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ABSTRACTS
(talks and posters)

TALKS

MONDAY

The semiring of values associated to an algebroid curve

Marcelo Hernandes
Universidade Estadual de Maringá
11:00 - 11:45

We introduce the semiring Γ of values with respect to the tropical operations associated to an algebroid curve. As a set, Γ determines and is determined by the well known semigroup of values S. We prove that Γ is always finitely generated in contrast to S. In particular, for a plane curve, we present a straightforward way to obtain Γ in terms of the semiring of each branch of the curve and the mutual intersection multiplicity of its branches. In the analytical case, this allows us to connect directly the results of Zariski and Waldi that characterize the topological type of the curve. The principal ingredient is the concept of Standard Basis for the local ring of the curve that give us a computational method to compute the minimal system of generators of Γ.

Singular Improper Affine Spheres from a Lagrangian Submanifold

Pedro de M Rios
University of Sao Paulo
11:45 - 12:10

Given a Lagrangian submanifold L of an affine symplectic space $\mathbb{R}^{2n}$, one can define uniquely, up to additive constants, a center-chord and a special improper affine sphere, as hypersurfaces in $\mathbb{R}^{2n+1}$. For each of these two improper affine spheres associated to a Lagrangian submanifold L, its set of singularities contains L and, furthermore, these improper affine spheres may present other singularities arbitrarily close to L. We classify the simple stable Lagrangian and Legendrian singularities that may occur in this context.

Betti numbers of tropical varieties

Lucía López De Medrano
UNAM
12:30 - 13:15

Surprisingly enough there exist planar tropical cubic curves of genus g for any non-negative integer g. During this talk, I will present this construction and some generalizations in higher dimension and higher degree.

Joint work with Benoît Bertrand and Erwan Brugallé.

MONDAY

Normal singularities with torus actions
Alvaro Liendo
Universidad de Talca
15:30 - 16:15

A T-variety is a normal variety endowed with a regular action of the algebraic torus T. In 2006, Altmann and Hausen gave a combinatorial description of affine T-varieties that generalizes the usual description of affine toric varieties via polyhedral cones. We call this the AH-description of a T-variety. In this talk, for every affine variety T-variety X, we compute a partial desingularization of X up to a toroidal variety in terms of the AH-description. We apply this partial desingularization to characterize the singularities of X. In particular, we give a criterion for X to have only rational singularities and partial criteria for X to have only Cohen-Macaulay and/or Du Bois singularities.

This talk is based on and joint work with H. Suess and current research with A. Laface and J. Moraga.

Semistable fibrations over the projective line with five singular fibres
Margarita Castañeda Salazar
Posgrado Conjunto UNAM-UMSNH
16:15 - 16:40

We consider a non-isotrivial semistable fibration over the projective line with five singular fibres. In addition, we suppose that the fibration is expressed as the pullback of a pencil on a minimal surface. We will show that $(K_X + F)^2 = 0$ whenever the genus of the general fibre is sufficiently large.

Multiplier ideals of irreducible plane curves
Carlos Rodrigo Guzman Durán
CIMAT
17:10 - 17:55

Multiplier ideals are a recent and important tool in singularity theory and birational geometry. In particular they give information of the singularity of a divisor. However they are difficult to compute in practice because in the algebraic geometry context they are defined through resolution of singularities. We give an effective method to built them in the case of irreducible plane curves using equisingularity invariants of the curve as the Newton pairs and the approximate roots.

MONDAY

Equivariant indices of 1-forms on varieties
Firuza Mamedova
Leibniz University Hannover
17:55 - 18:20

For a G-invariant holomorphic 1-form with an isolated singular point on a germ of a complex-analytic G-variety with an isolated singular point (G is a finite group) one has notions of the equivariant homological index and of the (reduced) equivariant radial index as elements of the ring of complex representations of the group. During my talk I will show that on a germ of a smooth complex-analytic G-variety these indices coincide. This permits to consider the difference between them as a version of the equivariant Milnor number of a germ of a G-variety with an isolated singular point. The talk is based on the joint work with Sabir M. Gusein-Zade.

