higher genus moduli spaces. This is joint with the Number Theory seminar.

**SPECIAL EVENT**  
Tuesday, February 09, 2016, 2:30pm-4:30pm  
AH5180B  
**Gregory Simon (UM)**  
*Thesis Defense: Automorphism-Invariant Integral Forms in Griess Algebras*

---

Student Geometry/Topology  
Tuesday, February 09, 2016, 3:00pm-4:00pm  
1866 East Hall  
**John Kilgore (UM)**  
*The Hodge Decomposition and the Index Theorem*

I will give the ideas of the proof of the Hodge decomposition and explain how it relates to the Index theorem.
Student Commutative Algebra
Tuesday, February 09, 2016, 3:00pm-4:00pm
3096 East Hall
Takumi Murayama (UM)
Applications of Local Cohomology II

This is the second half of a two-week workshop series focusing on applications of local cohomology. This week, we will be focusing on connections between local cohomology and the study of perfect complexes. This circle of ideas started with Hopkins and Neeman, who sought to apply ideas from homotopy theory to commutative algebra. After discussing their main result, we will discuss some concrete consequences, such as Balmer’s reconstruction theorem, which allows us to reconstruct an affine scheme from its category of perfect complexes, and results on finiteness of flat dimension due to Dwyer-Greenlees-Iyengar.

Colloquium Series
Tuesday, February 09, 2016, 4:10pm-5:00pm
1360 East Hall
Howard Masur (University of Chicago)
Billiards in polygons, translation surfaces, and moduli spaces

A nice example of a dynamical system is a billiard flow in a polygon. Most work has concentrated on the case that the vertex angles are multiples of pi. An unfolding process leads to considering the straight line flow on what is called translation surface. A translation surface can be also be thought of as a holomorphic 1-form on a compact Riemann surface. The classic example is billiards in a rectangle which leads to the straight line flow on a flat torus. I will talk about basic questions one asks about straight line flows. The solutions to these questions most often relies on considering a given translation surface as a point in a moduli space of all translation surfaces and then considering the orbit of the point under the action of the group SL(2,R) on the moduli space. I will talk at the end about recent spectacular work of Eskin-Mirzakhani-Mohammadi on this subject and some of what it says about billiards. This talk is meant to be a gentle introduction to the subject, accessible to graduate students.
RTG Working Seminar on Geometry, Dynamics and Topology  
Wednesday, February 10, 2016, 3:00pm-5:00pm  
4088 East Hall  
David Fisher (Indiana U)  
*Coarse differentiation, quasi-isometries and solvable groups I*

The classification of finitely generated groups up to quasi-isometry is a major problem in geometric group theory. Key difficulties arose in the area for studying quasi-isometries of solvable groups. The resolution of many of these difficulties comes from a notion of coarse differentiation. In general, quasi-isometries are not even continuous, let alone differentiable, but this notion allows one to analyze them as though they had derivatives. I will introduce the notion of coarse derivative and illustrate it's application in the context of rigidity of solvable groups.

---

Financial/Actuarial Mathematics  
Wednesday, February 10, 2016, 4:00pm-5:00pm  
1360 East Hall  
Dylan Possamai (Paris Dauphine)  
*Dynamic Programming Approach to Principal-Agent Problems*

Abstract: We consider a general formulation of the Principal-Agent problem from Contract Theory, on a finite horizon. We show how to reduce the problem to a stochastic control problem which may be analyzed by the standard tools of control theory. In particular, Agent's value function appears naturally as a controlled state variable for the Principal's problem. Our argument relies on the Backward Stochastic Differential Equations approach to non-Markovian stochastic control, and more specifically, on the most recent extensions to the second order case.

This is a joint work with Jaksa Cvitanic and Nizar Touzi.
Compactifying moduli spaces is a problem that goes all the way back to the middle of 19th century. Many times in history, changing the compactification lead to new results in enumerative geometry, and more; one example of that is the space of complete conics, that solved the problem of how many smooth conics are tangent to 5 conics in general position (3264). In many cases, the moduli space to compactify is of the form G/H, where G is the projective linear group of P^N (in the case of conics, for instance, it is PGL_3/PO_3). In my thesis, I studied what compactifications of such G/H are obtained compactifying G to the space X of complete collineations, and then taking the G.I.T quotient X//H by H. In this way, it is possible to use many representation theoretic tools to study the geometry of these spaces; in particular, intersection theory on X//H just becomes a matter of counting H-invariant vectors in irreducible representations of G. As an example, I'll show how this process creates substantially new moduli spaces for twisted cubics in P^3, and new enumerative answers about them.

A pseudo-Anosov map f : S -> S is a self-homeomorphism of a connected oriented surface S of finite type such that for any non-trivial simple closed curve c on S, the length of c under iterations of f grows exponentially. The growth rate is called the dilatation of f, and is its minimum for given surfaces S is not known except for small genus and number of punctures. In this talk we give partial solutions to the minimum dilatation problem for mapping classes associated to decorated Coxeter graphs.
Seminar & Events Bulletin: All
01-01-2016 to 06-30-2016

Analysis/Probability Learning Seminar
Thursday, February 11, 2016, 3:10pm-5:00pm
3096 East Hall
Roman Vershynin (University of Michigan)
Linear models for non-linear data?

Can we fit a linear model to non-linear data? The first reaction to this question might be -- no, unless we can linearize the dependence. But we will see that, surprisingly, the answer is "yes" in the statistical framework. Modern tools for linear regression, such as Lasso, actually work well for some non-linear data. Moreover, non-linearities can be non-smooth, discontinuous, non-invertible, and even unknown. For example, Lasso works well for binary (0-1) data, and this makes it useful for classification and learning. These findings are based on the following paradigm: "Statistical methods tends to treat non-linear data as noisy linear data". This talk is based on a joint work with Yaniv Plan (UBC), a former UM postdoc.

Math Club
Thursday, February 11, 2016, 4:00pm-5:00pm
Nesbitt Room
Joseph Marker (University of Michigan)
Placing a Price on Risk

Events such as fires, windstorms, accidents and negligence can bring financial ruin and great physical harm. Purchasing insurance from a property-casualty "insurer" reduces the probability of ruin. How does the insurer help others avoid ruin without ruining itself? We explore ideas about how the insurer might set a price to cover both the expected losses from the policies it writes and the uncertainty of the loss amounts.

Student Algebraic Geometry
Thursday, February 11, 2016, 4:00pm-5:00pm
4096 East Hall
Eamon Quinlan (University of Michigan)
Constructing orbit spaces

When an algebraic group G acts on a variety X, it is natural to ask whether one can realize the orbit space X/G as a variety. In this talk, I will show that we have a rather satisfactory answer when G is linearly reductive and X is affine. This lays the foundation for more general constructions, which I hope to discuss if time allows.
Commutative Algebra
Thursday, February 11, 2016, 4:00pm-5:00pm
3866 East Hall
Uwe Nagel (University of Kentucky)
Equivariant Hilbert Series in non-Noetherian Polynomial Rings

We discuss equivariant Hilbert series of ideals in polynomial rings in countably many variables that are invariant under a suitable action of a symmetric group or the monoid of strictly increasing functions. We show that these series are rational functions in two variables. This is used to prove that the Krull dimension and multiplicity of ideals in an invariant filtration grow eventually linearly and exponentially, respectively, and we determine the terms that dominate this growth. This may also be viewed as a method for assigning new asymptotic invariants to a homogeneous ideal in a noetherian polynomial ring.

The talk is based on joint work with Tim Roemer.

Student Representation Theory
Thursday, February 11, 2016, 5:00pm-6:00pm
3096 East Hall
Visu Makam (University of Michigan)
Quiver representations II: Gabriel and Kac's theorems

In last week's talk, we ended with Gabriel's theorem on classification of quivers of finite type. I'll sketch a proof, since much of it can be proved by some very concrete observations. I will then explain the finite-tame-wild trichotomy and describe Kac's theorem on the indecomposable representations for a general quiver. Most of the talk will rely heavily on explicit examples.

Theoretical Computer Science
Friday, February 12, 2016, 10:30am-11:30am
3725 BBB
Kevin Sung (U-M)
A cubic algorithm for computing the volume of a convex body

Last year, Cousins and Vempala gave a cubic algorithm for computing the volume of a well-rounded convex body in the membership oracle model. This talk will give an overview of their algorithm and explain some of the interesting tools that they use.
Borcherds Products Learning Seminar
Friday, February 12, 2016, 2:30pm-4:00pm
1096 East Hall
Igor Dolgachev ()
*The Weil representation and vector-valued modular forms*

We will give a gentle introduction into the theory of quadratic lattices, hermitian symmetric spaces of orthogonal type and vector-valued modular forms on them.

Applied Interdisciplinary Mathematics
Friday, February 12, 2016, 3:00pm-4:00pm
1084 East Hall
Amy Cochran (University of Michigan)
*Mathematical classification of bipolar disorder from longitudinal mood data*

Bipolar disorder is a chronic disease of mood instability. Longitudinal patterns of mood are central to any patient description, but are condensed into simple attributes and categories. Although these provide a common language for clinicians, they are not supported by empirical evidence. In this talk, I present patient-specific models of mood in bipolar disorder that incorporate existing longitudinal data. In the first part, I will describe mood as a Bayesian nonparametric hierarchical model that includes latent classes and patient-specific mood dynamics given by discrete-time Markov chains. These models are fit to weekly mood data, revealing three patient classes that differ significantly in attempted suicide rates, disability, and symptom chronicity. In the second part of the talk, I discuss how combined statistical inferences from a population do not support widely held assumptions (e.g. mood is one-dimensional, rhythmic, and/or multistable). I then present a stochastic differential equation model that does not make any of these assumptions. I show that this model accurately describes the data and that it can be personalized to an individual. Taken together, this work moves forward data-driven modeling approaches that can guide future research into precise clinical care and disease causes.

Commutative Algebra
Friday, February 12, 2016, 3:00pm-4:00pm
4096 East Hall
Luis Nunez-Betancourt (University of Virginia)
*Vanishing of local cohomology and consequences*

In this talk we will discuss a vanishing theorem for local cohomology modules over regular rings of unramified mixed characteristic. This is result is analogous to the vanishing theorem proved in equal-characteristic by Hartshorne, Ogus, and Huneke-Lyubeznik. We use this theorem to study connectedness properties of the spectrum of a ring. Time permitting, we give a new interpretation of the mixed characteristic Lyubeznik numbers in terms of the topology of Spec(R). This is joint work with Daniel J. Hernandez, Felipe Perez, and Emily E. Witt.
Combinatorics
Friday, February 12, 2016, 3:10pm-4:00pm
4088 East Hall
Michael Chmutov (U Minnesota)
Matrix Ball Construction for affine Robinson-Schensted Correspondence

In his study of Kazhdan-Lusztig cells in affine type A, Shi has introduced an affine analog of Robinson-Schensted correspondence. We generalize the Matrix-Ball Construction of Viennot and Fulton to give a more combinatorial realization of Shi's algorithm. As a byproduct, we also give a way to realize the affine correspondence via the usual Robinson-Schensted bumping algorithm. Next, inspired by Honeywill, we extend the algorithm to a bijection between the extended affine symmetric group and collection of triples \((P, Q, r)\) where \(P\) and \(Q\) are tabloids and \(r\) is a dominant weight.

Financial/Actuarial Mathematics
Friday, February 12, 2016, 4:00pm-5:00pm
1360 East Hall
Sebastian Hermann (ETH)
Model Uncertainty, Recalibration, and the Emergence of Delta-Vega Hedging

We study option pricing and hedging with uncertainty about a Black-Scholes reference model which is dynamically recalibrated to the market price of a liquidly traded vanilla option. For dynamic trading in the underlying asset and this vanilla option, delta-vega hedging is asymptotically optimal in the limit for small uncertainty aversion. The corresponding indifference price corrections are determined by the disparity between the vegas, gammas, vannas, and volgas of the non-traded and the liquidly traded options.

This is joint work with Johannes Muhle-Karbe.

Preprint Algebraic Geometry Seminar
Friday, February 12, 2016, 4:00pm-5:50pm
2866 East Hall
No meeting this week ()
TBA
On the first day of a complexity theory course, a teacher generally introduces the complexity classes P and NP: the set of tasks that can be done efficiently on a deterministic and nondeterministic computing agent, respectively. These classes are the most important because they represent the boundary between things we can actually do on our computers in a reasonable amount of time, and things we can't.

