Winter 2008
University of Michigan-Department of Mathematics
http://www.math.lsa.umich.edu/seminars/index.shtml
Ann Arbor, MI 48109-1043
March 31st – April 6th

Monday, March 31st

3:10-4:00pm **Student Analysis Seminar** --- TBA --- 3866 EH
3:10-4:00pm **Topics in Algebraic Geometry Seminar** --- Yogesh More (UM) *Log Smoothness* --- 2866 EH
3:10-4:00pm **Working Group in Integrable Systems and Asymptotics** --- Robert Buckingham (UM) *Universality Limits for Spectra of Random Matrices, III* --- 3088 EH
3:10-5:00pm **Number Theory and Representation Theory Seminar** --- Mihran Papikian (Penn State) *Modular varieties and the Weil-Deligne bound* --- 4096 EH
4:10-6:00pm **Geometry & Physics** --- TBA--- 4088 EH
4:10-5:00pm **Several Complex Variables Seminar** --- Al Taylor (UM) *(More on) Limit varieties and Phragmen-Lindelof conditions --- 3096 EH*
5:15-6:30pm **Teaching Mathematics** --- Gavin LaRose (UM) *Assessment of the Effect of Introducing On-line Homework to Calculus II* --- 3088 EH

Tuesday, April 1st

2:10-3:00pm "**What is … " Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Algebra Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Geometry Seminar** --- Willy Sarlet (University of Ghent) *Applications of the geometric calculus of second-order ordinary differential equations* --- 4088 EH
3:10-4:00pm **Student Algebraic Geometry Seminar** --- TBA --- 3088 EH
4:10-5:00pm **Colloquium** --- TBA --- 1360 EH

Wednesday, April 2nd

3:10-4:00pm **Geometric Function Theory Seminar** --- Vladimir Eiderman (Moscow and MSU) *Cartan type estimates for Riesz transforms* --- 4096 EH
3:10-4:00pm **Student Representation Theory/Lie Theory Seminar** --- TBA --- 3088 EH
3:10-4:00pm **Student Arithmetic Seminar** --- Johnson Jia (UM) TBA --- 3866 EH
3:10-4:00pm **Student AIM Seminar** --- Henry Boateng (UM) TBA --- 3096 EH
4:10-5:00pm **Complex Analysis Seminar** --- Alex Izzo (Bowling Green) *Localization for function algebras on two-manifolds* --- 3096 EH
4:10-5:30pm **Working Seminar in Several Complex Variables and Complex Dynamics** --- Liz Vivas (UM) *Fatou-Bieberbach Domains with C^{∞}-boundary* --- 4088 EH
4:10-6:00pm **Algebraic Geometry Seminar** --- David Smyth (Harvard) *New modular compactifications of M_{1,n}* --- 3088 EH

Thursday, April 3rd

1:10-2:00pm **MCTP Colloquium** --- Saul Teukolsky (Cornell) *Black holes and Gravitational Waves* --- 340 West Hall
3:10-4:00pm **Commutative Algebra Seminar** --- Will not be meeting this week --- 3096 EH
3:10-4:00pm **Financial/Actuarial Mathematics Seminar** --- Joe Conlon (UM) *On the Weiner-Hopf factorization method as applied to valuation of options*--- 3088 EH
3:10-4:00pm **Topology Seminar** --- TBA --- 4096 EH
4:10-5:00pm **Differential Equations** --- David Hoff (Indiana University) *Analyticity in time and backward uniqueness of weak solutions of the Navier-Stokes equations of multidimensional, compressible flow* --- 4088 EH
4:10-5:00pm **Math Club** --- TBA --- 2nd Floor Nesbitt Common Room
4:10-5:00pm **Student Combinatorics** --- TBA --- 3866 EH
4:10-5:30pm **Logic Seminar** --- TBA --- 3096 EH
4:10-6:00pm **Study Seminar** --- TBA --- 3088 EH

Friday, April 4th

10:50-12:00pm **EECS Theory Seminar** --- Alexander Sherstov (U of Texas at Austin) *The Unbounded-Error Communication Complexity of Symmetric Functions* --- DOW 1017

2:10-3:00pm **Topics in Geometry** --- TBA --- 3866 EH

3:10-4:00pm **Algebraic Geometry Seminar (Special Seminar)** --- Geordie Williamson (U of Freiburg) *Knot homology and equivariant cohomology* --- 3866 EH

3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- Andrew Christlieb (MSU) *A Step Towards Temporal Multi-Scale Problems* --- 1084 EH

3:10-4:00pm **Student Geometry/Topology** --- Qian Yin (UM) *Hirschs Immersions of Manifolds* --- 3096 EH

4:10-5:00pm **Combinatorics** --- Johannes Rau (TU Kaiserslautern) *First steps in tropical intersection theory* --- 3866 EH

ABSTRACTS FOR THE WEEK OF MAR 31-APRIL 6

Topics in Algebraic Geometry Seminar
Monday, March 31, 3:10-4:00pm
2866 EH
Yogesh More (UM)
Log Smoothness

We will define the notion of log smoothness, and illustrate it with examples.