TUESDAY

Reduction of singularities for vector fields and line foliations in dimension 3
Julio Rebelo
Université de Toulouse
9:30 - 10:15

In dimension 2 Seidenberg theorem asserts that the singularities of a line foliation can be "simplified" by performing (unramified) blow-ups. Moreover all the final models provided by Seidenberg theorem possess at least one eigenvalue different from zero. In dimension 3 however, this analogous statement no longer holds as shown by Sanz and Sancho. Recently this topic has been the object of two major works: Cano, Roche, and Spivakovsky have worked out a reduction procedure using unramified blow-ups though some of their final models have all eigenvalues equal to zero. On the other hand, McQuillan and Panazzolo have successfully used ramified blow-ups to obtain final models having one eigenvalue different from zero but the resulting ambient space is an orbifold, as opposed to a smooth manifold.

In this talk, we will build on these works to obtain a reduction of singularities theorem that is arguably sharp. We will also provide an application of this statement to the reduction of singularities of vector fields defined on compact complex manifolds of dimension 3. This is joint work with H. Reis.

The Bi-Lipschitz Equisingularity on Determinantal Surfaces in $\mathbb{C}^4$
Thiago Filipe da Silva
ICMC/USP
10:15 - 10:40

T. Gaffney started the study about Bi-Lipschitz equisingularity from a perspective of his previous works in Whitney equisingularity. In these works, the study of the equisingularity condition is developed in two directions. The first one is the study of a suitable notion of integral closure for modules, applying to the jacobian module of a singularity. The other one is going through analytic invariants which control a particular stratification condition. In his work, Gaffney got a sufficient algebraic condition so that a family of curves is Bi-Lispchitz equisingular, using the concept of integral closure of ideals. Further, some equations was obtained relating the Milnor number, the multiplicity and the second Segre number of a plane curve X. We conjecture that similar equations may be obtained in the case of families of determinantal surfaces in $\mathbb{C}^4$ using the Milnor number for this kind of surface defined by Pereira and Ruas. We also hope to get similar conditions so that this family is Bi-Lipschitz equisingular. This is a work in progress with M. Pereira and N. Grulha.

TUESDAY

On Segre numbers of homogeneous map germs
Michelle Morgado
UNESP
11:00 - 11:45

Segre numbers and Segre cycles of ideals were independently introduced by Tworzewski, by Achilles and Manaresi and by Gaffney and Gassler. They are generalization of the Lê numbers and Lê cycles, introduced by Massey. In this article we give Lê-Iomdine type formulas for these cycles and numbers of arbitrary ideals. As a consequence we give a Plücker type formula for the Segre numbers of ideals generated by weighted homogeneous functions, in terms of their weights and degree. As an application of these results, we compute, in a purely combinatorial manner, the Segre numbers of the ideal which defines the critical loci of a map germ defined by a sequence of central hyperplane in $\mathbb{C}^{n+1}$.

Detecting bifurcation values of polynomial maps
Luis Renato G. Dias
Universidade Federal de Uberlândia
11:45 - 12:10

Let $f : \mathbb{R}^n \to \mathbb{R}^p$ be a polynomial mapping, $n \geq p$. The bifurcation values of f is the smallest subset $B(f) \subset \mathbb{R}^p$ such that f is a locally trivial fibration over $\mathbb{R}^p \setminus B(f)$. We present an effective estimation of the nontrivial part of $B(f)$.

Algebraically closed fields containing the ring of power series
Víctor Manuel Saavedra Calderón
UNAM
12:30 - 13:15

We introduce a family of fields of series with support in strongly convex rational cones and coefficients in a field of positive characteristic. All these fields are algebraically closed and contain the ring of power series in several variables. As a consequence of our main theorem we extend the McDonald theorem to positive characteristic.

TUESDAY

Optimal bounds for T-singularities in stable surfaces

Giancarlo Urzua Elia
PUC Chile
15:30 - 16:15

Kollár and Shepherd-Barron (1988) introduced a natural compactification to the Gieseker moduli space of surfaces of general type, which is analogous to the Deligne-Mumford (1969) compactification of the moduli space of curves of genus $g > 1$. This compactification is coarsely represented by a projective scheme (due to Kollár 1990) because of Alexeev's proof of boundedness (1994). Thus we have a proper KSBA moduli space of stable surfaces, which includes classical canonical surfaces of general type. In particular, after fixing the self-intersection of the canonical class, we have a finite list of singularities appearing on stable surfaces. It is hard to give that list. T-singularities $1/dn^2(1, dna-1)$ (with $gcd(n,a) = 1$ and $n > 1$) form a remarkable set of singularities in stable surfaces, since they are precisely the ones showing up in normal degenerations of canonical surfaces in the KSBA compactification. This talk is about optimal bounds for singularities on stable surfaces W with one T-singularity. The bound depends linearly on K_W^2, and it is optimal when W is not rational. I will show examples achieving the bound for each Kodaira dimension of the minimal resolution of W. I will mention what we know when W is rational, putting together our approach with Alexeev's proof.

