Menos

Texas Algebraic Geometry Seminar 2015
Fall Workshops:

The Texas Algebraic Geometry Symposium is a joint seminar of Rice University, Texas A&M University, and the University of Texas at Austin. This conference aims to bring to a regional audience the latest developments in Algebraic Geometry.

This Fall there will be two weekend programs aimed at graduate students to complement the main conference series. These will be held at Texas A&M on September 26 and October 24 and will run from 11:30 am to 5:30 pm, with lunch provided.

September 26: Blocker 220

Radu Laza, Stony Brook University
Ye Luo, Rice University.
Harold Williams, University of Texas at Austin.
Alexander Yong, University of Illinois, Urbana-Champaign.

October 24: Blocker 628

John Calabrese, Rice University.
Anton Dochtermann, University of Texas at Austin.
Chris Peterson, Colorado State University.
Sonja Petrovic, Illinois Institute of Technology.

Organizers: JM Landsberg, Laura Matusevich, Gregory Pearlstein, Anne Shiu, Frank Sottile.
Registration: Please register at https://www.math.tamu.edu/forms/algebraic_geom/ two weeks in advance.
Funding: We have a limited amount of support available to cover travel costs (mileage only) for grad students and early-career participants. Please request this with your registration.
Local Information: www.math.tamu.edu/~laura/TAGS2015/local.html.
Contact Email: `gpearl@math.tamu.edu`

TAGS is generously supported by the National Science Foundation and the Texas A&M Mathematics Department.

Schedule:

September 26	October 24
11:00 – 11:20: Registration	11:00 – 11:20: Registration
11:30 – 12:20: Alexander Yong	11:30 – 12:20: Sonja Petrovic
12:30 – 1:50: Lunch	12:30 – 1:50: Lunch
2:00 – 2:50: Ye Luo	2:00 – 2:50: Anton Dochtermann
2:50 – 3:00: Break	2:50 – 3:00: Break
3:00 – 3:50: Harold Williams	3:00 – 3:50: John Calabrese
4:00 – 4:30: Tea	4:00 – 4:30: Tea
4:30 – 5:20: Radu Laza	4:30 – 5:20: Chris Peterson

Titles and Abstracts, September 26.

Alexander Yong
Title: The Prism tableau model for Schubert polynomials.
Abstract: The Schubert polynomials lift the Schur basis of symmetric polynomials into a basis for $\mathbf{Z}[x_1,x_2,...]$. We suggest the *prism tableau model* for these polynomials. A novel aspect of this alternative to earlier results is that it directly invokes semistandard tableaux; it does so as part of a colored tableau amalgam. In the Grassmannian case, a prism tableau with colors ignored is a semistandard Young tableau. Our arguments are developed from the Gröbner geometry of matrix Schubert varieties. This is joint work with Anna Weigandt (`arXiv:1509.02545`).

Ye Luo
Title: Smoothing of Limit Linear Series of Rank One Metrized Complexes of Algebraic Curves.
Abstract: We investigate the smoothing problem of limit linear series of rank one on an enrichment of reducible nodal curves called saturated metrized complexes. Our main result is an effective characterization for smoothability of a limit linear series of rank one. Furthermore, we characterize the space of all possible smoothings. Applications of our results include a proof that every (refined) limit linear series of rank one on a saturated metrized complex of compact-type is smoothable, corresponding to a theorem for nodal curves due to Eisenbud and Harris, and a proof of an analogue for saturated metrized complexes of a theorem of Harris and Mumford on the characterization of nodal curves contained in a given gonality stratum. This is a joint work with Madhu Manjunath.

Harold Williams
Title: Moduli Spaces of Micolocal Sheaves and Cluster Combinatorics.
Abstract: We explore a relationship between combinatorics and certain moduli spaces appearing in symplectic geometry. The combinatorics comes from the theory of cluster algebras, a kind of unified theory of canonical bases in representation theory and algebraic geometry. Some basic features of cluster algebras are that they are defined from purely combinatorial data (for example, a quiver) and they are coordinate rings of varieties covered by algebraic tori with transition functions of a special, universal form. Despite the originally representation-theoretic motivation for the subject, connections between cluster theory and symplectic geometry emerged later through the appearance of similar formulae in wall-crossing and mirror symmetry. We will discuss recent work expanding on this connection, in particular providing a universal framework for interpreting cluster varieties as moduli spaces of objects in Fukaya categories of Weinstein 4-manifolds. In simple examples these moduli spaces reduce to well-known ones, such as character varieties of surfaces and positroid cells in the Grassmannian. An accompanying theme, which plays a key role both technically and in relating the symplectic perspective to more standard representation-theoretic ones, is the role of categories of microlocal sheaves as topological counterparts of Fukaya categories. This is joint work with Vivek Shende, David Treumann, and Eric Zaslow.