More recently, quantum mechanics has stretched this computational boundary even further: tasks that are fundamentally impossible using the computers of today might not be for the computers of tomorrow (or at least, maybe a century from now).

The field of quantum information theory explores this question: assuming quantum mechanics is valid, what type of computational power does its view of nature give us? This is the new boundary of things we could actually do on our computers.

In this talk, I will give an abbreviated introduction to the basics of quantum information. I will discuss a few of its applications, and if time permits, I will give a brief overview of my research in the direction of quantum cryptography. I'll assume nothing more than some linear algebra and familiarity with tensor products.

Abelian varieties are those complete varieties which carry a group structure. Our discussion will focus on 3 topics: the Jacobians of curves, realizing abelian varieties over the complex numbers as complex tori, and describing line bundles over these complex tori with linear algebraic data. This talk will serve as an introduction to the theory and it will give background for the following week's talk on Tate modules and Tate's isogeny theorem.
Borcherds Products Learning Seminar
Monday, February 15, 2016, 3:00pm-4:00pm
4088 East Hall
Charlotte Chan (UM)
Heisenberg groups and the Weil representation

There is a natural action of SL_2 on the Heisenberg group (unipotent upper triangular 3x3 matrices) that gives rise to the Weil representation. We will then write down some explicit formulae for vector-valued modular forms and relate them to classical modular forms.

(We will be very concrete and only discuss SL_2 in this lecture, but it is important to keep in mind that this is a picture that generalizes to Sp_(2n). This is crucial to the construction of Borcherds products.)

Complex Analysis, Dynamics and Geometry
Monday, February 15, 2016, 4:00pm-5:00pm
3096 East Hall
Moon Duchin (Tufts University)
The Heisenberg group in complex hyperbolic geometry

Just as the intrinsic geometry of horospheres in real hyperbolic space is Euclidean, the horospheres in CH^2 carry the geometry of the Heisenberg group. I’ll discuss some recent work on the continuous and discrete Heisenberg groups and give applications in the complex hyperbolic setting.

Student Combinatorics Seminar
Monday, February 15, 2016, 4:00pm-5:00pm
3866 East Hall
John Wiltshire-Gordon (UM)
A Computational Introduction to Representation Stability

I will introduce the idea of “representation stability,” and give an idea of the way it takes problems from algebraic geometry, number theory, and topology and reduces them to linear algebra and combinatorics. This talk will be useful to anyone planning to attend Jordan Ellenberg's Colloquium talk tomorrow.
We discuss what it means for a genus 2 curve to be modular. First, in joint work with Andrew Booker, Jeroen Sijsling, Drew Sutherland, and Dan Yasaki, to every genus 2 curve $X$ we discuss conjectures (and some theorems) that attach to $X$ a modular form with a matching L-function: the description depends on the structure of the endomorphism algebra of the Jacobian of $X$. To explore this conjecture, we have built a database of genus 2 curves with associated data including geometric and arithmetic invariants of the curve and its Jacobian. Second, when $X$ is generic we arrive at the Brumer-Kramer paramodularity conjecture. In joint work with Armand Brumer, Cris Poor, and David Yuen, we prove a version of this conjecture in the first case, for an abelian surface of conductor 277.

Several invariants (e.g., numerical) of a normal toric variety serve as “footprints” for the convex-geometric building blocks in the variety's construction. This workshop will center on the following topics at the very least, topics one can play around with using Macaulay2:

(a) The embedding dimension of a normal toric ring;

(b) Divisor class group computations.

In part (a), we will discuss an algorithm (using Hirzebruch-Jung continued fractions) which AG folks use to resolve the (finitely-many) singularities of a singular toric surface. On the algebra side, this algorithm can also compute, up to isomorphism, a minimal set of algebra generators of a 2-dimensional normal toric ring. Exercises will be provided.
Consider the following two objects:

* The congruence subgroup of level p in $\text{SL}_n(\mathbb{Z})$; that is, the group of integral matrices congruent to 1 mod p;
* The ordered configuration space of n points on a manifold M, which is to say, the space parametrizing ordered n-tuples of distinct points on M;

Each of these objects carries a natural action of the symmetric group $S_n$ on n letters. (In the first case, this is by permuting the elements of the standard basis; in the second case, by permuting the points in the n-tuple.) What's more, each one is naturally described by cohomology groups $H^i$, which inherit the action and thus become representations of $S_n$.

Although these examples are quite different, it turns out there is a general notion of stability which applies to both of these cases (and many other examples in representation theory, algebraic geometry, and combinatorics.) In some sense, each $H^i$ is "the same representation" but of different groups! The goal of the talk is to explain a framework, the category of FI-modules, in which this notion actually makes sense, and to use this framework to show (for example) that the dimensions of these cohomology groups are polynomials in n for sufficiently large n. It turns out that the stability theorems one wants to get are typically consequences of showing that appealing features of the category of modules over a polynomial ring (e.g. Noetherian properties, Castelnuovo-Mumford regularity) persist in the category of FI-modules.

The work discussed will include joint work with Tom Church, Benson Farb, Rohit Nagpal, and John Wiltshire-Gordon, as well as results of Andy Putman, Andrew Snowden, and Steven Sam.

Some relevant papers:

http://arxiv.org/abs/1204.4533

http://arxiv.org/abs/1210.1854

http://arxiv.org/abs/1508.02430
RTG Working Seminar on Geometry, Dynamics and Topology  
Wednesday, February 17, 2016, 3:00pm-5:00pm  
4088 East Hall  
David Fisher (Indiana U)  
Coarse differentiation, quasi-isometries and solvable groups II

The classification of finitely generated groups up to quasi-isometry is a major problem in geometric group theory. Key difficulties arose in the area for studying quasi-isometries of solvable groups. The resolution of many of these difficulties comes from a notion of coarse differentiation. In general, quasi-isometries are not even continuous, let alone differentiable, but this notion allows one to analyze them as though they had derivatives. I will introduce the notion of coarse derivative and illustrate its application in the context of rigidity of solvable groups.

Financial/Actuarial Mathematics  
Wednesday, February 17, 2016, 3:00pm-4:00pm  
3088 East Hall  
Yavor Stoev (UM)  
Quickest change-point detection problems for multidimensional Wiener processes

We study the quickest change-point detection problems for the correlated components of a multidimensional Wiener process changing their drift rates at certain random times. These problems seek to determine the times of alarm which are as close as possible to the unknown change-point (disorder) times at which some of the components have changed their drift rates. The optimal times of alarm are shown to be the first times at which the appropriate posterior probability processes exit certain regions restricted by the stopping boundaries. We characterize the value functions and optimal boundaries as unique solutions of the associated free boundary problems for partial differential equations. We provide estimates for the value functions and boundaries which are solutions to the appropriately constructed ordinary differential free boundary problems.
Mechanism Design is a widely used design framework for resource allocation problems involving strategic agents. Decentralization of information is one of the main issues that mechanism design deals with. Recently, this approach has been studied for problems on networked systems where for instance efficient distribution of bandwidth among Internet users is to be achieved. Full implementation is a refinement of mechanism design and is generally more robust in achieving efficient allocations.

In this talk, I will begin by describing the Hurwicz-Reiter model for Mechanism Design and the relevant resource allocation problems for various networks like unicast, multi-rate/multicast and wireless network. Owing to the nuances of these networked problems like restrictions on complexity and hard system constraints on allocation, I will propose restrictions to the mechanism design framework which network problem ought to adhere to. Finally I will present a set of mechanisms that achieve full implementation for the various networks. As we shall see, dual optimization approach plays a key role in designing such mechanisms.

We prove gap universality in the bulk of the spectrum for band matrices, in the band width regime $W=\Omega(N)$. All previous results concerning universality of random matrices are for mean-field models. By relying on a new mean-field reduction technique, we deduce universality from quantum unique ergodicity for band matrices.
Algebraic Geometry  
**Wednesday, February 17, 2016, 4:10pm-5:30pm**  
4096 East Hall  
*Alexis Bouthier (UC Berkeley)*  
*Around Drinfeld-Grinberg-Kazhdan's theorem and perverse sheaves on arc spaces*

In the equal characteristics case, with Ngo and Sakellaridis, we proved that some important functions that appear in the Langlands program, such as local L-factors, are linked to some infinite dimensional objects, the arc spaces. More precisely, using a structure theorem proved by Drinfeld and Grinberg-Kazhdan, we constructed a function which should correspond to some hypothetical perverse sheaf on these arc spaces and showed that it matches up with the L-factor.

In a recent work of the speaker with D. Kazhdan, we constructed such a sheaf and more generally a category of perverse sheaves on these arc spaces. We will explain both works and if time permits, we will tell a few words about what can be generalized to the p-adic case.

Topology  
**Thursday, February 18, 2016, 3:00pm-4:00pm**  
1866 East Hall  
*Kevin Schreve (University of Michigan)*  
*TBA*

Analysis/Probability Learning Seminar  
**Thursday, February 18, 2016, 3:10pm-5:00pm**  
3866 East Hall  
*Han Huang (UM)*  
*Dvoretzky's theorem in L_p^n and Talagrand's L1-L2 bound*

This talk will be based on a new paper of G. Paouris, P. Valettas and J. Zinn three months ago. The paper provides better epsilon dependence in the critical dimension k(n,p,epsilon) that one can find random sections of the L_p^n ball which are (1+epsilon)-spherical. Indeed, the proof itself is more interesting than the result. Instead of using measure concentration for Lipschitz continuous functions, it uses Talagrand's L1-L2 bound to derive inequalities for proving Dvoretzky's theorem. Also, similar approach can be used to derive the correct order of variance of L_p norm with respect to the Gaussian measure.
Math Club
Thursday, February 18, 2016, 4:00pm-5:00pm
Nesbitt Room
Dick Canary (University of Michigan)
Golf in Hyperbolic Space

There are three 2-dimensional geometries: spherical, Euclidean and hyperbolic. We will introduce hyperbolic geometry, and get a feel for it by discussing how various sports would be affected by hyperbolic geometry: baseball, golf and beachball. It turns out that every surface can be given a geometric structure modeled on either spherical, Euclidean or hyperbolic geometry. We will discuss how these geometric structures are found for a given surface. We will then give a brief discussion of Thurston’s Geometrization Conjecture, which is a generalization of this result to 3-dimensional spaces. This is now proved as the Geometrization Theorem, due to work of Perelman which won him a Fields Medal in 2006.

Student Algebraic Geometry
Thursday, February 18, 2016, 4:00pm-5:00pm
4096 East Hall
Harold Blum (University of Michigan)
Rationally Connected Varieties

When studying varieties (up to birational equivalence), it is natural to look at rational varieties as having the simplest geometry. A weaker notion than "rational" is "rationally connected". A complex variety is rationally connected if any two points on the variety can be connected by a rational curve.

In this talk, we will explain why this is a very natural and geometric notion. The talk will end with a discussion on a theorem of Graber-Harris-Starr concerning families of rationally connected varieties.

Student Representation Theory
Thursday, February 18, 2016, 5:00pm-6:00pm
3096 East Hall
Daniel Barter (University of Michigan)
The Weyl Integration Formula

Take a unitary matrix uniformly (with respect to left multiplication) at random. How are the eigenvalues distributed around the circle? We shall answer this question and as a corollary, prove the Weyl character formula for semisimple Lie algebras over the complex numbers.
Is it possible to create a source of provable random numbers? An affirmative answer to this question would be of great importance in information security, where the safety of encryption schemes relies on the ability to generate random keys. Quantum technology is in a unique position to help address this problem, because quantum measurements are intrinsically random: no amount of prior knowledge can allow an adversary to predict the outcome. Turning this simple principle into a full protocol for random number generation -- one that is provable based on minimal assumptions -- is a complex problem that motivates some interesting mathematics.

In this talk I will present work by Yaoyun Shi and myself which gave the first error-tolerant proof of randomness expansion from untrusted quantum devices. I will present our newest results, discuss some of the basic principles from quantum information that underlie the proofs, and then finish with some open problems.
Multi-scale problems in science and engineering require accurate implicit methods for solving partial differential equations. However, in the world of distributed multi-core computing, a key bottleneck is the inversion of matrices. Hence, implicit solutions to partial differential equations have difficulty scaling on these computing platforms. Our goal is to develop a fast $O(N)$ direct approach to the inversion of linear operators in real space.