This is a joint work with Julie Rana.

Kato-Matsumoto type results for the image Milnor fiber

Matthias Zach
Leibniz Universitaet Hannover
16:15 - 16:40

We bound the (homological) connectivity of the image Milnor fiber of a holomorphic map germ $f : (\mathbb{C}^n, 0) \to (\mathbb{C}^{n+1}, 0)$ by means of the dimension of the locus of instability. Our methods apply in the case of corank 1.

Characteristic p, Hypersurfaces Singularities and Milnor Number

João Hélder Rodrigues
UFF - Universidade Federal Fluminense
17:10 - 17:55

The aim of this talk is to discuss some aspects of hypersurfaces singularities in characteristic p, mainly isolated singularities. We will see how some problems with the well known definition m μ as the codimension of the gradient ideal are related with counter-examples of Bertini's Theorem in characteristic p. We also use a bit of Commutative Algebra to present a consistent definition for μ in arbitrary characteristic. If time permits we can also discuss an extension of the μ^* sequence introduced by Teissier to characteristic p hypersurface singularities.

TUESDAY

Modified multiple point spaces
Guillermo Peñafort Sanchis
UFSCar
17:55 - 18:20

We introduce a new approach to multiple point spaces of high corank mappings. Our new spaces satisfy many natural properties, are easily computable, and in many cases they coincide with Kleiman's multiple point schemes. Finally, our spaces characterize A-finite determinacy for arbitrary corank maps in a wide range of dimensions, in the same manner as Mond's multiple point spaces do for corank one germs.

WEDNESDAY

Singularities of equidistant submanifolds (support front)
Ricardo Uribe Vargas
Université de Bourgogne Franche Comté
9:30 - 10:15

In classical differential geometry the "support function" of a given closed convex curve enables to describe the equidistant curves and their singularities. We show that the graph of the support function of a plane curve contains all local and global geometric information of the initial curve, of its equidistants and of its evolute (caustic). Moreover, to any plane curve (without convexity restrictions) corresponds a curve on the unit cylinder (the graph of a "multivalued function") and vice-versa. We establish the correspondence between Euclidean differential geometry of plane curves and projective differential geometry of curves on the unit cylinder the "support map", which sends any plane curve to a curve on the unit cylinder. We give the geometric construction of the natural isomorphism between the surface (in space-time) formed by the union of equidistants of a plane curve with the dual surface of the graph of the support function (the subvariety formed by the planes of $\mathbb{R}^3$ which are tangent to the graph). All our constructions and results hold in Euclidean spaces of higher dimensions for submanifolds of any dimension. Theorem. For any class of singularities X the set of singularities of type X of the evolute of a smooth submanifold M of $\mathbb{R}^n$ is isomorphic to the set of singularities of type X in the front formed by the hyperplanes of $\mathbb{R}^{n+1}$ which are tangent to the image of M by the support map (in the unit cylinder C_n) by the support map. The talk will be elementary and with many pictures.

Stability of relative degree
Maria Michalska
ICMC, Universidade de Sao Paulo
10:15 - 10:40

Let S be an unbounded subset of R^n. Consider a polynomial f. Let $\deg_S f$ be the smallest degree of a polynomial h such that $f < h$ on S. We call such a number the degree of f relative to S. Analogously, one can define a multiplicity at 0 relative to a set S such that 0 lies in its closure. Consider a real polynomial mapping $(g_1, \ldots, g_k) : R^n \to R^k$ and its sublevel set S_c, where $c \in R^k$, given by inequalities $g_1 < c_1, \ldots, g_k < c_k$. We show that there exists a semialgebraic set $V_g \subset R^k$ of positive codimension such that if c, C are contained in the same connected component of $R^k \setminus V_g$, then the relative degrees coincide i.e. $\deg_{S_c} \equiv \deg_{S_C}$. Analogous property is true for the relative multiplicity. To prove this, we will construct an appropriate compactification of R^n via resolution of singularities. We will discuss the relation of V_g with bifurcation values at infinity of g, the moment problems and Positivstellensaetze. This is joint work with V. Grandjean.

