

Conference: "SINGULAR LANDSCAPES"



Report of Contributions

Contribution ID: 2

Type: **not specified**

Refined curve counting and Hrushovski-Kazhdan motivic integration

Motivated by mathematical physics, Block and Göttsche have defined “quantized” versions of Mikhalkin’s multiplicities for tropical curves. In joint work with Sam Payne and Franziska Schroeter, we propose a geometric interpretation of these invariants as χ_y genera of semi-algebraic analytic domains over the field of Puiseux series. In order to define and compute these χ_y genera, we use the theory of motivic integration developed by Hrushovski and Kazhdan and we explore its connections with tropical geometry.

Presenter: Mr NICAISE, Johannes (University of Leuven)

Contribution ID: 3

Type: **not specified**

About the arc space of C^2 and adjacencies of plane curves.

Presenter: Mrs PE PEREIRA, María (ICMAT, Madrid)

Contribution ID: 4

Type: **not specified**

Sets with few rational points

In the spirit of famous papers by Pila & Bombieri and Pila & Wilkie, I will explain how to bound the number of rational points, with respect to their height, in various kinds of sets, such as algebraic varieties of a given degree, transcendental sets definable in some o-minimal (or even not o-minimal) structure over the real field, and, after joint work with R. Cluckers and F. Loeser, also definable sets in non-archimedean contexts.

Presenter: Mr COMTE, Georges (Université de Savoie - Chambéry)

Contribution ID: 6

Type: **not specified**

Resolution by alterations

De Jong's famous theorem states that any integral variety can be resolved by an alteration. Recently Gabber strengthened this by proving that for any fixed prime l not equal to the characteristic, the alteration can be taken of degree prime to l . In my talk I will tell about Gabber's results and some newer progress on this topic.

Presenter: Mr TEMKIN, Mikael (The Hebrew University of Jerusalem)

Contribution ID: 8

Type: **not specified**

Local monomialization of analytic maps

Monday, June 22, 2015 11:30 AM (50 minutes)

We prove that germs of analytic maps of complex analytic varieties can be made monomial by sequences of local blow ups of nonsingular analytic subvarieties in the domain and target along an arbitrary étoile. An étoile and the voûte étoilée is a generalization by Hironaka of valuations and the Zariski Riemann manifold to analytic spaces.

Presenter: Mr CUTKOSKY, Steven Dale (University of Missouri)

Session Classification: Morning session

Contribution ID: 9

Type: **not specified**

Noetherianity up to symmetry

Many non-Noetherian rings and topological spaces equipped with the action of a large group or monoid are in fact Noetherian up to that action. This phenomenon is responsible for several recent finiteness results in algebraic geometry and commutative algebra. I will discuss examples concerning certain infinite-dimensional toric varieties with an action of the infinite symmetric group, and concerning secant varieties of classical varieties with an action of an infinite-dimensional algebraic group.

Presenter: Mr DRAISMA, Jan (Technische Universiteit Eindhoven)

Contribution ID: 10

Type: **not specified**

Convexifying positive polynomials and a proximity algorithm

We prove that if f is a positive C^2 function on a convex compact set X then it becomes strongly convex when multiplied by $(1+|x|^2)^N$ with N large enough. For f polynomial we give an explicit estimate for N , which depends on the size of the coefficients of f and on the lower bound of f on X . As an application of our convexification method we propose an algorithm which for a given polynomial f on a convex compact semialgebraic set X produces a sequence (starting from an arbitrary point in X) which converges to a (lower) critical point of f on X . The convergence is based on the method of talweg which is a generalization of the Lojasiewicz gradient inequality. (Joint work with S. Spodzieja).

Presenter: Mr KURDYKA, Krzysztof (Université de Savoie)

Contribution ID: 11

Type: **not specified**

On some questions about valuations and minimal log discrepancies

Minimal log discrepancies are invariants of singularities defined using the divisorial valuations centered at one point. They play an important role in birational geometry and several questions about them are widely open. In this talk I will give an introduction to this circle of ideas, I will discuss some of these questions and some partial results.

Presenter: Mr MUSTATA, Mircea (University of Michigan)

Contribution ID: 12

Type: **not specified**

Algebraic geometry, theory of singularities, and convex geometry

Monday, June 22, 2015 3:15 PM (50 minutes)

I will review some results which relate these areas of mathematics.

Newton polyhedra connect algebraic geometry and the theory of singularities to the geometry of convex polyhedra. This connection is useful in both directions. On the one hand, explicit answers are given to problems of algebra and the theory of singularities in terms of the geometry of polyhedra. On the other hand, algebraic theorems of general character (like the Hirzebruch–Riemann–Roch theorem) give significant information about the geometry of polyhedra. In this way one obtains, for example, a multidimensional generalization of the classical one-dimensional Euler–Mclaurin formula. Combinatorics related to the Newton polyhedra theory allows to prove that in hyperbolic space of high dimension there do not exist discrete groups generated by reflections with fundamental polyhedron of finite volume (it was a longstanding conjecture).

The theory of Newton–Okounkov bodies relates algebra, singularities and geometry outside the framework of toric geometry. This relationship is useful in many directions. For algebraic geometry it provides elementary proofs of intersection-theoretic analogues of the geometric Alexandrov–Fenchel inequalities and far-reaching generalizations of the Fujita approximation theorem. The local version of the theory provides a new proof of the famous Teissier’s inequalities for the multiplicities of primary ideals in a local ring. In geometry it suggests a transparent analog of Alexandrov–Fenchel inequality for coconvex bodies.