Radu Laza
Title: Birational geometry of the moduli space of hyperelliptic quartic K3's.
Abstract: The study of compactifications of the moduli space of K3 surfaces is a problem of great interest. For the low degree cases, E. Looijenga has constructed a framework that provides a comparison between the two naturally available compactifications in this case: GIT and Baily-Borel. In this talk, I will discuss an enrichment of this picture, essentially a continuous interpolation between the GIT and BB models. While the discussion will be mostly concerned with the case of hyperelliptic quartic K3 surfaces, we expect such an interpolation to hold quite generally. This is inspired and quite analogous to the Hassett-Keel program that studies the birational geometry of the moduli space \bar M_g of curves. This is a report on joint work with K. O'Grady.

Titles and Abstracts, October 24.

Sonja Petrovic
Title: Random sampling in computational algebra: Helly numbers and violator spaces.
Abstract: Systems of polynomial equations are ubiquitous in optimization, statistics, biology, and other fields in science and engineering. Solving such systems is a cornerstone of computational algebra today, but it is well-known that many algorithms have high worst-case complexity. In this talk, I will describe a new randomized algorithm for computing solutions of (large) systems of polynomial equations that has expected runtime linear in the number of input polynomials. Joint work with Jesús A. De Loera (University of California, Davis) and Despina Stasi (Illinois Institute of Technology).

Anton Dochtermann
Title: Cellular resolutions of combinatorially defined ideals**.**
Abstract: Given a homogeneous ideal I in a polynomial ring S, a basic question in\ncommutative algebra (and algebraic geometry) is to understand its minimal resolution: a presentation of the generators of I, the relations among the generators (the 'syzygies'), etc. For example certain discrete data\ncoming from a minimal resolution allows one to compute the Hilbert polynomial of S/I. The theory of Groebner bases and initial ideals allow us to (in some sense) reduce the question to monomial ideals, where tools from combinatorics can be employed. Although resolutions of certain classes of monomial ideals are well understood, they can still be quite complicated and we seek to realize the\nresolutions geometrically by finding a polyhedral (CW-) complex which `supports' them. These so-called `cellular resolutions' were introduced by Bayer and Sturmfels in their study of generic monomial ideals. We survey some results in this area. In particular we show that if I is an edge ideal of a `cointerval' hypergraph, a certain homomorphism space of the graph can be used to construct a minimal resolution. In addition we show how to realize the Eliahou-Kervaire resolution of a stable ideal via a geometric mapping cone construction. This will include joint work with Alex Engstrom and with Fatemeh Mohammadi

John Calabrese
Title: Gabriel’s theorem and points
Abstract: A classic theorem of Gabriel says that a variety can be reconstructed from its category of coherent sheaves. In this talk I’ll try and explain what this means and discuss a modern proof, which has the benefit of extending the range of the original theorem (joint work with Michael Groechenig).

Chris Peterson
Title: Approximations in Algebraic Geometry: Can it be good enough to be "almost correct"?
Abstract: Computations play an important role in Algebraic Geometry and Commutative Algebra. Grobner basis algorithms, reduction to finite fields, and other computational methods have led to wonderful breakthroughs and have spurred on new directions in research. As tools from algebraic geometry find their way into applications, one is confronted with new restrictions and new goals. For instance, suppose one wants to know the common zero locus of a system of polynomial equations that has some uncertainty in the coefficients. Or suppose one wants to understand the common zero locus of a system involving many variables. Some of the computational tools mentioned above have complexity growth or other restrictions that inhibit their applicability in such settings. The goal of this talk is to describe some computational tools that extend the applicability of algebraic geometry and to describe some specific applications of these tools.