2015 Route 81 Conference — Schedule —

Saturday, 17 October 2015

Department of Mathematics and Statistics
Queen's University, Kingston, Ontario

8:50 – 9:30	Break
9:30 – 10:20	Jaydeep Chipalkatti (Manitoba) Sextuples with specified Pascals
10:20 – 11:00	Break
11:00 – 11:50	Farbod Shokrieh (Cornell) Non-archimedean abelian varieties, and uniformization, faithful tropicalization
11:50 – 14:00	Lunch
14:00 – 14:50	Hal Schenck (UIUC) Chen ranks and resonance varieties
15:00 – 15:30	Break
15:30 – 16:20	Robert Krone (Queen's) Equivariant Gröbner bases
16:30 – 15:20	Louis de Thanhoffer de Volcsey (Toronto) Exceptional sequences in noncommutative geometry and Grothendieck groups of noncommutative Del Pezzo surfaces

All talks are in 234 Jeffery Hall (it is one floor below ground).
Breaks and lunch will be in the fifth floor lounge of Jeffery Hall.

Abstracts

Jaydeep Chipalkatti: *Sextuples with specified Pascals*

Suppose that we fix a nonsingular conic in the complex projective plane. Given six points A, B, C, D, E, F on the conic, we can arrange them in an array $\left[\begin{smallmatrix} A & B & C \\ F & E & D \end{smallmatrix}\right]$. Then Pascal's theorem says that the three intersection points $AE \cap BF$, $BD \cap CE$, $AD \cap CF$ are collinear. The line containing them is called their Pascal, and generically one gets sixty such lines by permuting the points. Now suppose that we specify a line in the plane *ex ante*, and form the variety of all sextuples which lead to this line as the Pascal. I will describe some results on such varieties together with a few variations on this theme. Along the way, I will also introduce the so-called Veronese properties of these sixty lines, and their connection to the outer automorphism of the symmetric group on six objects.

Louis de Thanhoffer de Volcsey: *Exceptional sequences in noncommutative geometry and Grothendieck groups of noncommutative Del Pezzo surfaces*

After describing some of the guiding ideas in noncommutative geometry, we go on to introduce exceptional sequences which play a key role in relating the geometry of varieties to representations of algebras. This theory is particularly relevant in the setting of Del Pezzo surfaces. In the second part of the talk, we will describe a generalization of Grothendieck groups which allows us to recover certain aspects of said results on exceptional sequences on Del Pezzo surfaces all the while being applicable to certain new noncommutative varieties.

Robert Krone: *Equivariant Gröbner bases*
Given a polynomial ring with an action of the infinite symmetric group on its set of variables, an equivariant Gröbner basis of an ideal is a set of polynomials whose orbits under the action form a Grbner basis. Equivariant Gröbner bases offer a concise way to describe ideals in high dimension with symmetry and (under some conditions) can be effectively computed. Buchberger's algorithm can be adapted straight-forwardly to the equivariant setup, but only in some cases can termination be guaranteed. We present a way to repair this in the case that a finite Gröbner basis exists. Additionally we look to adapt more efficient Gröbner basis algorithms such as signature-based algorithms. This is work with Chris Hillar and Anton Leykin.

Hal Schenck: *Chen ranks and resonance varieties*
The Chen groups of a group G are the lower central series quotients of the maximal metabelian quotient of G. Under certain conditions, we relate the ranks of the Chen groups to the first resonance variety of G, a jump locus for the cohomology of G. In the case where G is the fundamental group of the complement of a complex hyperplane arrangement, our results positively resolve Suciu's Chen ranks conjecture. We obtain explicit formulas for the Chen ranks of a number of groups of broad interest, including pure Artin groups associated to Coxeter groups, and the group of basis-conjugating automorphisms of a nitely generated free group. This talk is based on joint work with Dan Cohen (LSU).

Farbod Shokrieh: *Non-archimedean abelian varieties, uniformization, and faithful tropicalization*
The skeleton of a Berkovich analytic space is a subspace onto which the whole space deformation retracts. For an abelian variety, the skeleton is a real torus with an integral structure. I will discuss faithful tropicalization of abelian varieties in terms of non-archimedean and tropical theta functions. The solution relies on interesting combinatorial facts about lattices, matroids, and Voronoi decompositions. This talk is based on joint projects with Tyler Foster, Joe Rabinoff, and Alejandro Soto.