ABSTRACTS

Bierstone Edward: *Resolution except for minimal singularities*

Resolution of singularities leads to a divisor with normal crossings. It therefore makes sense to consider normal crossings singularities acceptable from the start, and try to resolve singularities except for normal crossings. We will discuss the following question (a variant of a problem of Janos Kollar). Can we find the smallest class of singularities S with the following properties: (1) S includes all normal-crossings singularities; (2) every reduced variety X admits a proper birational morphism $f : X' \longrightarrow X$ such that X' has only singularities in S, and f is an isomorphism over the locus of points of X having only singularities in S? The desingularization invariant is well suited to studying such questions. We will need to talk about how to make calculations using the desingularization invariant, guided by examples that are motivated by the question above. (Based on joint work with Pierre Milman.)

Cluckers Raf: *Stability under Lebesgue integration of subanalytic functions and their logarithms*

We will present joint work with Daniel Miller in which we prove the stability under Lebesgue integration of sums of products of globally subanalytic functions and their logarithms.

Dutertre Nicolas: *Radial index and Poincare-Hopf index of 1-forms on semi-analytic sets*

The radial index of a 1-form on a singular set is a generalization of the classical Poincare-Hopf index. We consider different classes of closed singular semi-analytic sets in $\mathbb{R}^n$ that contain 0 in their singular locus and we relate the radial index of a 1-form at 0 on these sets to Poincare-Hopf indices at 0 of vector fields defined on $\mathbb{R}^n$.

Fu Joe: *Theory and applications of the normal cycle*

It is a classical fact that the manifold N(V) of co-normals to a submanifold V of a smooth manifold M is a Lagrangian submanifold of the cotangent bundle of M, and encodes an enormous amount of geometric information about V. It turns out that even if V is replaced by a singular subspace X then there is often an object N (X)— the "(co)normal cycle" of X— canonically associated to X, and containing similar information. In full generality, N(X) is defined measure-theoretically as an integral current in the sense of Federer and Fleming. After reviewing the measure theoretic foundations we will illustrate the power of this perspective via several applications in analytic geometry, and describe some fundamental open problems.

Ghiloni Riccardo: *Effective Hodge decomposition theorem for vector fields defined on bounded Lipschitz semialgebraic open subsets of R^3*

We give an effective version of the Hodge decomposition theorem for the spaces of L^2-vector fields defined on bounded semialgebraic open subsets of R^3 with Lipschitz boundary.

Grandjean Vicent: *On the oscillation of gradient trajectories of restricted functions to singular surfaces. (Joint work with Fernando Sanz)*

Given a real analytic function germ f and real analytic surface germ S, at the origin O of $\mathbb{R}^n$. We assume that $\mathbb{R}^n$ is equipped with a real analytic metric in a neighbourhood of O. Any connected component of the germ of S_{reg} is equipped with the induced metric from the ambient space. For X the germ at O of the closure of a connected component of S_{reg}, we want to know whether any gradient semi-trajectory of the function f restricted to X, ending-up at O, oscillates, spirals or has neither of these behaviours. I explain what is happening in the isolated singularity case and, if time allows it, I will quickly deal with the non-isolated case.

Grigoriev Dima: *Nash conjecture for binomial varieties and multidimensional Euclidean algorithm*

Nash algorithm for desingularization consists in consecutive taking closures of the graphs of the Gauss map. Nash conjectured that for any variety over a field of zero characteristic the algorithm terminates, thus providing its desingularization.

We establish an equivalence of the Nash algorithm for an affine binomial variety V with a multidimensional Euclidean division. Our structure theorem identifies (local) singularities of an irreducible component of V as products of germs of smooth varieties and an irreducible (toric) variety $Y(V)$.

When $\dim(Y(V)) = 2$ we prove a polynomial complexity bound for the composites of normalizations with Nash blowings up.

(This is a joint work with P.Milman)

Le Gal Olivier: *Un résultat de o-minimalité pour des fonctions génériques*

Les structures o-minimales permettent d'obtenir une topologie "modérée" pour les ensembles qu'elles définissent; on connaît en particulier un algorithme de résolution des singularités pour les fonction C infini définissables dans une structure o-minimale polynomialement bornée. D'un autre côté, les études de Thom sur les singularités des fonctions lisses génériques laissent espérer la même "modération" que dans les structures o-minimales polynomialement bornées. On montrera dans cet exposé que la structure engendrée par une fonction C infini restreinte générique est o-minimale et polynomialement bornée.