WEDNESDAY

Local uniformization and reduction to rank one
Josnei Novacoski
ICMC-USP
11:00 - 11:45

In this talk we will give an overview about the local uniformization problem. This problem can be seen as a local version of the resolution of singularities problem for algebraic varieties. Local uniformization is one of the two main steps in Zariski's approach for resolution of singularities, which is still open in positive characteristic. We will also present our joint work with Mark Spivakovsky, where we show that in order to prove local uniformization, it is enough to prove it for rank one valuations. We will also discuss our recent work which generalizes the reduction to the rank one case for valuations centered on an algebraic variety not necessarily reduced.

On the topology of smooth map-germs near a critical point
Aurélio Menegon Neto
Universidade Federal da Paraíba
11:45 - 12:10

We study the topology of differentiable map-germs $(\mathbb{R}^n, 0) \xrightarrow{f} (\mathbb{R}^k, 0)$, $n \geq k \geq 2$, near a critical point. The starting point is Milnor's celebrated theorem (see the text below) stating that if f is a complex valued holomorphic function, then one has two locally trivial fibrations which are essentially equivalent. The first is a fibration $\mathbb{S}_\varepsilon \setminus f^{-1}(0) \xrightarrow{\frac{f}{|f|}} \mathbb{S}^1$, where $\mathbb{S}_\varepsilon$ is a sufficiently small sphere around $0 \in \mathbb{C}^m$, while the second is a local *"tube fibration"*. Milnor also discusses in his book the real analytic case restricted to the rather stringent condition that f has an isolated critical point. This gave rise to interesting work by several authors. Later Pichon-Seade extended the discussion to real analytic functions with an isolated critical value, which is more general but still rather stringent. Here we study the general case of smooth functions (not necessarily analytic) and arbitrary critical set, subject to two conditions which are stringent but rather general. The first of these grants that we have a local *tube fibration* away from the discriminant. The second condition grants that up to a homeomorphism, this local tube fibration determines an equivalent fibration on small spheres.

On Higher order Whitney conditions
Arturo Enrique Giles Flores
Universidad Autónoma de Aguascalientes
12:30 - 13:15

For a germ of complex analytic singularity $(X, 0)$ we use the concepts of generalized tangent spaces and the related Higher Nash blowups to define higher order Whitney conditions. We will talk about their basic properties and give a couple of examples. This is joint work with Roberto Callejas-Bedregal and Daniel Duarte.

WEDNESDAY

Deforming Spaces Of M-Jets Of Hypersurfaces Singularities
Maximiliano Leyton
Universidad de Talca
15:30 - 16:15

Let K be an algebraically closed field of characteristic zero, and V a hypersurface defined by an irreducible polynomial f with coefficients in K. In this talk we prove that an Embedded Deformation of V which admits a Simultaneous Embedded Resolution induces, under certain mild conditions, a deformation of the reduced scheme associated to the space of m-jets V_m, $m \geq 0$.

Milnor fibration to discriminant of dimension one of real analytical map
Rafaella de Souza Martins
Universidade de São Paulo
16:15 - 16:40

Milnor proves the existence of, what we call today, the Milnor Fibration, for polinomial function $f : (\mathbb{C}^n, \underline{0}) \longrightarrow (\mathbb{C}, 0)$. Later, Lê presented a new version of this result, what is known as the Milnor-Lê Fibration. The first fibration is a projection on the unitary sphere and the second is in the Milnor tube, $N(\epsilon, \delta) = \mathbb{B}^n_\epsilon \cap f^{-1}(\mathbb{S}^1_\delta)$. The approach used in our problem is closer to the last fibration. The isolated singularity case was wide investigated and still has interesting open questions, although much more questions remains open in the non-isolated case. This talk is dedicate tho the non-isolated critical values case. In our work, we study the discriminant of a function f, denoted by Δ_f. In the category of subanalytic subsets. Applying results on Whitney stratifications, with w -regularity it was possible to guarantee the main result of lecture:

Theorem: Let $f : (\mathbb{R}^n, 0) \longrightarrow (\mathbb{R}^k, 0),\ n < k \leq 2$ be a real analytic map-germs with dim $\Delta_f = 1$. Then $f_{|\mathcal{A}} : \mathcal{A} \longrightarrow \mathcal{Y}$ is a locally trivial topological fibration, where $\mathcal{A} := f^{-1}(\Delta_f \cap \overset{\circ}{\mathbb{D}}{}^*_\eta) \cap \mathbb{B}^n_\epsilon$, $\mathcal{Y} := \Delta_f \cap \overset{\circ}{\mathbb{D}}{}^*_\eta$, with $\epsilon > 0$ sufficiently small.