The work is based on the method of lines transpose which combines Green's function methods, successive convolution, fast summation and Rothe's method. The method may also be expressed as an efficient approach for direct evaluation of pseudodifferential operators. Practically speaking, the formulation of the method based on successive convolution can be directly expressed as an $O(N)$ method for computing the resolvent expansion of a pseudodifferential operator in real space. This method has been used to develop an A-stable arbitrary order method for solving the two way wave equation, Maxwell's equations and both linear and nonlinear parabolic problems. We are currently working to extend these methods to high-order phase field models.

The totally nonnegative Grassmannian is the set of k-dimensional subspaces of $\mathbb{R}^n$ whose nonzero Pluecker coordinates all have the same sign. Gantmakher and Krein (1950) showed that a k-dimensional subspace is totally nonnegative if and only if every vector in it, when viewed as a sequence of $n$ numbers and ignoring any zeros, changes sign at most k-1 times. I will present a generalization of this result, which characterizes when the vectors in a subspace change sign at most m times in terms of sign changes of certain sequences of Plucker coordinates. I will also discuss an application to the problem of defining amplituhedra and Grassmann polytopes, in the sense of Arkani-Hamed and Trnka (2013) and Lam (2015).

Hodge Theory for Combinatorial Geometries (following Adiprasito-Huh-Katz)

http://arxiv.org/abs/1511.02888
Given two abelian varieties $A$ and $B$, when are they isogenous? We have a relatively easy answer when we are over the field of complex numbers since we have a nice correspondence between abelian varieties and complex lattices. However, when we are over an arbitrary base field, things are not as nice, simply because there may not be a lattice at all.

However, as Matt implied last week, Tate module (which can be thought as something like a "lattice") can give a nice answer if our base field satisfies some conditions. Tate (1966) conjectured that if $k$ is finite over its prime field, the group of $k$-isogenies from $A$ to $B$ and the group of $G$-homomorphisms between the corresponding Tate modules is isomorphic. After giving an introduction about basic concepts, I will give a brief outline of the proof of Tate's isogeny theorem (over a finite field). If time permits, we will also talk about its applications to cryptography.

**Borcherds Products Learning Seminar**  
Monday, February 22, 2016, 3:00pm-4:00pm  
4088 East Hall  
Andrew Snowden (UM)  
Holomorphic and non-holomorphic Poincare series (continued)

**Complex Analysis, Dynamics and Geometry**  
Monday, February 22, 2016, 4:00pm-5:00pm  
3096 East Hall  
Matthieu Astorg (UM)  
Summability condition and rigidity for finite type maps

Finite type maps are a class of analytic maps on complex 1-manifolds introduced by Epstein, that notably include rational maps and entire functions with a finite singular set. Each of those maps possess a natural finite-dimensional moduli space, and one can define a Teichmueller space parametrizing their quasiconformal conjugacy class. Using the fact that this Teichmueller space immerses into a moduli space, we will generalize rigidity results of Dominguez, Makienko and Sienra under assumption of expansion along the critical orbits.
Seminar & Events Bulletin: All
01-01-2016 to 06-30-2016

Student Combinatorics Seminar
Monday, February 22, 2016, 4:00pm-5:00pm
3866 East Hall
Jacob Haley (UM)
The Octahedron Recurrence and Aztec Diamonds

The octahedron recurrence arose as a method of iteratively computing the determinant of a matrix from the determinants of its submatrices. We will describe this recurrence and then discuss how it can be used to count the domino tilings of a region in $\mathbb{R}^n$ known as the Aztec diamond. If time permits, we will also discuss Somos sequences and the Laurent phenomenon.

Group, Lie and Number Theory
Monday, February 22, 2016, 4:10pm-5:30pm
4088 East Hall
Erez Nesharim (Tel Aviv)
Cassels’ constant for inhomogeneous approximation in function fields

Irrational rotations of the circle $\mathbb{R}/\mathbb{Z}$ are amongst the most studied dynamical systems. One can think of the badly approximable numbers as those numbers which gives rise to rotations for which the orbit of zero do not visit a certain shrinking neighborhood of zero. Khinchine proved in 1926 that for every rotation, the orbit of zero do not visit a shrinking neighborhood around some point of the circle. Moreover, the constant related to this shrinking neighborhood can be chosen uniformly for all rotations. Since then the best constant has been estimated, but its exact value remains unknown. We formulate an analogue of this problem in function fields with coefficients in a finite field, and calculate the exact value. This talk is based on a joint work with Efrat Bank and Steffen Hojris Pedersen.

Student Analysis
Monday, February 22, 2016, 5:00pm-6:00pm
3088 East Hall
Yan Shuo Tan (UM)
Solving Undetermined Linear Systems using Sparsity

In a 2005 paper, Candes and Tao showed how one can solve an undetermined linear system using Basis Pursuit when the input vector is sparse and provided the measurement matrix satisfies a "Restricted Isometry Property". They also showed that Gaussian random matrices satisfy this property with overwhelming probability. This is the second part of a series of talks on the paper. The first part will be quickly reviewed.
SPECIAL EVENT  
Tuesday, February 23, 2016, 11:30am-1:00pm  
4866 East Hall  
(UM)  
IBL Lunch

Student Commutative Algebra  
Tuesday, February 23, 2016, 3:00pm-4:00pm  
3096 East Hall  
Robert Walker (UM)  
Computing select invariants of Normal Toric Rings

Several invariants (e.g., numerical) of a normal toric variety serve as “footprints” for the convex-geometric building blocks in the variety's construction. This workshop will center on the following topics at the very least, topics one can play around with using Macaulay2:

(a) The embedding dimension of a normal toric ring;  
(b) Divisor class group computations.

As for part (b), starting from a theorem giving a finite presentation of the divisor class group of a normal toric variety, participants are invited to compute, up to isomorphism, several examples of divisor class groups. Unlike the general scheme setting, the divisor class group of a normal toric variety is always a finitely-generated abelian group. Conversely, we adduce our humble computations to deduce that every finitely-generated abelian group arises, up to isomorphism, as the divisor class group of a normal (affine) toric variety. In case the group is nontrivial, we'll construct a variety explicitly, using as few defining equations as possible! I see this as an "Eilenberg-MacLane space" style result that doesn't get a cameo in any version of Math 631-32, unfortunately.

Colloquium Series  
Tuesday, February 23, 2016, 4:10pm-5:00pm  
1360 East Hall  
Guoliang Yu (Texas A & M University)  
Geometry of groups and rigidity of manifolds

I will explain how certain geometric properties of groups can be used to study rigidity and non-rigidity of manifolds. In particular, I will discuss how a certain secondary invariants can be used to estimate the degree of non-rigidity of manifolds. Parts of the work are joint with Erik Guentner, Romain Tessera, Shmuel Weinberger, and Zhizhang Xie. This talk will be accessible to graduate students.
Financial/Actuarial Mathematics  
**Wednesday, February 24, 2016, 3:00pm-4:00pm**  
4096 East Hall  
Asaf Cohen (UM)  
*Risk Sensitive Control of the Lifetime Ruin Problem*

We study a risk sensitive control version of the lifetime ruin probability problem. We consider a sequence of investments problems in Black-Scholes market that includes a risky asset and a riskless asset. We present a differential game that governs the limit behavior. We solve it explicitly and use it in order to find an asymptotically optimal policy.

Joint work with Erhan Bayraktar.

**RTG Working Seminar on Geometry, Dynamics and Topology**  
**Wednesday, February 24, 2016, 3:00pm-5:00pm**  
4088 East Hall  
David Fisher (U Indiana)  
*Coarse differentiation, quasi-isometries and solvable groups III*

The classification of finitely generated groups up to quasi-isometry is a major problem in geometric group theory. Key difficulties arose in the area for studying quasi-isometries of solvable groups. The resolution of many of these difficulties comes from a notion of coarse differentiation. In general, quasi-isometries are not even continuous, let alone differentiable, but this notion allows one to analyze them as though they had derivatives. I will introduce the notion of coarse derivative and illustrate it's application in the context of rigidity of solvable groups.

**Algebraic Geometry**  
**Wednesday, February 24, 2016, 4:10pm-5:30pm**  
4096 East Hall  
Christopher Dodd (Perimeter Institute For Theoretical Physics)  
*Quantization, reduction mod p, and autoequivalences of the Weyl algebra*

The Weyl algebra of polynomial differential operators is a basic object which appears in algebraic geometry, representation theory, and mathematical physics. In this talk, I will discuss my recent proof of some conjectures of A. Belov-Kanel and M. Kontsevich concerning the structure of the automorphism group of the Weyl algebra. The question turns out to be related to defining an appropriate notion of "support cycle" for a differential equation, which, in turn, involves techniques from positive characteristic. In particular, we shall explain a "quantization correspondence" which is based on reducing differential equations to finite characteristic.
A theme connecting analysis and topology is that global analysis (elliptic operators, $L^2$-differential forms, and all that stuff) on the universal cover of a closed manifold tells us about the topology of the base manifold (e.g. about the Euler characteristic, signature and growth of Betti numbers in finite covers). If the universal cover is contractible, then the simplest possible analytic picture (suggested by Dodziuk and Singer) is that its $L^2$-de Rham cohomology (represented by the harmonic $L^2$ forms) appears only in the middle dimension. A combinatorial form of global analysis works on the universal cover of a finite complex (instead of a closed manifold). Viewed from this perspective, the Dodziuk-Singer picture would have striking topological consequences. It would imply for instance (by a result of Okun and Schreve), that if the universal cover of a finite complex is contractible and has a non-zero $L^2$ harmonic $k$-form, then that complex does not embed in $\mathbb{R}^{2k-1}$, and is not even homotopy equivalent to a $2k$-1 manifold. Topologically, such embedding and ``thickening'' obstructions are fragile, finite order things that tend to disappear rationally. In this talk I will explain why such complexes are sometimes rationally homotopy equivalent to manifolds of dimension $<2k$. This is used to find closed manifolds whose universal covers are ``rationally contractible” but whose harmonic $L^2$ forms are not concentrated in the middle dimension.

A Gaussian Mixture Model is a mixture distribution comprising $k$ Gaussian clouds with possibly different weights and covariance matrices. It is a classical problem in non-supervised learning to recover the cluster labels for sample points drawn according to a GMM. Historically, the most popular approach has been to try to approximate the maximum likelihood using the Expectation-Maximization algorithm, which can be viewed as a "soft" version of k-means. In 1999, Dasgupta showed how to perform clustering using distance concentration when the Gaussian clouds were spherical and satisfied a separation condition. Arora and Kannan later improved this to non-spherical Gaussians by using an isoperimetric inequality. In this talk, we will present the results and methods of their paper, and also give a summary of subsequent research.<br />

A Torus Farey Tale

http://www.math.lsa.umich.edu/seminars_events/  -  Page 76/123
Student Algebraic Geometry  
Thursday, February 25, 2016, 4:00pm-5:00pm  
4096 East Hall  
Emanuel Reinecke (University of Michigan)  
The irreducibility of the moduli space of curves of given genus

After discussing the problem of constructing a moduli space which parameterizes all smooth curves of a given genus $g>1$, I will explain how one can compactify such a space using the notion of stable curves. I will then present the ideas behind the proof of a classic result due to Deligne and Mumford that the moduli space of curves of genus $g$ over an algebraically closed field is irreducible.

Commutative Algebra  
Thursday, February 25, 2016, 4:00pm-5:00pm  
3866 East Hall  
Daniel Erman (University of Wisconsin-Madison)  
Noether normalization over the integers

We use probabilistic methods to study systems of parameters for graded rings over finite fields. As an application, we prove a Noether normalization result for projective schemes over the integers. This is joint work with (former Michigan undergrad!) DJ Bruce.