Number Theory and Representation Theory Seminar
Monday, March 31, 3:10-5:00pm
4096 EH
Mihran Papikian (Penn State)
Modular varieties and the Weil-Deligne bound

We compare the asymptotic growth of the number of rational points on modular varieties of Delliptic sheaves over finite fields to the growth of their Betti numbers as the degree of the level tends to infinity. This is a generalization to higher dimensions of a well-known result for modular curves. As a consequence of the main result, we also produce a new asymptotically optimal sequence of curves.

Teaching Mathematics
Monday, March 31, 5:15-6:30pm
3088 EH
Gavin LaRose (UM)
Assessment of the Effect of Introducing On-line Homework to Calculus II

In this talk we will present data from the implementation of on-line homework in Calculus II at the University of Michigan in Fall 2007. We will compare students' work in classes without and with on-line homework, their performance in the class, and the extent to which any differences in performance can be attributed to the on-line homework. In addition, we will consider instructors' sense of the success of the homework and how their management of the course and coverage of material was affected by their use of the on-line homework.

Geometry Seminar
Tuesday, April 1, 3:10-4:00pm
4088 EH
Willy Sarlet (University of Ghent)
Applications of the geometric calculus of second-order ordinary differential equations

I shall start from the following concrete question: given an arbitrary (coupled) system of second-order differential equations, how can we figure out whether it is possible to change coordinates in such a way that the transformed equations decouple into single equations? To tackle this question, one needs to know about general tangent bundle geometry and the geometry of second-order equation fields. Efficient tools for studying geometrical aspects of second-order dynamics are provided by the calculus of derivations of forms along the tangent bundle projection. After a brief survey of this theory, which relies on canonically defined connections, I will present the full solution of the separability question and will briefly dwell on a few other applications, such as the inverse problem of the calculus of variations.

Geometric Function Theory Seminar
Wednesday, April 2, 3:10-4:00pm
4096 EH
Vladimir Eiderman (Moscow and MSU)
Cartan type estimates for Riesz transforms

Our aim is to give sharp upper bounds for the size of the set of points where the singular Riesz transform of a linear combination of N point masses is large. This size will be measured by the Hausdorff content with various gauge functions. Among other things, we shall characterize all gauge functions for which the estimates do not blow up as N tends to infinity (in this case a routine limiting argument will allow us to extend our bounds to all finite Borel measures).

(Joint work with F. Nazarov and A. Volberg)

Complex Analysis Seminar
Wednesday, April 2, 4:10-5:00pm
3096 EH
Alex Izzo (Bowling Green)
Localization for function algebras on two-manifolds

Some results and problems concerning local and nonlocal function algebras will be presented.

Working Seminar in Several Complex Variables and Complex Dynamics
Wednesday, April 2, 4:10-5:30pm
4088 EH
Liz Vivas (UM)
Fatou-Bieberbach Domains with C^∞-boundary

We will read a paper by Stensønes in which she constructs Fatou-Bieberbach Domains with smooth boundary. The construction is substantially different from the usual basin of attraction approach. We will focus on the main ideas rather than in the calculations in the proof.

Algebraic Geometry Seminar
Wednesday, April 2, 4:10-6:00pm
3088 EH
David Smyth (Harvard)
New modular compactifications of M_ {1,n}

We construct new compactifications of M_{1,n} by varying the definition of Deligne-Mumford stability to allow curves with cusps, tacnodes, triple-points, and more exotic singularities. In the spirit of Mori theory, we factor the rational maps between these new compactifications into elementary contractions and flips, and exhibit these spaces as log-canonical models of \overline{M}_{1,n}.

MCTP Colloquium
Thursday, April 3, 1:10-2:00pm
340 West Hall
Saul Teukolsky (Cornell)
Black holes and Gravitational Waves

Gravitational wave detectors like LIGO are poised to begin detecting signals. One of the prime scientific goals is to detect waves from the coalescence and merger of black holes in binary systems. Confronting such signals with the predictions of Einstein's General Theory of Relativity will be the first real strong-field test of the theory. Until very recently, theorists were unable to calculate what the theory actually predicts. I will describe recent breakthroughs that have occurred and that have set things up for an epic confrontation of theory and experiment.

Financial/Actuarial Mathematics Seminar
Thursday, April 3, 3:10-4:00pm
3088 EH
Joe Conlon (UM)
On the Wiener-Hopf factorization method as applied to valuation of options

This is an exposition of some work of S. Levendorskii concerning the use of Wiener-Hopf factorizations for solving some optimal control problems which occur in finance. The basic problem is to find the value of a generalized perpetual American option when the underlying process is Levy. The solution can be written as an iterated integral. The kernels of the integral operators can be explicitly computed in some situations. Levendorskii carries this out by using the fact that the characteristic function of the Levy process with a random exponential time has a Wiener-Hopf factorization. The factorization yields the corresponding characteristic functions for the maximum and minimum of the process.