In our work we consider linear discriminant. Improving the number of interesting examples of Milnor fibrations for the real case. We search more applications for the results obtained.

This research was developed with Aurélio Mengon Neto and Nivaldo Grulha.

WEDNESDAY

Surfaces with non isolated singularities
Otoniel Nogueira da Silva
University of São Paulo
17:10 - 17:55

In this talk, we speak about the topological triviality and Whitney equisingularity of families of surfaces parametrized by finitely determined map germs from $\mathbb{C}^2$ to $\mathbb{C}^3$.

Poincaré-Hopf Index Formula Associated With Certain Real Algebraic Surfaces
Miguel Guadarrama
UNAM
17:55 - 18:20

We will present an index formula for the field of asymptotic lines involving the number of connected components of the projective Hessian curve of f and the number of godrons. As an application of this, we obtain upper bounds, respectively, for the number of godrons having an interior tangency and when they have an exterior tangency. We will analyse the extension to the real projective plane of both fields of asymptotic lines and the Poincaré index at its singular points at infinity. Also, we will show certain criteria to determine when the parabolic curve is compact and when the unbounded component of its complement is hyperbolic or elliptic.

THURSDAY

On specialization of Milnor classes for singular varieties
Roberto Callejas-Bedregal
Federal University of Paraiba
11:45 - 12:10

Chern classes had played an important role in Complex Geometry and Algebraic Geometry ever since its introduction by S-S Chern in 1946. Chern classes are characteristic classes associated to smooth complex manifolds or smooth algebraic varieties.In this talk I will address the two most important generalization which have appeared in the literature for singular varieties, the so called Fulton-Johnson and Schwartz-MacPherson classes. The difference between those two classes is the so called Milnor class, which is a class supported on the singular locus of the variety. In this talk I will be mostly concerned with the specialization of this Milnor class when the variety is deformed in a flat one-parameter family of varieties.

Holomorphic flows on analytic spaces
Adolfo Guillot
UNAM
12:30 - 13:15

The existence of a holomorphic flow on an analytic space imposes restrictions upon the nature of the singularities of the space. We will talk about a result that states that, in Stein singular surfaces endowed with a holomorphic flow, the singularities are either quasihomogeneous or cyclic quotient ones.

Indefinite fibrations on differentiable 4-manifolds
Osamu Saeki
Kyushu University
15:30 - 16:15

A broken Lefschetz fibration (BLF, for short) is a smooth map of a closed oriented 4-manifold onto a closed surface whose singularities consist of Lefschetz critical points together with indefinite folds (or round singularities). Such a class of maps was first introduced by Auroux-Donaldson-Katzarkov (2005) in relation to near-symplectic structures. In this talk, we give a set of explicit moves for BLFs, and give an elementary and constructive proof to the fact that any map into the 2-sphere is homotopic to a BLF with embedded round image. We also show how to realize any given null-homologous 1-dimensional submanifold with prescribed local models for its components as the round locus of a BLF. These algorithms allow us to give a purely topological and constructive proof of a theorem of Auroux-Donaldson-Katzarkov on the existence of broken Lefschetz pencils with embedded round image on near-symplectic 4-manifolds. We moreover establish a correspondence between BLFs and Gay-Kirby trisections of 4-manifolds, and show the existence of simplified trisections on all 4-manifolds. This is a joint work with R. Inanc Baykur (University of Massachusetts).

THURSDAY

Motivic String Amplitudes
Wilson A. Zuniga
Cinvestav
16:15 - 16:40

The talk aims to discuss the connections between p-adic string amplitudes with the theory of local zeta functions. We will present the motivic versions (in the sense of motivic integration) of the p-adic string amplitudes and discuss some applications.

On the complexity of polynomial perturbations of integrable systems
Laura Ortiz
UNAM
17:10 - 17:55

We present the results of a recent joint work with Pavao Mardesic, Dmitry Novikov and Jessie Pontigo-Herrera.