Logic  
Thursday, February 25, 2016, 4:00pm-5:30pm  
CC Little 2502  
David Fernandez Breton (University of Michigan)  
d=c implies that there are gruff ultrafilters

I will show a proof of the statement in the title. Recall that a gruff ultrafilter was defined by van Douwen to be an ultrafilter on the rational numbers with a base of perfect subsets (where perfect means both closed (in the topology inherited from the usual Euclidean one from the reals) and crowded (without isolated points)). The main question, which to date is still open, regarding these objects is whether one can prove their existence in ZFC.
Differential Equations  
Thursday, February 25, 2016, 4:00pm-5:00pm  
4088 East Hall  
Matthew Creek (Univ. of Chicago)  
*Global Well-Posedness Results for Generalizations of the Nonlinear Sigma Model*

The classical nonlinear sigma model of Gell-Mann and Levy, which describes interactions between nucleons and pions, has given rise to several generalizations. Among these are the Skyrme and Faddeev models, which are quasilinear generalizations that admit topological solitons. The global well-posedness of the equations of motion associated with these models has been studied intensely in recent years, in both the small- and large-data regimes. In this presentation, I will survey some of the current results related to these models. Then I will state and outline the proof of a large-data global well-posedness result of mine concerning the two-dimensional Skyrme model. This proof features a nonstandard technique which is not well known. Finally, I will suggest some possible future projects related to this work.

Student Representation Theory  
Thursday, February 25, 2016, 5:00pm-6:00pm  
3096 East Hall  
Phil Tosteson (University of Michigan)  
*D Modules on Flag Varieties and Localization*

Beilinson-Bernstein localization connects the representation theory of a semisimple lie algebra to geometric objects on flag varieties. We will introduce D modules, state the localization theorem, and give examples and applications.

Borcherds Products Learning Seminar  
Friday, February 26, 2016, 2:30pm-4:00pm  
1096 East Hall  
Charlotte Chan (UM)  
*The regularized theta lift*
Applied Interdisciplinary Mathematics  
Friday, February 26, 2016, 3:00pm-4:00pm  
1084 East Hall  
Karl Liechty (DePaul University)  
*The Fourier continuation method and discrete orthogonal polynomials on an arc*

The Fourier continuation method is a numerical method used to estimate a function from a discrete sample using Fourier techniques. It turns out that the error estimates in this method are closely connected with polynomials orthogonal with respect to a discrete weight on an arc of the unit circle. I will discuss the asymptotic properties of these polynomials, and their implications for the Fourier continuation method.

Combinatorics  
Friday, February 26, 2016, 3:10pm-4:00pm  
4088 East Hall  
Visu Makam (U. Michigan)  
*Polynomial degree bounds for matrix semi-invariants*

Even though the invariant ring for a representation of a reductive group is finitely generated, finding strong bounds for the degrees of generators has proved to be extremely difficult. We focus on the left-right action of SL(n)x SL(n) on m-tuples of n-by-n matrices. We show that invariants of degrees at most n(n-1) define the null cone, and that consequently invariants of degree at most n^6 generate the invariant ring in characteristic 0. If time permits, we shall discuss the ramifications of our bound to algebraic complexity theory, such as a polynomial time algorithm for noncommutative rational identity testing.

This is joint work with Harm Derksen.

Group, Lie and Number Theory  
Monday, February 29, 2016, 4:10pm-5:30pm  
4088 East Hall  
- No Talk - ()  
*Winter Break*

Colloquium Series  
Tuesday, March 01, 2016, 4:10pm-5:00pm  
1360 East Hall  
Winter Break ()  
*Winter Break*
Math Club
Thursday, March 03, 2016, 4:00pm-5:00pm
Nesbitt Room

No Math Club—Winter Break

Preprint Algebraic Geometry Seminar
Friday, March 04, 2016, 4:00pm-5:50pm
2866 East Hall
Winter break
TBA

Mathematical Biology
Monday, March 07, 2016, 12:00pm-1:00pm
335 West Hall
Madhav Mani (Northwestern University)
A Physical View of Gene Regulation

Genes are much more than nodes in a network. They are physical objects, whose state is under cellular and developmental control. This physicality makes itself manifest in the degree of stochasticity observed in mRNA and protein levels, as well as the requirement for the local genomic vicinity of the gene to be physically mobile to recruit transcriptional machinery. To this end, I will present ongoing experimental, data-analysis, and modeling work conducted in close collaborations with the Carthew (Northwestern) and Gregor (Princeton) labs. Relying on a secure understanding of the biophysics of gene regulation in the early Drosophila embryo and larval wing, we hope to understand a little more about the logic of how gene regulation is controlled over space and time in developing organisms.
Student Arithmetic  
Monday, March 07, 2016, 1:00pm-2:00pm  
1866 East Hall  
Angus Chung (UM)  

How does a prime split in an extension?

If we have a ring extension A to B, it is very rare that a prime ideal A extends to be a prime ideal in B. Sometimes, we are able to factorize the extended ideal into a product of prime ideals in B. In this talk, we will focus on a special case where we can do so for any prime ideals in A, and we will present an algorithm to calculate how prime splits in this situation. We will try to be as elementary as possible.

Complex Analysis, Dynamics and Geometry  
Monday, March 07, 2016, 4:00pm-5:00pm  
3096 East Hall  
Luke Edholm (OSU)  

The Bergman projection of certain generalizations of the Hartogs triangle

Given a domain in $\mathbb{C}^n$, the Bergman projection and its corresponding kernel function are important tools used to investigate holomorphic function theory on this domain. Though originally defined as the projection from the space of $L^2$ functions onto its holomorphic subspace, it is natural to investigate the action of the Bergman projection on other associated Banach spaces.

I'll present new results about the $L^p$ boundedness of Bergman projections of certain types of non-smooth domains in $\mathbb{C}^2$. I explicitly compute the Bergman kernels of these domains, then focus on mapping properties of the Bergman projection operator. The main result shows that two domains which are arbitrarily close as sets may have drastically different Bergman mapping behavior.

Student Combinatorics Seminar  
Monday, March 07, 2016, 4:00pm-5:00pm  
3866 East Hall  
Umang Varma (UM)  

Circulant Hadamard Matrices

An $n \times n$ matrix is called a Hadamard matrix if it has $\pm 1$ entries and orthogonal rows. This is only possible if $n = 1$, $n = 2$, or $n = 4m$ for positive integers $m$. It is conjectured that there is a $n \times n$ Hadamard matrix for all such integers $n$. One way to look for such matrices might be to focus on simpler cases, for example, that of circulant matrices. A circulant matrix is one whose rows are cyclic permutations of the first. However, it is also conjectured that the largest circulant Hadamard matrix is of size $4 \times 4$. We will prove this for the case when $n$ is a power of 2. I will only assume knowledge of basic ring theory.
For each positive integer $d$, let $T(d)$ denote the supremum of all orders of groups $E(F)[\text{tors}]$ appearing for an elliptic curve $E$ defined over a degree $d$ number field $F$. A celebrated theorem of Merel asserts that $T(d) < \infty$ for all $d$. However, the known quantitative results in this direction are far from the conjectured truth. I will discuss some recent, sharp statistical results for the quantity $T_{\text{CM}}(d)$, defined as above but with the restriction to CM elliptic curves. Perhaps surprisingly, the "anatomy of integers" (as studied by Paul Erdos) plays a key role in the proofs. Joint work with Abbey Bourdon and Pete L. Clark.

The mapping class group of a topological space encodes certain symmetries of the space. We will start by defining the group and computing a few examples. Next, we will see that mapping class groups of closed oriented surfaces have particularly nice finite generating sets. The remainder of the talk will be spent discussing how the structure of any closed 3-manifold can be encoded into an element of a mapping class group of a closed surface.

I will give the definition of Castelnuovo-Mumford regularity, and we will compute some examples to familiarize ourselves with the concept. We will also work with an equivalent definition of regularity and some related results. Time permitting, we will begin to discuss Betti tables.
Pattern formation is a striking feature of nature, for example the exquisite patterns on a butterfly wing, the bones in a limb, the stripes on a zebra.

Despite decades of research, the mechanisms by which these patterns arise are still not fully understood. The most famous mathematical model for this phenomenon is the reaction diffusion system proposed by Alan Turing in 1952. In this general talk, I will describe his model, outline its predictions, and critique it through several biological examples.

This talk will review a number of recent mathematical models for tumour growth and development, showcasing some of the different mathematical frameworks that have been employed to address different problems. These will include a partial differential equation model for the acid-mediated cell invasion hypothesis, an agent-based model for colorectal tumour growth, and a hybrid multiscale model for vascular dynamics. In each case, model predictions will be compared with experimental results. (This seminar is co-sponsored by the University of Michigan Center for Systems Biology.)

In 1987, Bieri, Neumann and Strebel introduced a new class of invariants for finitely generated groups. These are certain subsets of the character sphere, and determine, among other things, whether a homomorphism from G to an abelian group has finitely generated kernel. In this talk, I will give some background on these invariants, and talk about some more recent applications.
Financial/Actuarial Mathematics  
**Wednesday, March 09, 2016, 4:00pm-5:00pm**  
1360 East Hall  
Chris Miller (UC Berkeley)  
*Optimal Control of Conditional Value-at-Risk in Continuous Time*

We consider continuous-time stochastic optimal control problems featuring Conditional Value-at-Risk (CVaR) in the objective. The major difficulty in these problems arises from time-inconsistency, which prevents us from directly using dynamic programming. To resolve this challenge, we convert to an equivalent bilevel optimization problem in which the inner optimization problem is standard stochastic control. Furthermore, we provide conditions under which the outer objective function is convex and differentiable. We compute the outer objective’s value via a Hamilton-Jacobi-Bellman equation and its gradient via the viscosity solution of a linear parabolic equation, which allows us to perform gradient descent. The significance of this result is that we provide an efficient dynamic programming-based algorithm for optimal control of CVaR without lifting the state-space. To broaden the applicability of the proposed algorithm, we provide convergent approximation schemes in cases where our key assumptions do not hold and characterize relevant suboptimality bounds. In addition, we extend our method to a more general class of risk metrics, which includes mean-variance and median-deviation. We also demonstrate a concrete application to portfolio optimization under CVaR constraints. Our results contribute an efficient framework for solving time-inconsistent CVaR-based dynamic optimization.

This is a joint work with Insoon Yang

---

**SPECIAL EVENT**  
**Thursday, March 10, 2016, 2:00pm-3:00pm**  
5515 Biomedical Science Research Building (BSRB)  
Philip Maini (University of Oxford)  
*Ziwet Lecture III: Mathematical Models of Cell Population Movement in Biology*

One of the most common events in biology is the movement of groups of cells, which occurs in normal circumstances (embryonic development), regulation (wound healing) and disease (cancer growth). This talk presents a number of case studies in which mathematical models have been used to try to understand the mechanisms underpinning this collective movement. Examples will include cranial neural crest cell movement, and the movement of epithelial sheets. (The seminar is co-sponsored by the Department of Cell & Developmental Biology.)
Topology
Thursday, March 10, 2016, 3:00pm-4:00pm
1866 East Hall
Jon Chaika (University of Utah)
The limit of some Teichmüller geodesics in PMF

Thurston’s compactification of Teichmüller space, PMF, is not Teichmüller space’s visual boundary. Masur proved that the geodesic defined by a quadratic differential with uniquely ergodic vertical foliation has a (unique) limit in PMF and that it was what one would expect. Lenzhen constructed an example of a non-minimal quadratic differential that did not have a limit in PMF (the limit set was a line segment). Using an example of a minimal and not uniquely ergodic abelian differential coming from 2 tori glued along a slit (based on Veech’s example of non-uniquely ergodic $\mathbb{Z}_2$ skew products of rotations) we construct geodesics which
1) have a unique limit,
2) have a line segment as a limit set
3) and an ergodic (but not uniquely ergodic) abelian differential which does not have a limit.

This work gives an example of a pair divergent geodesics which share a point in their limit sets. We also have an example of two geodesics which stay bounded distance apart whose limit sets do not coincide. This is joint work with H. Masur and M. Wolf. This talk will focus on some motivating special examples and introduce Veech’s example.

Math Club
Thursday, March 10, 2016, 4:00pm-5:00pm
Nesbitt Room
Igor Kriz (University of Michigan)
The P versus NP Problem
Consider a complex projective algebraic variety $X$ acted on by a reductive algebraic group $G$. Geometric invariant theory provides a way to construct the quotient variety. The construction depends on a choice of an ample $G$-linearized line bundle $L$, i.e., an ample line bundle with a compatible $G$-action. It is natural to ask whether the set of non-isomorphic quotients is finite and how the GIT quotient changes if we vary the line bundle $L$ in the group of isomorphism classes of $G$-linearized line bundles.

In this talk, I will give a brief review of geometric invariant theory and introduce the variation theorem due to Dolgachev and Hu.