Presenter: Mr KHOVANSKII, Askold (University of Toronto)

Session Classification: Afternoon session

Contribution ID: 13

Type: **not specified**

Free divisors and rational cuspidal curves in the plane

I will discuss a surprising relation between the free divisors in the complex projective plane (and a slight extension of them called the nearly free divisors) and the rational cuspidal curves. A number of conjectures express this relation and some of them are proved in special cases.

Presenter: Mr DIMCA, Alexandru (Université de Nice-Sophia Antipolis)

Contribution ID: 14

Type: **not specified**

Families of isolated singularities and three inspirations from Bernard Teissier

Monday, June 22, 2015 10:00 AM (50 minutes)

Part of Bernard Teissier's work is a substantial contribution to equisingularity theory. In this talk I will discuss three of the many inspirations his work has given me, and their role in my current approach to the equisingularity of isolated singularities. The talk will use determinantal singularities as an illustration of these ideas.

Primary author: Mr GAFFNEY, Terence (Northeastern University)

Presenter: Mr GAFFNEY, Terence (Northeastern University)

Session Classification: Morning session

Contribution ID: 15

Type: **not specified**

Minimal Log Discrepancy of Isolated Singularities and Reeb Orbits.

Let A be an affine variety inside a complex N dimensional vector space which has an isolated singularity at the origin. The intersection of A with a very small sphere turns out to be a manifold called the link of A . The link has a natural hyperplane distribution called a contact structure. If the singularity is numerically \mathbb{Q} -Gorenstein then we can assign an invariant of our singularity called the minimal discrepancy. We relate the minimal discrepancy with the contact geometry of our link. As a result we show that if the link of A is contactomorphic to the link of \mathbb{C}^3 and A is normal then A is smooth at 0. This generalizes a Theorem by Mumford in dimension 2.

Presenter: Mr MCLEAN, Mark (Stony Brook)

Contribution ID: 16

Type: **not specified**

Milnor numbers of projective hypersurfaces and the chromatic polynomial of graphs

Monday, June 22, 2015 2:00 PM (50 minutes)

I will give an overview of a proof of a conjecture of Read that the coefficients of the chromatic polynomial of any graph form a unimodal sequence. There are two main ingredients in the proof, both coming from works of Bernard Teissier: The first is the idealistic Bertini for sectional Milnor numbers, and the second is the isoperimetric inequality for mixed multiplicities of ideals.

Presenter: Mr HUH, June (Princeton)

Session Classification: Afternoon session

Contribution ID: 17

Type: **not specified**

Non-Archimedean Lipschitz stratification

I will discuss Lipschitz stratification from a nonarchimedean point of view and thereby show that it exists for definable sets, not necessarily bounded, in any polynomial-bounded o-minimal field structure. Unlike the previous approaches in the literature, our method bypasses resolution of singularities and Weierstrass preparation altogether; it transfers the situation to a nonarchimedean model, where the failure of certain “quantitative estimates” are sharpened into valuation-theoretic inequalities and the desired stratification follows, *reductio ad absurdum*, from a construction that realizes these inequalities. (Joint work with Immanuel Halupczok)

Presenter: Mr YIN, Yimu (Sun Yat-Sun University)

Contribution ID: 18

Type: **not specified**

Enumeration of curves via non-archimedean geometry

I will begin by explaining motivations from mirror symmetry. Then I will present some new results concerning tropical geometry and non-archimedean geometry. As an application, I will talk about the enumeration of curves in log Calabi-Yau surfaces. An explicit computation for a del Pezzo surface will be presented in detail. The enumeration is related to the notion of broken lines in the works by Gross-Hacking-Keel, where they are used to prove Looijenga's conjecture on the smoothing of cusp singularities.

Presenter: Mr YU, Tony Yue (IMJ - Paris)

Contribution ID: 20

Type: **not specified**

Rees algebras of codimension three Gorenstein ideals

We study the implicit equations defining the image and the graph of rational maps between projective spaces, under the hypothesis that the base locus has codimension at most three and is defined by a Gorenstein ideal. We provide degree bounds for these implicit equations, and we describe them explicitly if the syzygies of the Gorenstein ideal are all linear. This is joint work with Andy Kustin and Claudia Polini.

Primary author: Mr ULRICH, Bernd (University of Purdue)

Presenter: Mr ULRICH, Bernd (University of Purdue)

Contribution ID: 21

Type: **not specified**

Continuities, discontinuities and singularities in Visual Perception

Primary author: Mr LORENCEAU, Jean (Ecole Normale Supérieure)

Presenter: Mr LORENCEAU, Jean (Ecole Normale Supérieure)

Contribution ID: 23

Type: **not specified**

An overview of Teissier's works on valuations

Presenter: Mr SPIVAKOVSKY, Mark (Univ. Toulouse)

Contribution ID: 25

Type: **not specified**

How Teissier mixed multiplicities

Presenter: Mr POPESCU-PAMPU, Patrick (Université de Lille)

Contribution ID: 26

Type: **not specified**

Geometry of some functional architectures of vision

Presenter: Mr PETITOT, Jean