We will consider polynomial perturbations of polynomial integrable systems. Fixing a loop on a regular fiber, and fixing a perturbation, there is a displacement function associated to them. The first nonzero term of the displacement function is known as the first non zero Melnikov function and it depends on the perturbation. This function is expressed by an iterated integral. We will explain how to provide a universal bound for the complexity (depth) of such integral in terms of the geometry of the unperturbed system.

FRIDAY

Resolution of singularities of the cotangent sheaf of a singular variety
Andre Belotto da Silva
Université Paul Sabatier – Toulouse III
9:30 - 10:15

The subject of the talk is resolution of singularities of differential forms on an algebraic or analytic variety. We address the problem of finding a resolution of singularities $\sigma : X \to X_0$ of a singular algebraic or analytic variety X_0 such that the pulled back cotangent sheaf of X_0 (i.e., the pull-back of the differential forms defined in X_0) is given, locally in X, by monomial differential forms (with respect to a suitable coordinate system). This problem is related with monomialization of maps, the L^2 cohomology of singular varieties and reduction of singularities of vector-fields. In a work in collaboration with Bierstone, Grandjean and Milman, we give a positive answer to the problem when $\dim X_0 \leq 3$.

A new singularity in the multiplication of polynomials
Enrique Vega Castillo
Fac.Ciencias, UNAM
10:15 - 10:40

(Joint work with Santiago López de Medrano) The multiplication of monic polynomials of degree n and m defines a mapping $\mathbb{R}^{n+m} \to \mathbb{R}^{n+m}$. The singularities of this mapping at a point (P, Q) have been studied by M.Chaperon and SLdM, and depend on the $mcd(P, Q)$. In this talk we will give the general idea and describe the singularity that appears in a case not studied before.

Equisingularity of map germs from a surface to the plane
Bruna Oréfice Okamoto
Universidade Federal de São Carlos
11:00 - 11:45

Let $(X, 0)$ be an ICIS of dimension 2 and let $f : (X, 0) \to (\mathbb{C}^2, 0)$ be a map germ with an isolated instability. We look at the invariants that appear when X_s is a smoothing of $(X, 0)$ and $f_s \to B_\epsilon$ is a stabilization of f. We find relations between these invariants and also give necessary and sufficient conditions for a 1-parameter family to be Whitney equisingular.

Joint work with J. J. Nuño-Ballesteros and J. N. Tomazella.

FRIDAY

The local Euler obstruction of generic determinatal varieties
Nivaldo Grulha
Universidade de São Paulo
11:45 - 12:10

In the 1970s MacPherson proved the existence and uniqueness of Chern classes for possibly singular complex algebraic varieties. The local Euler obstruction, defined by MacPherson in that paper, was one of the main ingredients in his proof. The computation of the local Euler obstruction is not easy; various authors propose formulas which make the computation easier. In a paper that published in 2000, Brasselet, Lê and Seade give a Lefschetz type formula for the local Euler obstruction. The formula shows that the local Euler obstruction, as a constructible function, satisfies the Euler condition relative to generic linear forms. In order to understand this invariant better, some authors worked on some more specific situations. For example, in the special case of toric surfaces, an interesting formula for the Euler obstruction was proved by Gonzalez–Sprinberg, his formula was generalized by Matsui and Takeuchi for normal toric varieties. A natural class of singular varieties to investigate the local Euler obstruction and the generalizations of the characteristic classes is the class of generic determinantal varieties. Roughly speaking, generic determinantal varieties are sets of matrices with a given upper bound on their ranks. Their significance comes, for instance, from the fact that many examples in algebraic geometry are of this type, such as the Segre embedding of a product of two projective spaces. In a joint work with M. Ruas and T. Gaffney, we prove a formula that allow us to compute the local Euler obstruction of generic determinantal varieties using only Newton binomials. Using this formula we also compute the Chern–Schwartz–MacPherson classes of such varieties.

Singularities arising in the multiplication of polynomials.
Santiago López de Medrano Sánchez
UNAM
12:30 - 13:15

(Joint work with Marc Chaperon and Enrique Vega). The multiplication of two general real monic polynomials of degree n and m defines a mapping $R^{n+m} \to R^{n+m}$ which is a local diffeomorphism at a point (P, Q) if, and only if, the polynomials are relatively prime. The singularity type at a point where the greatest common divisor of P and Q is of positive degree was studied for a certain number of cases (Chaperon-LdM). In this talk we will give a general view of the theory and introduce a new singularity type obtained in joint work with Enrique Vega, who will describe it in detail.