We study Maxwell's equations in media with small random fluctuations of the electric permittivity, to obtain a detailed mathematical characterization of the statistics of the electric and magnetic fields at long distances of propagation. We introduce a novel wide-angle wave propagation regime, which is mathematically justified by scaling assumptions. In this regime, we obtain a decomposition of the waves in transverse electric and magnetic modes with random amplitudes. These amplitudes account for the cumulative scattering effects in the medium, and satisfy a system of stochastic differential equations which can be analyzed with the Markov limit theorem. The result is an explicit quantification of the randomization of the waves due to scattering, an understanding of polarization effects, and a mathematical justification of the radiative transport equations with polarization.
Logic  
Thursday, March 10, 2016, 4:00pm-5:30pm  
2866 East Hall  
Peter Cholak (Notre Dame University)  
Rado's Path Decomposition

Let $X$ be a countably infinite set, let $r$ be a positive integer, and let $c$ be a coloring of the two-element subsets of $X$ with $r$ colors. By a path of color $j$, I mean a (finite or infinite, possibly empty) sequence $(a_0, a_1, ...)$ of distinct elements of $X$ in which each pair of consecutive elements $\{a_i, a_{i+1}\}$ has color $j$. (The empty sequence and one-term sequences count as paths of color $j$ for all $j$; for longer sequences, the color is unique.) In 1978, improving an earlier result of Erdos, Rado proved that, in this situation, there are $r$ paths, one of each color, which, as sets, partition $X$. We will provide some results and proofs that allow us to analyze the effective content of this theorem. These results and proofs are joint work with Greg Igusa, Ludovic Patey, Mariya Soskova, and Dan Turetsky.

Theoretical Computer Science  
Friday, March 11, 2016, 10:30am-11:30am  
3725 BBB  
Grant Schoenebeck (U-M)  
Complex Contagions on Social Networks

Social interactions constitute a crucial part of everyday life. Behavior changes, similar to rumors or viruses, spread in the social network and become a contagion. Diseases and information can spread through a single contact. However, in many realistic settings when agents' actions and behavioral changes are involved, it often takes multiple activated neighbors to spread a contagion. We denote this type of contagion as a complex contagion. The requirement of synergy between neighbors, intuitively, makes the spreading of a complex contagion to be more unlikely, slower, and more delicate. Enabling the successful spreading of a complex contagion requires special graph structures. This talk will present recent mathematical results on the study of complex contagion in network models. In particular, we will highlight classes of models where complex contagions can spread quickly and provide a rigorous mathematical foundation for how.

SPECIAL EVENT  
Friday, March 11, 2016, 1:10pm-2:00pm  
1360 East Hall  
Roman Vershynin (UM)  
Graduate Recruitment Symposium: Some open problems in high dimensional probability

High dimensional probability studies random structures in high dimensions. I will describe some open problems, which connect this area to random matrix theory, convex geometry, and data science.

This event is open to everyone in the department and folks are encouraged to attend.
SPECIAL EVENT
Friday, March 11, 2016, 1:10pm-2:00pm
3088 East Hall
Ralf Spatzier (UM)
Graduate Recruitment Symposium: Rigidity in Geometry and Dynamics

Do most maps only commute with their own powers? Steve Smale asked this question about fifty years ago, and it is finally getting some answers. Much depends on the differentiability of the maps: it gets harder the more differentiable the map is. Sometimes we can even classify such maps. I’ll discuss this and related phenomena.

This event is open to everyone in the department and folks are encouraged to attend.

SPECIAL EVENT
Friday, March 11, 2016, 2:10pm-3:00pm
3088 East Hall
Charlie Doering (UM)
Graduate Recruitment Symposium: Heat Rises - 100 Years of Rayleigh-Benard Convection

Buoyancy forces result from density variations, often due to temperature variations, in the presence of gravity. Buoyancy-driven fluid flows shape the weather, ocean and atmosphere dynamics and the climate, and the structure of the earth and stars. In 1916 Lord Rayleigh published a paper entitled “On Convection Currents in a Horizontal Layer of Fluid, when the Higher Temperature is on the Under Side” introducing the minimal mathematical model of buoyancy-driven fluid flow now known as Rayleigh-Bénard convection. For a century this model has served as a primary paradigm of nonlinear dynamical systems displaying spontaneous symmetry breaking and pattern formation, chaos and turbulence. Here we describe progress and challenges for the analysis of Rayleigh’s model in the strongly nonlinear regime of turbulent convection.

This event is open to everyone in the department and folks are encouraged to attend.
Let $f(x,y)$ be a polynomial with rational coefficients. The solution set $f(x,y)=0$ is a planar algebraic curve. A problem of great interest, going back to antiquity, is to understand the points on the curve with rational coordinates. I will give an overview of some of the major theorems in the subject (those of Mordell, Faltings, Mazur, and Wiles), and some of the big questions that are still unresolved.

This event is open to everyone in the department and folks are encouraged to attend.

We will discuss whether or not one can use rubber bands to determine the geometry of a closed manifold. If one releases a rubber band on a manifold, it pulls tight to a geodesic (i.e. a locally length minimizing curve). In simple situations, like Euclidean tori and closed hyperbolic surfaces, one can completely determine the geometry of the surface by releasing finitely many rubber bands and measuring the lengths of the resulting geodesics. However, in general, the lengths of these geodesics do not determine the surface. We will discuss more general situations where one can use rubber bands to determine the geometry of the surface.

This event is open to everyone in the department and folks are encouraged to attend.
We discuss the collective dynamics of systems driven by "social engagement" of agents with their local neighbors. Prototypical examples which involve environmental averaging include alignment-based models in opinion dynamics, flocking, self-organization of biological organisms, and rendezvous in mobile networks. We address two natural questions which arise in this context. First, how different rules of engagement influence the formation of large time, large scale patterns such as clusters, and in particular, the emergence of "consensus". We propose an alternative paradigm based on the tendency of agents "to move ahead" which leads to the emergence of leaders. Second, the group behavior of systems which involve a large number of agents lend themselves to kinetic and hydrodynamic descriptions. It is known that if smooth solutions of "social hydrodynamics" exist, then they must flock. Do such smooth solutions exist? Alignment-based models reflect the competition on resources, and left unchecked, may lead to finite-time singularities. We discuss the global regularity of social hydrodynamics for sub-critical initial configurations.

The n-th Lie representation is the multilinear component of the free Lie algebra on n generators. It is a representation of the symmetric group S_n with the remarkable property that its restriction to S_{(n-1)} is isomorphic to the regular representation. In this talk I will present a representation of the hyperoctohedral group with the same property. This representation arises as the top degree component of the so-called internal zonotopal algebra of the Gale dual of the type B reflection arrangement. 
SPECIAL EVENT
Friday, March 11, 2016, 3:10pm-4:00pm
B844 East Hall
Karen Smith (UM)
Graduate Recruitment Symposium: Measuring Singularities

Algebraic geometry is the study of geometric objects called varieties which are the zero sets of polynomials. One interesting and important line of research focuses on the singularities of varieties. For example, let V by the zero set of a single polynomial (in, say, n complex variables). How can we tell if V is smooth or singular? Can we resolve its singularities? Can we measure its singularities numerically? In this talk, we discuss some ways to measure singularities: analytically (using integration), geometrically (using resolutions of singularities) or algebraically (using reduction to characteristic p). Miraculously, these three approaches all yield the same numerical result.

This event is open to everyone in the department and folks are encouraged to attend.

SPECIAL EVENT
Friday, March 11, 2016, 3:10pm-4:00pm
1360 East Hall
Jinho Baik (UM)
Graduate Recruitment Symposium: Tracy-Widom distributions

In 1994 Tracy and Widom wrote three distribution functions whose formulas involve a certain nonlinear differential equation. Just like the Gaussian distribution (the normal distribution) is the universal distribution in the classical central limit theorem, the Tracy-Widom distributions are now expected to be the universal distribution for a wide class of nonlinear models in probability. I will talk about the story about these distributions and their applications in random matrices and random tiling models.

This event is open to everyone in the department and folks are encouraged to attend.

SPECIAL EVENT
Friday, March 11, 2016, 4:00pm-5:00pm
Mathematics Common Room
(UM)
Graduate Recruitment Symposium: Department Tea

This event is open to everyone in the department and folks are encouraged to attend.
We propose an approach to the valuation of contingent claims in general, symmetric semimartingale models of financial markets. We start from two simple, economically motivated axioms, namely absence of arbitrage (in the sense of NUPBR) and absence of relative arbitrage among all buy-and-hold strategies (called static efficiency). We then call a valuation process for a contingent claim economically consistent if the financial market enlarged by that process still satisfies this combination of properties. It turns out that this approach lies in the middle between the extremes of valuing by risk-neutral expectation or by absence of arbitrage alone.

We show that this always yields put-call parity, although put and call values themselves can be nonunique, even for complete markets. We provide general formulas for put and call values in complete markets and show that these are symmetric and that both contain in general three terms. We also show that our approach contains all the put-call parity respecting valuation formulas in the classic theory as special cases, and we explain precisely when and how the different terms in the put and call valuation formulas disappear or simplify.

Joint work with Martin Schweizer.

Preprint Algebraic Geometry Seminar

Friday, March 11, 2016, 4:10pm-5:00pm

2866 East Hall

Takumi Murayama (UM)

Explicit Brill-Noether-Petri general curves (following Arbarello, Bruno, Farkas, Sacca)

http://arxiv.org/abs/1511.07321
SPECIAL EVENT
Friday, March 11, 2016, 5:10pm-6:00pm
1084 East Hall
Daniel Forger (UM)
Graduate Recruitment Symposium: From a network of 10,000 neurons to a smartphone app with 125,000 users - Mathematical approaches to study circadian rhythms

I will briefly describe mathematical models of networks of neurons and chemical reactions within neurons that generate daily (circadian) timekeeping. We will focus on how GABA is used in the timekeeping network of ~10,000 neurons in the suprachiasmatic nucleus (the site of the central daily pacemaker in the brain) to send multiple simultaneous signals to coordinate timekeeping, track the seasons, send outputs to control physiology (particularly that related to mood) and process inputs. I will then describe an optimal control problem that finds schedules that decrease the time needed to adjust to get over jet lag by a factor of 2 or more. These optimal schedules have been implemented into a smartphone app, ENTRAIN, which collects data from users and helps users avoid jet-lag. We will use data from this app, collected in over 100 countries, and thousands of individuals to determine what factors affect human sleep. We will then determine if women sleep more than men, and how the country you live in affects how much you sleep.

This event is open to everyone in the department and folks are encouraged to attend.

SPECIAL EVENT
Friday, March 11, 2016, 5:10pm-6:00pm
B844 East Hall
Kartik Prasanna (UM)
Graduate Recruitment Symposium: Cycles, motives and the Langlands program

The theory of algebraic cycles has many mysterious open problems such as the related conjectures of Hodge and Tate. I will discuss this circle of ideas in the context of a single interesting example arising from the Langlands program.

This event is open to everyone in the department and folks are encouraged to attend.
SPECIAL EVENT
Friday, March 11, 2016, 5:10pm-6:00pm
1360 East Hall
Thomas Lam (UM)

Graduate Recruitment Symposium: Electrical networks and group theory

Electrical networks consisting only of resistors are modeled in combinatorics by undirected weighted graphs, where the weight of an edge is the resistance of a resistor. In this talk we will discuss some mathematical problems related to electrical networks, in a combinatorial and algebraic context. For example, it is known that multiple resistors in series or in parallel can be replaced by a single resistor. I'll discuss how equivalences of electrical networks can be thought of as relations in a group.

This event is open to everyone in the department and folks are encouraged to attend.
A defining component of Synthetic Biology is the development of theoretical modeling that can serve as the foundation for a new type of cellular engineering. This talk will be anchored by my quest to build genetic oscillators in bacteria, with a particular focus on the utility of theory and computation. I'll start by describing how the coupling of transcriptional activators and repressors was originally modeled as a type of classical "predator-prey" system. Although this system led to the design of a robust intracellular clock (http://biodynamics.ucsd.edu/Intracellular.mov), I'll show how the experiments pointed to a different type of "degrade and fire" oscillator characterized by a coupled set of delayed differential equations. Interestingly, the biological constraints naturally lead to a system that can be solved approximately.