Differential Equations
Thursday, April 3, 4:10-5:00pm
4088 EH
David Hoff (Indiana University)
Analyticity in time and backward uniqueness of weak solutions of the Navier-Stokes equations of multidimensional, compressible flow

We prove that solutions of the Navier-Stokes equations of three-dimensional, compressible flow, restricted to fluid-particle trajectories, can be extended as analytic functions of complex time. One important corollary is backwards uniqueness: if two such solutions agree at a given time, then they must agree at all previous times. Additionally, analyticity yields sharp estimates for the time derivatives of arbitrary order of solutions along particle trajectories.

Algebraic Geometry Seminar (Special Seminar)
Friday, April 4, 3:10-4:00pm
Geordie Williamson (U of Freiburg)
3866 EH
Knot homology and equivariant cohomology

Khovanov-Rozansky link homology is a categorical knot invariant: starting with any knot (or link) one obtains an invariant consisting of a triply graded vector space. Moreover, taking the Euler characteristic yields the HOMFLYPT polynomial. I will describe one way of constructing Khovanov-Rozansky homology (due to Khovanov) in terms of Soergel bimodules and explain joint work with Ben Webster in which we reinterpret the steps in its construction geometrically. Along the way we calculate the cohomology of certain smooth orbit closures in a reductive complex algebraic group.

Applied and Interdisciplinary Mathematics Seminar
Friday, April 4, 3:10-4:00pm
1084 EH
Andrew (Christlieb)
A Step Towards Temporal Multi-Scale Problems

In this talk, we will discuss two classic kinetic plasma problems to motivate the development of a high order Spectral Deferred Correction Lagrangian framework. The two problems are the two stream instability and the dynamics of Bernstine-Greene-Kruskal (BGK) modes (the only known class of fully non-linear solutions to the Vlasov-Poisson (VP) system). These two problems are linked via the notion of particle trapping. Particle trapping is the idea of forming a seperatrix in phase space where electrons on the inside of the seperatrix are trapped at a location in space, while electrons on the out side are able to free stream in space. In particular, we are interested in developing numerical methods that can bridge the electron ion time scale gap which arises in two fluid models of a plasma. The electrons being light, respond quickly to changes in the electric field, while the more massive ions will respond on a much slower time scale. The current objective is to use high order time stepping to begin to bride these vastly different time scales and thereby eliminate an outstanding computational bottle neck for a wide range of interesting plasma problems.
This work will consider two key issues previously neglected in our Lagrangian particle model; the incorporation of arbitrary high order time stepping methods, based on Spectral Deferred Correction (SDC), and the development of sufficiently smooth regularization methods which are consistent with high order time stepping. Spectral Deferred Correction is based on a low order predictor corrector method where a corrector, which is successive applied, is formulated via a Picard integral equation for the residual. We will demonstrate the utility of using high order methods in the correction step by considering both the region of absolute stability and our own metric, which we dub the accuracy plot. In addition, we have formally established that if Runga-Kutta 2, 3 or 4 is used in the correction step, the accuracy of the scheme will increase by 2,3 or 4 respectively upon each iteration of the correction. We present the associated theorems and give some discussion for the spatial case of forward Euler. We next turn our attention to the simulation of N particles interacting via long range forces and demonstrate the need to high continuity of the regularization chosen, so as to maintain high order in SDC time stepping. It will be demonstrated that apparently handling the N particle system is the first step in the development of an arbitrary high order accuracy Lagrangian particle method for the VP system.
This is joint work with R. Krasny, J. Qiu and B. Ong.

Student Geometry/Topology
Friday, April 4, 3:10-4:00pm
3096 EH
Qian Yin (UM)
Hirschs Immersions of Manifolds

We will see how an open n-dimensional manifold with trivial tangent bundle can be immersed in the Euclidean space with the same dimension.

Combinatorics
Friday, April 4, 4:10-5:00pm
3866 EH
Johannes Rau (TU Kaiserslautern)
First steps in tropical intersection theory

Aiming at the main results of my paper "First steps in tropical intersection theory" (joint with Lars Allermann, arXiv), we will make a small journey through tropical geometry. On our way, we will meet polyhedral fans and piecewise linear functions on them. To the latter we will assign a subfan of codimension of which one can think as the weighted set of tropical zeros and poles. This is the basic ingredient for our intersection theory. We will try to motivate some of our definitions and statements by explaining the connections to classical algebraic geometry. As we will focus on giving ideas rather than all technical details, the talk hopefully requires no previous knowledge of tropical or algebraic geometry.