McCrory Clint: *The weight filtration for complex and real varieties*

I will compare the properties of the weight filtration on the homology of complex and real varieties. A key difference is that the weight spectral sequence collapses for complex varieties but not for real varieties. Some elementary examples will be presented, including a simple case of the Gabrielov-Vorobjov-Zell resolution. I will discuss the construction of the weight filtration and the axioms of Guillen and Navarro Aznar, and I will present work in progress on extending the definition of the weight filtration from Borel-Moore homology to classical homology of real varieties.

Panazzolo Daniel: *Composing the flows of one-dimensional vector fields: looking for relations in the witt algebra via the b-series expansion*

In 1890, Cayley has remarked that it is very convenient to use rooted trees in order to study the composition of flow maps of vector fields. This kind of expansion appears nowadays in many contexts (b-series expansions in compositional methods in numerical analysis, Ecalle's mould-comould arborification, etc.) . In this talk, I will describe how to formulate in this context a very simple problem concerning the existence of nontrivial relations in the group of powers and translations.

Parusiński Adam: *Inverse Function Theorems for semi-algebraic blow-analytic homeomorphisms*
(joint work with T. Fukui and K. Kurdyka) We call a local homeomorphism $h : (R^n, 0) \to (R^n, 0)$ blow-analytic if it becomes real analytic, as a map, after composing with a finite number blowings-up with smooth nowhere dense centers. We show that if h is blow-analytic, its inverse is Lipschitz, and its graph is semialgebraic, then h is bi-Lipschitz and bi-blow-analytic. The proof is by a motivic integration argument, using additive invariants (virtual Betti numbers) on the spaces of arcs.

Paunescu Laurentiu *Enriched Riemann Sphere, Morse Stability and Equi-singularity in $\mathcal{O}_2$*
The *Enriched Riemann Sphere* $\mathbb{C}P^1_*$ is $\mathbb{C}P1$ plus a set of *infinitesimals*, having the Newton-Puiseux field $\mathcal{F}$ as coordinates. Complex Analysis is extended to the *$\mathcal{F}$-Analysis* (*Newton-Puiseux Analysis*). The classical *Morse Stability Theorem* is also extended; the *stability idea* is used to formulate an *equi-singular deformation theorem* in $\mathbb{C}\{x, y\}(= \mathcal{O}_2)$.

Rainer Armin: *Quasianalytic perturbation of polynomials and linear operators*
Given a smooth family of complex univariate polynomials (resp. normal matrices), it is natural to study the regularity of its roots (resp. its eigenvalues and eigenvectors). Using resolution of singularities, considerable progress was recently made for quasianalytic multiparameter families of polynomials (resp. matrices). Similar perturbation results can be obtained for quasianalytic families of unbounded normal operators with compact resolvent and common domain of definition. This requires a differential calculus for quasianalytic mappings beyond Banach spaces, which we recently developed for some quasianalytic Denjoy-Carleman classes. (Joint work with A. Kriegl and P. Michor)

Risler Jean-Jacques: *Sur la courbure totale des ensembles algébriques réels*
A universal inequality between the total curvature of a (affine) real variety and its complexification is proved. Similar inequalities and their sharpness are studied in various cases: algebraic, local analytic, amoebas of curves, smooth tropical varieties.

Sabbah Claude: *Phénomène de Stokes et singularités réelles*
Le phénomène de Stokes des systèmes d'équations différentielles linéaires complexes mélange géométrie complexe et géométrie semi- et sous-analytique réelle. L'exposé fera un survol de quelques résultats récents dans ce domaine.

Spodzieja Stanislaw: *Effective formulas for the local Lojasiewicz exponent*
(joint with Tomasz Rodak) We will present an effective formula for the local Lojasiewicz exponent of a polynomial mapping. Moreover, we will show an algorithm for computing the local dimension of an algebraic set.

Tanabe Susumu: *Topology of the real complete intersection and the logarithmic vector fields tangent to the discriminant*

We examine how the multiplication table on the Jacobian quotient module for the isolated complete intersection singularity calculates the logarithmic vector fields tangent to the discriminant and the bifurcation set. As applications, we establish signature formulae for Euler characteristics of real hypersurfaces and real complete intersections by means of these fields.

Włodarczyk Jaroslaw: *Cohomology of the dual complexes of rational singularities.*

We show that the higher cohomology of the dual complex associated to a resolution of a rational singularity vanish. This is a generalization of a well known fact that the exceptional set in a resolution of rational surface is a tree of rational curves. This is a joint work with Donu Arapura and Parsa Bakhtary.