In terms of engineering, the clock was not of the Swiss variety; the period and amplitude exhibited large intracellular variability. However, it provided a benchmark for the development of general synchronization strategies that can restore determinism. I'll conclude with our efforts to use cellular communication to couple clocks between cells (http://biodynamics.ucsd.edu/Intercellular.mov) and colonies (http://biodynamics.ucsd.edu/Intercolony.mov). Here, the threshold nature of the communication mechanism leads naturally to oscillators that are highly reminiscent of "integrate and fire" systems in neuroscience.
Complex Analysis, Dynamics and Geometry  
Monday, March 14, 2016, 4:00pm-5:00pm  
3096 East Hall  
Michael Kelly (U(M))  
*BD Equivalence for Return times of Linear Flows on the Torus*

Linear flows on the torus are some of the simplest dynamical systems yet there are many basic questions about them that remain unanswered. For instance, a large class of mathematical quasicrystals called cut-and-project sets can be realized as return times of linear toral flows to a section-- and there are many basic unanswered questions in the active field of mathematical quasicrystals! For instance, it is a fundamental question whether a quasicrystal can be obtained as a bounded perturbation of a crystal, or rather if return times of a linear toral flow set can be realized as a bounded perturbation of a lattice. We will show that for almost every linear toral flow the answer is yes, but there is a topologically residual set of linear toral flows for which the answer is no. This is joint work with Alan Haynes, Henna Koivusalo, Lorenzo Sadun, and Barak Weiss.

Group, Lie and Number Theory  
Monday, March 14, 2016, 4:10pm-5:30pm  
4088 East Hall  
Ari Shnidman (Boston College)  
*Cubic twist families of elliptic curves and parameterizing cubic fields*

We give estimates for the average size of the 3-Selmer group in cubic twist families of elliptic curves, and show that for all but one of these families, the average size of 3-Selmer is infinite. We also show that 0% of curves in a given cubic twist family of genus 1 curves are everywhere locally soluble. Along the way, we give a new parameterization of cubic fields in terms of "cube roots" in the class groups of quadratic fields. This is joint work with Manjul Bhargava.

Student Geometry/Topology  
Tuesday, March 15, 2016, 3:00pm-4:00pm  
1866 East Hall  
Feng Zhu (UM)  
*Towards the Virtually Haken theorem*

In 2012, Ian Agol filled in the last gap remaining in a proof of the Virtually Haken conjecture. Agol's result answers many questions about the structure of hyperbolic 3-manifolds, and also opens new avenues for exploration. We will give a sketch of the proof of the Virtually Haken conjecture that Agol caps off. The emphasis will be on the overall structure of the argument, and on the motivation for and general idea behind the use of tools that range from ergodic theory to geometric group theory.
Colloquium Series
Tuesday, March 15, 2016, 4:10pm-5:00pm
1360 East Hall
Percy Deift (Courant Institute, NYU)
Zwet lecture I: Universality in numerical computations with random data. Case studies

This is joint work with Govind Menon, Sheehan Olver and Thomas Trogdon. The speaker will present evidence for universality in numerical computations with random data. Given a (possibly stochastic) numerical algorithm with random input data, the time (or number of iterations) to convergence (within a given tolerance) is a random variable, called the halting time. Two-component universality is observed for the fluctuations of the halting time, i.e., the histogram for the halting times, centered by the sample average and scaled by the sample variance, collapses to a universal curve, independent of the input data distribution, as the dimension increases. Thus, up to two components, the sample average and the sample variance, the statistics for the halting time are universally prescribed. The case studies include six standard numerical algorithms, as well as a model of neural computation and decision making.

Financial/Actuarial Mathematics
Wednesday, March 16, 2016, 3:00pm-4:00pm
3088 East Hall
Jinniao Qiu (UM)
Weak Solution for Fully Nonlinear Stochastic Hamilton-Jacobi-Bellman Equations and its Applications

This talk is concerned with the stochastic Hamilton-Jacobi-Bellman (HJB) equation with controlled leading coefficients, which is a type of fully nonlinear stochastic partial differential equation (SPDE). In order to formulate the weak solution for such kind of SPDEs, a class of regular random parabolic potentials are introduced in the stochastic framework. The existence and uniqueness of weak solution is proved, which seems new even for the classical HJB equations. For the partially non-Markovian case, we obtain the associated gradient estimate. The applications in finance and economics will be discussed as well if time allows.
SPECIAL EVENT  
Wednesday, March 16, 2016, 3:00pm-4:00pm  
4096 East Hall  
Tim Ferguson (University of Alabama)  
*Extremal Problems for Analytic Functions and Their Connections to Other Topics*

In this talk, I will discuss extremal problems in spaces of analytic functions and connections between such problems and other areas of analysis. The main focus will be the problem of maximizing linear functionals on Bergman spaces, which are spaces of analytic functions of finite $L^p$ norm. I will speak about the connections of this problem to topics in analysis such as partial differential equations, quasiconformal mappings, and uniform convexity.

---

Financial/Actuarial Mathematics  
Wednesday, March 16, 2016, 4:00pm-5:00pm  
1360 East Hall  
Matin Herdegen (ETH)  
*Sensitivity of Optimal Consumption Streams*

We study the sensitivity of optimal consumption streams with respect to perturbations of the random endowment. At the leading order, the consumption adjustment does not matter: any choice that matches the budget constraint simply shifts the original utility by the marginal value of the perturbation. Nontrivial results obtain at the next-to-leading order. Here, one first solves the problem for a deterministic perturbation, which leads to a "prognosis measure". The desired consumption adjustment for a general endowment perturbation is in turn given by the conditional expectation of the latter, computed under this measure and appropriately weighted with the conditional expectations of the remaining risk-tolerance. As an interesting application, we consider the problem of optimal consumption with small transaction costs.

The talk is based on joint work with Johannes Muhle-Karbe (University of Michigan).
Analysis/Probability
Wednesday, March 16, 2016, 4:10pm-5:00pm
2866 East Hall
Percy Deift (Courant Institute, NYU)
Zwet Lecture 2: Riemann-Hilbert problems

The great utility of special functions, such as Bessel functions, Legendre functions, hypergeometric functions etc., rests in large part on the fact that the asymptotic behavior of these functions as some associated parameter becomes large can be described with great accuracy. This is possible because these functions all have integral representations from which the asymptotics can be deduced in turn using, for example, the classical steepest-descent/stationary phase method. The Riemann-Hilbert problem provides a nonlinear, non-commutative generalization of integral representations, which makes possible the detailed analysis, particularly the asymptotic analysis, of a wide variety of nonlinear problems such as KdV, NLS etc., and also problems in areas such as orthogonal polynomials and random matrix theory: Here a nonlinear/ non-commutative version of the steepest-descent method plays a key role. The speaker will discuss developments in Riemann-Hilbert theory that have taken place in recent years.

Topology
Thursday, March 17, 2016, 3:00pm-4:00pm
1866 East Hall
Viveka Erlandsson (University of Fribourg)
Counting curves on hyperbolic surfaces

In this talk I will discuss the growth of the number of closed geodesics of bounded length, and the length grows. More precisely, let $c$ be a closed curve on a hyperbolic surface $S=S(g,n)$ and let $N_{c}(L)$ denote the number of curves in the mapping class orbit of $c$ with length bounded by $L$. Due to Mirzikhani it is known that in the case that $c$ is simple this number is asymptotic to $L^{6g-6+2n}$. Here we consider the case when $c$ is an arbitrary closed curve, i.e. not necessarily simple. This is joint work with Juan Souto.

Math Club
Thursday, March 17, 2016, 4:00pm-5:00pm
Nesbitt Room
Malke Rosenfeld (Math Educator/ Percussive Dance Teaching Artist)
Math in Unexpected Spaces

Experience math as both an art and a science using just a little bit of tape and your own two feet. Harness the math of making and making comparisons to explore congruence, symmetry, transformations, categorical variables, group theory, and spatially complex physical/temporal patterns. Future math teachers welcome.
Differential Equations  
Thursday, March 17, 2016, 4:00pm-5:00pm  
4088 East Hall  
Percy Deift (Courant Institute, NYU)  
Ziwe Lecture 3: The Toda eigenvalue algorithm: Universality of fluctuations of halting times

This is joint work with Tom Trogdon. The speaker will show how to prove rigorously universality of the fluctuations in the halting times described in Talk 1, in the particular case of the Toda eigenvalue algorithm.

Student Algebraic Geometry  
Thursday, March 17, 2016, 4:00pm-5:00pm  
4096 East Hall  
Takumi Murayama (University of Michigan)  
TBA
Theoretical Computer Science
Friday, March 18, 2016, 10:30am-11:30am
3725 BBB
Sina Shiehian (U-M)
Multi-Key FHE from LWE, Revisited

Traditional fully homomorphic encryption (FHE) schemes only allow computation on data encrypted under a single key. Lopez-Alt, Tromer, and Vaikuntanathan (STOC 2012) proposed the notion of a multi-key FHE, which allows homomorphic computation on ciphertexts encrypted under different keys, and also gave a construction based on a (somewhat nonstandard) assumption related to NTRU. More recently, Clear and McGoldrick (CRYPTO 2015), followed by Mukherjee and Wichs (EUROCRYPT 2016), proposed a multi-key FHE based on learning with errors (LWE). However, unlike the original construction of Lopez-Alt et al., these later LWE-based schemes have the somewhat undesirable property of being "single-hop" with respect to keys, i.e., all relevant keys must be known at the start of the homomorphic computation, and the output cannot be usefully combined with ciphertexts encrypted under other keys (unless an expensive "bootstrapping" step is performed). In this work we construct two multi-key FHE schemes, based on LWE assumptions, which are multi-hop with respect to keys: the output of a homomorphic computation on ciphertexts encrypted under a set of keys can be used in further homomorphic computation involving additional keys, and so on. Our systems also have smaller ciphertexts than the previous LWE-based ones; indeed, ciphertexts in our second construction are simply GSW ciphertexts with no auxiliary data.

The paper can be accessed at: https://eprint.iacr.org/2016/196.pdf
Applied Interdisciplinary Mathematics
Friday, March 18, 2016, 3:00pm-4:00pm
1084 East Hall
Ihsan Topaloglu (McMaster University)

Nonlocal energies defined via attractive-repulsive interaction potentials

A variety of physical and biological interaction - from self-assembly of nano particles to collective behavior of many-agent systems such as biological swarming - can be modeled via a nonlocal energy. Depending on the choice of the interaction kernel, the asymptotic states of these physical and biological systems can be characterized as minimizers of such energies via a gradient flow connection. In this talk, first, I will present on a joint project with Katy Craig where we show that regularization of singular attractive-repulsive kernels allows us to restore convexity and differentiability; hence enables us to understand the minimizers and the gradient flows of these energies. Next, I will consider the minimization of these energies over sets. Although this nonlocal shape optimization problem poses additional challenges I will discuss the existence/nonexistence of minimizers on certain parameter regimes and present on recent results joint with Almut Burchard and Rustum Choksi.

Combinatorics
Friday, March 18, 2016, 3:10pm-4:00pm
4088 East Hall
Mihai Ciucu (U. Indiana)

Lozenge tilings with gaps in a 90 degree wedge domain with mixed boundary conditions

We consider a triangular gap of side two in a 90 degree angle on the triangular lattice with mixed boundary conditions: a constrained, zig-zag boundary along one side, and a free lattice line boundary along the other. We study the interaction of the gap with the corner as the rest of the angle is completely filled with lozenges. We show that the resulting correlation is governed by the product of the distances between the gap and its three images in the sides of the angle. This provides evidence for a unified way of understanding the interaction of gaps with the boundary under mixed boundary conditions, which we present as a conjecture. Our conjecture is phrased in terms of the steady state heat flow problem in a uniform block of material in which there are a finite number of heat sources and sinks. This new physical analogy is equivalent in the bulk to the electrostatic analogy we developed in previous work, but arises as the correct one for the correlation with the boundary.
Geometry
Friday, March 18, 2016, 4:00pm-5:00pm
3096 East Hall
Dylan Thurston (Indiana University)
Energies for maps between graphs

Preprint Algebraic Geometry Seminar
Friday, March 18, 2016, 4:10pm-5:30pm
2866 East Hall
Matt Stevenson (UM)
The gonality conjecture on syzygies of algebraic curves of large degree (following Ein and Lazarsfeld)
http://arxiv.org/abs/1407.4445

Student Arithmetic
Monday, March 21, 2016, 1:00pm-2:00pm
1866 East Hall
Harry Richman ()
TBA

Complex Analysis, Dynamics and Geometry
Monday, March 21, 2016, 4:00pm-5:00pm
3096 East Hall
Holly Krieger (MIT)
TBA

Group, Lie and Number Theory
Monday, March 21, 2016, 4:10pm-5:30pm
4088 East Hall
Ian Petrow (EPFL)
TBA
Nonlinear dispersive waves are partial differential equations that model numerous physical phenomena, ranging from plasma physics, ocean and atmospheric science, to general relativity. Over the past twenty years, the long-time behavior of small amplitude solutions to such equations on Euclidean space (R^n) became relatively well-understood. In contrast, the situation is much less understood on bounded domains, that feature a markedly different and rich set of behaviors. In particular, the dynamics in this setting is characterized by out-of-equilibrium behavior, in the sense that solutions typically do not exhibit long-time stability near equilibrium configurations.