POSTERS

TUESDAY

Minimal CW model for the configuration space of the complex projective space

Cesar Augusto Ipanaque Zapata
ICMC-Universidade de São Paulo

A model for a topological space is a CW complex homotopy equivalent to it. In the best case, such models are chosen to be minimal, that is, they are chosen such that have the minimum number of cells consistent with its homology, namely, one n-cell for each Z summand of H_n and a pair of cells of dimension n and $n+1$ for each Z_k summand of H_n. In this poster, I will show a minimal CW model for the configuration space of 2-distinct points in the complex projective space.

The local Euler obstruction and its generalizations

Hellen Santana
ICMC-USP

The local Euler obstruction was defined by MacPherson, in [3], as a tool on the study of characteristics classes of singular varieties. In [1], Brasselet, Massey, Parameswaran and Seade present a generalization of this concept, adding informations of an analytic function f with isolated singularity, defined over a singular variety, called the Euler obstruction of a function f. More recently, in [2], Dutertre and Grulha have presented another generalization of the local Euler obstruction, called Brasselet Number, which is well defined even if f has non-isolated singularity. In this work, we present some questions about the local Euler obstruction and its generalizations. The goal is to search for relations between the Brasselet Number and other invariants, like the Lê Number, as well as search for formulas to simplify its calculation and then, with those relations, evaluate implications about the topology of functions defined over singular varieties.

References

[1] J.-P. Brasselet, D. Massey, A. J. Parameswaran, J. Seade, *Euler obstruction and defects of functions on singular varieties*, Jornal London Math. Soc. (2), 70 (2004).

[2] N. Dutertre, N. Grulha, *Lê-Greuel type formula for the Euler obstruction and applications*, Adv. Math. 251 (2014), p. 127-146.

[3] R. D. MacPherson, *Chern classes for singular algebraic varieties*, Ann. of Math. 100,(1974), 423-432.

TUESDAY

Geometry and equisingularity of finitely determined map germs from C^n to C^3, $n > 2$.

Marcelo Saia
ICMC-Universidade de São Paulo

The study of the geometry of the singularities of map germs is one of the main questions in singularity theory. A key tool to better understanding of the geometry is the description of all strata which appear in the critical locus $\Sigma(f)$, in the discriminant $\Delta(f)$, and in the hypersurface $X(f)$. Moreover, in these sets we can study the numerical invariants that control triviality conditions in families of map germs. In this article, first we investigate the geometry of finitely determined map germs $f : (C^n, 0) \to (C^3, 0)$ with $n \geq 3$, in the second section we give an explicity description of all strata in these dimensions and, with the aid of a computer system, we show in an explicity way how to compute them in several examples. Concerning the Whitney equisingularity, Gaffney describes the following problem: "Given a 1-parameter family of map germs $F\colon (C \times C^n, (0, 0)) \to (C \times C^p, (0))$, find analytic invariants whose constancy in the family implies the family is Whitney equisingular." He shows that for the class of finitely determined map germs of discrete stable type, the Whitney equisingularity of such a family is guaranteed by the invariance of the zero stable types and the polar multiplicities associated to all stable types. A natural question is to find a minimal set of invariants that guarantee the Whitney equisingularity of the family. Gaffney and Vohra in studied map germs from n-space to the plane, with $n \geq 3$. In this case they showed that the top dimensional stratum of the inverse image of the discriminant carries all information necessary to determine if the family of map germs is Whitney equisingular, in fact they showed that Lê numbers of this stratum control all other invariants needed for the Whitney equisingularity. In this work we show that the Whitney equisingularity of $X(f)$ also implies the Whitney equisingularity of the strata in $\Sigma(f)$, and on the other hand, we use the Lê numbers also for the discriminant $\Delta(f)$, instead of the polar multiplicities, as done in a previous work by the authors, moreover we show that the corank one condition is not needed.

Singularities of Gauss mappings of hypersurfaces in $\mathbb{R}^4$

Maria Carolina Zanardo
ICMC - USP

Following the ideas of T. Banchoff, T. Gaffney and C. McCrory on the book Cusps of Gauss Mappings, we provide in this work different geometrical characterizations for the singularities that may appear in the Gauss map of a generically immersed 3-manifold in $\mathbb{R}^4$.