At the level of the physics underlying these problems, studying this out-of-equilibrium behavior leads to an interesting interplay between dynamics and statistical mechanics, in what is often known as wave turbulence theory. At the level of the mathematics, this study features a beautiful interaction between PDE methods, dynamical systems theory, probability theory, as well as a surprising and very elegant input from analytic number theory.

In this first talk, we shall discuss all these aspects, and survey some recent advances in this direction of research.

Tensor triangular geometry provides a unified framework in which to study structural properties of triangulated categories with a compatible tensor (i.e. symmetric monoidal) product. Examples of such categories include:

* perfect complexes over a commutative ring,
* the derived category of G-modules for G a finite group,
* the Spanier-Whithead stable homotopy category,
* the stable G-equivariant homotopy category, and
* the stable motivic homotopy category.

I will survey the constructions and successes of tensor triangular geometry, and then describe a particularly important comparison map between the tt-spectrum of a tt-category C and the Zariski spectrum of the endomorphisms of the unit object in C. Recent work of Heller, Thornton, and myself uses this map to study the tensor triangular geometry of the stable motivic homotopy category.
Financial/Actuarial Mathematics  
Wednesday, March 23, 2016, 4:00pm-5:00pm  
1360 East Hall  
Gustavo Schwenkler (Boston University)  
*The Systemic Effects of Benchmarking*

We show that the competitive pressure to beat a benchmark may induce institutional trading behavior that exposes retail investors to tail risk. In our model, institutional investors are different from a retail investor because they derive higher utility when their benchmark outperforms. This forces institutional investors to take on leverage to overinvest in the benchmark. Institutional investors execute fire sales when the benchmark experiences shock. This behavior increases market volatility, raising the tail risk exposure of the retail investor. Ex post, tail risk is only short lived. All investors survive in the long run under standard conditions, and the most patient investor dominates. Ex ante, however, benchmarking is welfare reducing for the retail investor, and beneficial only to the impatient institutional investor.

Algebraic Geometry  
Wednesday, March 23, 2016, 4:10pm-5:30pm  
4096 East Hall  
Teruhisa Koshikawa (University of Chicago)  
*Hodge bundles and heights of motives*

Kato proposed height of a pure motive as a generalization of Faltings height of an abelian variety. I will explain the (modified) definition of the height and analogues in geometric situations.

I will also discuss certain positivity properties of Hodge bundles and their relation to heights of motives.
Nonlinear dispersive waves are partial differential equations that model numerous physical phenomena, ranging from plasma physics, ocean and atmospheric science, to general relativity. Over the past twenty years, the long-time behavior of small amplitude solutions to such equations on Euclidean space \((\mathbb{R}^n)\) became relatively well-understood. In contrast, the situation is much less understood on bounded domains, that feature a markedly different and rich set of behaviors. In particular, the dynamics in this setting is characterized by out-of-equilibrium behavior, in the sense that solutions typically do not exhibit long-time stability near equilibrium configurations.

At the level of the physics underlying these problems, studying this out-of-equilibrium behavior leads to an interesting interplay between dynamics and statistical mechanics, in what is often known as wave turbulence theory. At the level of the mathematics, this study features a beautiful interaction between PDE methods, dynamical systems theory, probability theory, as well as a surprising and very elegant input from analytic number theory.

In this talk, we shall discuss how to approach this problematic from a statistical physics perspective, and present some mathematical results in this direction.

A set of curves on a surface is filling if there is no simple closed curve disjoint from the set, or equivalently if it cuts the surface into a union of disks with at most one puncture.

I will talk about bounding the size of filling sets of curves with restrictions on the number of intersections. I will also discuss what happens if we endow the surface with a hyperbolic metric and we require the curves to be systoles. Joint work with Hugo Parlier.
Math Club  
Thursday, March 24, 2016, 4:00pm-5:00pm  
Nesbitt Room  
David Speyer (University of Michigan)  
*You can't gift wrap a basketball*

It's easy to wrap paper around a cube or a cylinder. And paper can be twisted into lots of other shapes as well -- a Mobius strip, a helix, a cone... But paper cannot be made into a sphere without tearing, and there are many other curved forms it cannot take on. We'll talk about what distinguishes the first list of shapes from the second, using only basic calculus and linear algebra. We'll also talk about some other practical consequences of this result, beyond the field of gift wrapping.

Differential Equations  
Thursday, March 24, 2016, 4:00pm-5:00pm  
4088 East Hall  
Zaher Hani (Georgia Tech)  
*Long-time dynamics and turbulence of nonlinear waves: Part III. Dynamical Approach*

Nonlinear dispersive waves are partial differential equations that model numerous physical phenomena, ranging from plasma physics, ocean and atmospheric science, to general relativity. Over the past twenty years, the long-time behavior of small amplitude solutions to such equations on Euclidean space $\mathbb{R}^n$ became relatively well-understood. In contrast, the situation is much less understood on bounded domains, that feature a markedly different and rich set of behaviors. In particular, the dynamics in this setting is characterized by out-of-equilibrium behavior, in the sense that solutions typically do not exhibit long-time stability near equilibrium configurations.

At the level of the physics underlying these problems, studying this out-of-equilibrium behavior leads to an interesting interplay between dynamics and statistical mechanics, in what is often known as wave turbulence theory. At the level of the mathematics, this study features a beautiful interaction between PDE methods, dynamical systems theory, probability theory, as well as a surprising and very elegant input from analytic number theory.

In this talk, we will adopt a dynamical systems approach, and construct solutions that exhibit this out-of-equilibrium behavior in a quantitative manner.

Student Algebraic Geometry  
Thursday, March 24, 2016, 4:00pm-5:00pm  
4096 East Hall  
Jake Levinson (University of Michigan)  
*TBA*
Commutative Algebra
Thursday, March 24, 2016, 4:00pm-5:00pm
3866 East Hall
Haydee Lindo (University of Utah)
TBA

Borcherds Products Learning Seminar
Friday, March 25, 2016, 2:30pm-4:00pm
1096 East Hall
Kartik Prasanna ()
Chern classes of Heegner divisors

Applied Interdisciplinary Mathematics
Friday, March 25, 2016, 3:00pm-4:00pm
1084 East Hall
Rita Gitik (University of Michigan)
Generation theory: application to the genography problem

The generation theory was developed as a tool for studying self-reproducing systems. In this talk we show how this theory can be applied to study a search for common ancestors of living organisms. We give two algorithms with flowcharts in pseudocode for finding the common ancestors of a set of microbes and describe the connections with the genography problem.
Geometry
Friday, March 25, 2016, 3:00pm-5:00pm
3096 East Hall
John Kilgore (U Michigan)
Weyl's law for singular projective algebraic varieties

It is a classical result that the spectrum of the Laplacian on a compact Riemannian manifold forms a sequence going to positive infinity and satisfies an asymptotic growth rate known as Weyl's law determined by the volume and dimension of the manifold. Weyl's law motivated Kac's famous question, “Can one hear the shape of a drum?” In this talk, I will show Weyl's law also holds for the non-singular locus of embedded, irreducible, singular projective algebraic varieties with the metric inherited from the Fubini-Study metric of complex projective space. This non-singular locus is an open manifold with finite volume that comes from a very natural class of spaces studied heavily outside of differential geometry. I will discuss the difficulties that occur when considering Weyl's law for open manifolds and how they can be overcome for the case above using a heat kernel estimate of Li and Tian.

Combinatorics
Friday, March 25, 2016, 3:10pm-4:00pm
4088 East Hall
Emily Barnard (NCSU)
Coxeter-biCatalan Combinatorics

We pose counting problems related to the various settings for Coxeter-Catalan combinatorics (noncrossing, nonnesting, clusters, Cambrian). Each problem involves in some sense a "doubling" of a corresponding problem in Coxeter-Catalan combinatorics. We show that the problems all have the same answer, and we call the common solution to these problems for a given finite Coxeter group W the W-biCatalan number.

This work is joint with my advisor Nathan Reading.

Preprint Algebraic Geometry Seminar
Friday, March 25, 2016, 4:10pm-5:30pm
2866 East Hall
Ashwath Rabindranath (UM)
A vanishing theorem for weight one syzygies (following Ein, Lazarsfeld, and Yang)

http://arxiv.org/abs/1512.06384
Student Arithmetic
Monday, March 28, 2016, 1:00pm-2:00pm
1866 East Hall
Corey Everlove ()
TBA

Borcherds Products Learning Seminar
Monday, March 28, 2016, 3:00pm-4:00pm
4088 East Hall
Igor Dolgachev ()
Examples of Borcherds products in algebraic geometry
Complex Analysis, Dynamics and Geometry  
Monday, March 28, 2016, 4:00pm-5:00pm  
3096 East Hall  
Margaret Stawiska-Friedland (Math Reviews)  
A characterization of polynomials in complex and non-archimedean dynamics

In the 1960s Hans Brolin initiated systematic application of potential-theoretic methods in the dynamics of holomorphic polynomials. Among other things, he proved the now-famous equidistribution theorem: for a polynomial $f$ of degree greater than 1 the preimages, under successive iterates of $f$, of a Dirac measure at an arbitrary point of the complex plane (except at most two so-called exceptional points) converge weakly to the equilibrium measure of the Julia set for $f$. In 1980s a similar result (about convergence of preimages of quite general probabilistic measures) was proved for a rational map $f$ of degree greater than 1. The limit measure obtained in this case (called the balanced measure) is also supported on the Julia set for $f$, but does not have to be its equilibrium measure. In fact, A.O. Lopes proved (using dynamical properties of Julia sets) that equality of these two measures (under suitable assumptions on $f$, also making precise the notion of the equilibrium measure for the Julia set) implies that $f$ is a polynomial. In 2010 we obtained a proof of Lopes's theorem (under slightly weaker assumptions) using only classical and weighted potential theory. In this talk I will present a recent extension of this result, namely a characterization of polynomials among rational functions, up to rational functions having potentially good reductions as exceptions, on the projective line over an algebraically closed field of any characteristic that is complete with respect to a non-trivial and possibly non archimedean absolute value. I will introduce basic notions of non-archimedean dynamics and discuss possible cases. This is joint work with Yusuke Okuyama from Kyoto Institute of Technology.

Group, Lie and Number Theory  
Monday, March 28, 2016, 4:10pm-5:30pm  
4088 East Hall  
Luis Garcia (University of Toronto)  
TBA

Colloquium Series  
Tuesday, March 29, 2016, 4:10pm-5:00pm  
1360 East Hall  
Faculty meeting with the Dean ()  
Faculty meeting with Dean Martin
Financial/Actuarial Mathematics
Wednesday, March 30, 2016, 4:00pm-5:00pm
1360 East Hall
Christian Keller (UM)
TBA

Analysis/Probability
Wednesday, March 30, 2016, 4:10pm-5:00pm
2866 East Hall
Wei-Kuo Chen (University of Minnesota)
TBA

Math Club
Thursday, March 31, 2016, 4:00pm-5:00pm
Nesbitt Room
Andreas Blass (University of Michigan)
Shared Secrets

I have a document purporting to be a clue to an important secret, but in fact it contains no information whatsoever about the secret. You have a different document, also purporting to be a clue about the same secret, but also not actually containing any information about the secret. Yet, when we read both documents, we can determine the secret completely. I'll describe how such a "0+0=1" phenomenon is possible, and then I'll discuss generalizations --- for example, ten documents, such that no six of them, even combined, contain any information about the secret, but any seven of them let you determine the secret.

Student Algebraic Geometry
Thursday, March 31, 2016, 4:00pm-5:00pm
4096 East Hall
Rob Silversmith (University of Michigan)
TBA
Differential Equations  
Thursday, March 31, 2016, 4:00pm-5:00pm  
4088 East Hall  
Volker Elling (Univ. of Michigan)

Applied Interdisciplinary Mathematics  
Friday, April 01, 2016, 3:00pm-4:00pm  
1084 East Hall  
Howard Stone (Princeton University (Mech. Eng.))

Elementary channel flows with surprising response: (i) Biofilms and flow and (ii) Trapping of bubbles in stagnation point flows

In this talk I describe two distinct problems that we have studied where seemingly modest variations in an elementary channel flow produce new effects. First, we investigate influences of flow on biofilms. In particular, we identify the formation of biofilm streamers, which are filaments of biofilm extended along the central region of a low Reynolds number channel flow, and show how these filaments are capable of causing catastrophic disruption and clogging. We present a mathematical model to rationalize the rapid growth of the streamer. Second we consider flow in a T-junction, which is perhaps the most common element in many piping systems. In this example, the flows are laminar but have high Reynolds numbers, typically Re=100-1000. It seems obvious that any particles in the fluid that enter the T-junction will leave following the one of the two main flow channels. Nevertheless, we report experiments that document that bubbles and other low density objects can be trapped at the bifurcation. The trapping leads to the steady accumulation of bubbles that can form stable chain-like aggregates in the presence of surfactants, or give rise to a growth due to coalescence. Our three-dimensional numerical simulations rationalize the mechanism behind this phenomenon.
Geometry
Friday, April 01, 2016, 3:00pm-4:00pm
3096 East Hall
Jun Zhang (Psychology, UM (junz@umich.edu))
Kahler and para-Kahler structure in information geometry

Information Geometry is the differential geometric study of the manifold of probability models, and promises to be a unifying geometric framework for statistical inference, information theory, machine learning, etc. Instead of using metric for measuring distances on such manifolds, these applications often use “divergence functions” for measuring proximity of two points (that do not impose symmetry and triangular inequality), for instance Kullback-Leibler divergence, Bregman divergence, f-divergence, etc. Divergence functions induce what is called "statistical structure" on a manifold: a Riemannian metric g together with a pair of torsion-free affine connections \nabla, \nabla^\ast, such that \nabla and \nabla^\ast are both Codazzi coupled to g while being conjugate to each other. Divergence functions also induce a natural symplectic structure \omega on the product manifold. This talk will report our recent research investigating the interaction of \nabla with g, \omega, and a tangent-bundle isomorphism L, two special cases being L= J (almost complex structure, J^2 = -id) and L=K (almost para-complex structure, K^2 = id). We show that Codazzi coupling of \nabla with any two of the compatible triple (g, \omega, L) will lead to its coupling with the remainder, which further gives rise to a (para-)Kahler structure on the manifold. We call this Codazzi-(para-)Kahler structure, generalizing the special (para-)Kahler geometry known in mathematical physics, without requiring \nabla to be flat. In fact, we prove a general result that g-conjugate, \omega-conjugate, and L-gauge transformations of \nabla, along with the identity transform, form a 4-element Klein group. This leads a Codazzi-(para-)Kahler manifold to admit a pair of torsion-free connections compatible with the (g, \omega, L). Finally, we discuss implications of the rich geometric structures we reveal for statistical inference, information, and machine learning. (Joint work with Teng Fei of MIT.)

Combinatorics
Friday, April 01, 2016, 3:10pm-4:00pm
4088 East Hall
David Speyer (U Michigan)
Kasteleyn's method and positroids

In 1967, Kasteleyn gave a way to count perfect matchings of a planar graph by computing determinants. We'll give a quick proof of Kasteleyn's result, and will then explain Postnikov's parametrization of positroid varieties. This talk will be mostly exposition of other people's work, but I like to think that I've cleaned up the exposition a bit.

Quant Program Practitioner Seminar
Friday, April 01, 2016, 4:00pm-5:00pm
B844 East Hall
Pete Benson (University of Michigan Quant Program)
TBA
Preprint Algebraic Geometry Seminar  
Friday, April 01, 2016, 4:10pm-5:30pm  
2866 East Hall  
Emanuel Reinecke (UM)  
Level structures on abelian varieties, Kodaira dimensions, and Lang's conjecture (following Abramovich and Várilly-Alvarado)  
http://arxiv.org/abs/1601.02483  

Complex Analysis, Dynamics and Geometry  
Monday, April 04, 2016, 4:00pm-5:00pm  
3096 East Hall  
Misha Hlushchanka (Jacobs University)  
TBA  

Group, Lie and Number Theory  
Monday, April 04, 2016, 4:10pm-5:30pm  
4088 East Hall  
TBA  

Colloquium Series  
Tuesday, April 05, 2016, 4:10pm-5:00pm  
1360 East Hall  
Sumner Myers Prize (University of Michigan)  
Sumner Myers Prize
Financial/Actuarial Mathematics  
Wednesday, April 06, 2016, 4:00pm-5:00pm  
1360 East Hall  
Tom Bielecki (IIT)

Dependence between components of multivariate conditional Markov chains: Markov consistency and Markov Copulae

Modeling of evolution of dependence between processes occurring in financial markets is important. Typically, one can identify marginal statistical properties of individual processes, and then one is confronted with the task of modeling dependence between these individual processes so that the marginal properties are obeyed. We have been advocating, for some time now, to address this modeling problem via the theory of Markov consistency and Markov copulae.

In this talk we shall examine the problem of existence and construction of a non-trivial multivariate conditional Markov chain with components that are given conditional Markov chains. In this regard we shall give sufficient and necessary conditions, in terms of relevant conditional expectations, for a component of a multivariate Markov chain to be a Markov chain in the filtration of the entire chain - a property called strong Markov consistency, as well as in its own filtration - a property called weak Markov consistency. These characterization results are proved via analysis of the semi-martingale structure of the chain.

Several financial applications will be indicated.

Algebraic Geometry  
Wednesday, April 06, 2016, 4:10pm-5:30pm  
4096 East Hall  
Chi Li (Purdue University)  
TBA

Analysis/Probability  
Wednesday, April 06, 2016, 4:10pm-5:00pm  
2866 East Hall  
Palina Salanevich (Jacobs University Bremen)  
TBA
Math Club
Thursday, April 07, 2016, 4:00pm-5:00pm
Nesbitt Room
John Schotland (University of Michigan)
Discrete Tomography

Applied Interdisciplinary Mathematics
Friday, April 08, 2016, 3:00pm-4:00pm
1084 East Hall
AVAILABLE ()
TBA

Combinatorics
Friday, April 08, 2016, 3:10pm-4:00pm
4088 East Hall
Vivek Shende (UC Berkeley)
TBA

Geometry
Friday, April 08, 2016, 4:00pm-5:00pm
3096 East Hall
Simion Filip (U Chicago)
TBA

Preprint Algebraic Geometry Seminar
Friday, April 08, 2016, 4:10pm-5:30pm
2866 East Hall
Tyler Foster (UM)
Contractibility of the space of rational maps (following Gaitsgory)

http://arxiv.org/abs/1108.1741
Student Arithmetic
Monday, April 11, 2016, 1:00pm-2:00pm
1866 East Hall
Emanuel Reinecke ()
TBA

Complex Analysis, Dynamics and Geometry
Monday, April 11, 2016, 4:00pm-5:00pm
3096 East Hall
Sandrine Daurat (U(M))
TBA

Group, Lie and Number Theory
Monday, April 11, 2016, 4:10pm-5:30pm
4088 East Hall
Frank Thorne (University of South Carolina)
TBA

Colloquium Series
Tuesday, April 12, 2016, 3:10pm-4:00pm
1360 East Hall
Arnaud Beauville (UniversitÃ© de Nice)
Special AG lecture series in Spring
Colloquium Series
Tuesday, April 12, 2016, 4:10pm-5:00pm
1360 East Hall
Alex Eskin (University of Chicago)

Polygonal Billiards and Dynamics on Moduli Spaces

Billiards in polygons can exhibit some bizarre behavior, some of which can be explained by deep connections to several seemingly unrelated branches of mathematics. These include algebraic geometry (and in particular Hodge theory), Teichmuller theory and ergodic theory on homogeneous spaces. I will attempt to explain some of these connections.
Financial/Actuarial Mathematics
Wednesday, April 13, 2016, 4:00pm-5:00pm
1360 East Hall
Vadim Linetsky (Northwestern)
*Long Forward Measure, Recovery, and the Term Structure of Bond Risk Premiums*

In the first part of the talk, we extend the long-term factorization of the pricing kernel introduced by Alvarez and Jermann (2005) in discrete-time ergodic environments and by Hansen and Scheinkman (2009) in Markovian environments to general semimartingale environments. The long-term factorization is an alternative to the familiar risk-neutral factorization, where the pricing kernel is factorized into discounting at the rate of return on the long bond and a martingale that accomplishes a change of probabilities to the long forward measure. A sufficient condition is given that guarantees convergence in semimartingale topology of trading strategies that invest in T-maturity pure discount bonds to the long bond and convergence in total variation of T-forward measures to the long forward measure. Under the long forward probabilities, the long bond is growth optimal, so that only the (negative of the) covariance with the (reciprocal of the) long bond earns excess return. The volatility of the martingale component drives the wedge between data-generating and long forward probabilities. When the Markov property is imposed, the operator theory-based results of Hansen and Scheinkman (2009) linking the long-term factorization with the principal eigenfunction of the pricing operator are naturally recovered from our martingale formulation.

In the second part of the talk, we empirically estimate the long-term factorization in the US Treasury bond market, and show that the martingale component is highly volatile, produces a downward-sloping term structure of bond Sharpe ratios, and implies that the long bond is far from growth optimality. In contrast, the long forward probabilities forecast an upward sloping term structure of bond Sharpe ratios that starts from zero for short-term bonds and implies that the long bond is growth optimal. These results imply that the transition independence and degeneracy of the martingale component that underpin the Recovery Theorem of Ross are implausible assumptions in the bond market.

Algebraic Geometry
Wednesday, April 13, 2016, 4:10pm-5:30pm
4096 East Hall
Arnaud Beauville (University of Nice)
*Spring Lectures*
Math Club
Thursday, April 14, 2016, 4:00pm-5:00pm
Nesbitt Room

TBA

Math Club
Thursday, April 14, 2016, 4:00pm-5:00pm
Nesbitt Room
Jennifer Park (University of Michigan)

TBA

Commutative Algebra
Thursday, April 14, 2016, 4:00pm-5:00pm
3866 East Hall
Florian Enescu (Georgia State University)

TBA

Applied Interdisciplinary Mathematics
Friday, April 15, 2016, 3:00pm-4:00pm
1084 East Hall
Joel Tropp (Caltech)

TBA

Preprint Algebraic Geometry Seminar
Friday, April 15, 2016, 4:00pm-5:50pm
2866 East Hall
Arnaud Beauville (University of Nice)

Spring Lectures
Student Arithmetic  
Monday, April 18, 2016, 1:00pm-2:00pm  
1866 East Hall  
Takumi Murayama ()  
TBA

Complex Analysis, Dynamics and Geometry  
Monday, April 18, 2016, 4:00pm-5:00pm  
3096 East Hall  
Alastair Fletcher (Northern Illinois University)  
TBA

Group, Lie and Number Theory  
Monday, April 18, 2016, 4:10pm-5:30pm  
4088 East Hall  
Jerry Wang (Princeton University)  
TBA

Colloquium Series  
Tuesday, April 19, 2016, 4:10pm-5:00pm  
1360 East Hall  
Federico Rodriguez Hertz (Penn State)  
Stationary measures, P-invariant measures and invariant measures for group actions.

For actions of non-amenable groups, existence of an invariant measure has often important implications. In this lecture we shall discuss examples of these implications as well as results on existence of invariant measures. These results involves the notion of random dynamics, stationary measures and P-invariant measures when the group is a semisimple Lie group. We will try to maintain the discussion at an elementary level, and present the notions mostly through simple examples. This is based on ongoing work with Aaron Brown and Zhiren Wang.
Preprint Algebraic Geometry Seminar
Friday, April 22, 2016, 4:10pm-5:30pm
2866 East Hall
No meeting this week ()