WEDNESDAY

Curvature parabola and asymptotic directions for corank 1 surfaces in $\mathbb{R}^4$
Pedro Benedini Riul, CMC/USP

We study the geometry of surfaces in $\mathbb{R}^4$ with corank 1 singularities. At the singular point we define the curvature parabola using the first and second fundamental forms of the surface. R. Mendes and J.J. Nuño-Ballesteros give a partition in four orbits of all corank 1 map germs $f : (\mathbb{R}^2, 0) \to (\mathbb{R}^4, 0)$ acording to their 2-jets under the action of $\mathcal{A}^2$. We show that the curvature parabola distinguishes the four types of corank 1 singularities only by looking at the type of degeneracy of the parabola. We also show that two corank 1 2-jets $(\mathbb{R}^2, 0) \to (\mathbb{R}^4, 0)$ are equivalent under the action of the subgroup $\mathcal{R}^2 \times \mathcal{O}(4)$ iff there exists an isometry between the normal planes preserving the respective curvature parabola. Therefore, the curvature parabola contains all the local second order geometrical information of the surface. The definition and some results about asymptotic directions are given.

On a Varchenko's Lemma and Higher bilinear forms induced by Grothendieck Duality on the Milnor algebra of an Isolated Hypersurface Singularity
Miguel Angel De La Rosa Castillo, Univ. Juárez Autónoma de Tabasco

For an isolated hypersurface singularity $f : (\mathbb{C}^{n+1}, 0) \to (\mathbb{C}, 0)$ with Milnor number μ and good representative $f : (X, 0) \to (\Delta, 0)$ canonical μ-dimensional $\mathbb{C}$-bilinear vector spaces are associated: the Milnor algebra, A_f, and the cohomology of the canonical Milnor fibre, H. Indeed, on the algebra A_f one has defined the non-degenerate Grothendieck pairing $res_{f,0}$ which is a symmetric $\mathbb{C}$-bilinear form, and on vanishing cohomology H it is defined a non-degenerate $\mathbb{C}$-bilinear form bS, induced by Poincaré duality, which is $(-1)^{n+1}$-symmetric on the generalized monodromy eigenspace H_1 and $(-1)^n$-symmetric on the direct sum of generalized monodromy eigenspaces $H_{\neq 1} := \oplus_{\lambda \neq 1} H_\lambda$. On the other hand, there are two nilpotent $\mathbb{C}$-linear maps defined on A_f and H respectively; the first one is the map $\{\mathbf{f}\}$ given by multiplication with f, which is $res_{f,0}$-symmetric, and the other one is the bS-antisymmetric endomorphism N given by the logarithm of the unipotent part of the monodromy transformation. New bilinear forms can be constructed by composing on the left (or equivalently on the right) with powers of such nilpotent maps: $res_{f,0}(\{\mathbf{f}\}^j \bullet, \bullet)$ and $bS(N^l \bullet, \bullet)$ for $j, l \geq 1$. These new bilinear forms are called higher bilinear forms on A_f resp. on H. In this work, we show a formula which relates the powers $\{\mathbf{f}\}^j$ to the powers N^l. Our proof, which is a consequence of some Varchenko's result obtained in the 1980's, uses the Laurent series (asymptotic) expansions of elements in the Milnor Algebra with respect to the Malgrange-Kashiwara's cV-filtration. Finally, when the relation between K. Saito pairing and Grothendiek pairing is considered such a formula provide us with a result that gives an additive expansion for each higher bilinear form on A_f expressed in terms of the higher bilinear forms on H and depending on the asymptotic expansions for the top forms on A_f where these bilinear forms act.

WEDNESDAY

Equisingularity of Symmetric Determinantal Singularities

Michelle Molino
Universidade Federal Fluminense

A lot of work has been done in recent years in equisingularity of determinantal singularities. This poster is a report of a work in progress with Professor Terence Gaffney in the framework of symmetric determinantal singularities.

The geometry of profiles of surfaces in $\mathbb{R}^3$

Mostafa Salarinoghabi
Unifei

We consider in this work the geometry of the profile of a smooth surface in $\mathbb{R}^3$ and the way it changes as the direction of projections varies locally in the unit 2-sphere. The key geometric features of the profile are its singularities, inflections and vertices. We locate these on the profile and on its deformations. We also study the deformations of the evolute of the profile.