

Conference program

Holomorphic foliations in Alsace

Strasbourg – 23-27 October 2017

Monday, October 23 (IRMA)

9h15-10h Welcome

10h-10h50 Bertrand DEROIN (Cergy-Pontoise)

Supra-maximal representations and Painlevé VI equations

I'll describe some representations from fundamental groups of punctured spheres to the group $PSL(2, \mathbb{R})$, that we called supra-maximal, and their relations with Painlevé VI equations. Joint work with Nicolas Tholozan.

11h-11h50 Daniel PANAZZOLO (Mulhouse)

Singularities of foliations and GIT

We will see that some classification problems for germs of singular foliations can be rephrased using an infinite dimensional analog of geometric invariant theory. In particular, we will discuss an application of Kempf's instability theory to the problem of resolution of singularities of foliations.

12h-14h Lunch break

14h-14h50 Enrica FLORIS (Poitiers)

Invariance of plurigenera for foliations on surfaces.

Recently, Brunella and McQuillan proved some of the main results of birational geometry in the setup of foliations on surfaces. In this talk, we will discuss to which extent the theorem of Invariance of Plurigenera is true for foliations on surfaces. This is a joint work with Paolo Cascini.

15h-15h30 Coffee break

15h30-16h20 Benoît CLAUDON (Rennes)

Representations of Kähler and quasi-projective groups in the group of formal diffeomorphisms in one variable.

I will explain the following dichotomy for representations of fundamental groups of Kähler manifolds or of smooth quasi-projective varieties into the group of formal diffeomorphisms in one variable: either the image of the representation is virtually abelian or the representation (essentially) factors through an orbicurve. The motivation comes from the foliated situation and it will appear clearly in Frédéric Touzet's talk. This is joint work with Frank Loray, Jorge Vitório Pereira and Frédéric Touzet.

16h30-17h20 Olivier THOM (Rennes)

Bifoliated neighborhoods of curves

Given a compact curve C , we want to study two-dimensional neighborhoods of C which are equipped with two foliations both having C as a leaf. I will present the classification of such neighborhoods, up to diffeomorphism and up to shrinking the neighborhood, when C has a low genus (1 or 2).

Tuesday, October 24 (IRMA)

9h30-10h20 Nuria CORRAL (Santander)

About the topology of the jacobian curve of two singular foliations

The jacobian curve of a pair of singular foliations is the contact curve of the foliations. In this talk, we will describe properties of the equisingularity type of the jacobian curve in terms of local invariants of the foliations.

10h30-11h Coffee break

11h-11h50 Frédéric TOUZET (Rennes)

Compact leaves of codimension one foliations.

This is the foliated counterpart of B. Claudon's talk. In particular, we provide a partial answer to the following conjecture: Let \mathcal{F} a cod 1 foliation on a projective manifold admitting a compact leaf; then either \mathcal{F} is transversely affine, either \mathcal{F} is a pullback of a foliation on a surface. Joint work with Claudon, Loray and Pereira.

12h30-14h Lunch break

14h-14h50 Victor KLEPTSYN (Rennes)

Around the group actions on the circle

The world of one-dimensional actions of groups that do not preserve a measure is split into two highly different kingdoms: the actions that are locally discrete and the ones that are not. Those that are not locally discrete (that is, for which there exists an interval I and a sequence of elements whose restrictions on I are non-identical, but converge to the identity) are already well-understood. Their dynamics is quite rich (by the argument of Loray-Rebelo-Nakai-Scherbakov the local closure of such an action contains a local flow), that allows to establish ergodicity, topological rigidity (a recent work of Rebelo and Eskif), etc.

On the other hand, the kingdom of locally discrete actions is much less understood. I will speak on recent advances in our common project with B. Deroin, A. Navas, D. Filimonov, M. Triestino, D. Malicet, S. Alvarez and C. Meniño, devoted to the study of such actions. In particular, in all the cases except for one (the « Missing Case Conjecture »), we establish the « star » property for such an action, allowing to launch an expansion procedure (thus establishing ergodicity for minimal actions and zero Lebesgue measure for the exceptional minimal sets). We also conclude in these cases that the action admits (in a sense) a Markov partition; the latter can then be used to classify such actions.

15h-15h30 Coffee break + Poster session

15h30-16h20 Gabriel CALSAMIGLIA (Niterói)

The Riemann-Hilbert mapping on \mathfrak{sl}_2 -systems

The Riemann-Hilbert mapping on \mathfrak{sl}_2 -systems associates, to any \mathfrak{sl}_2 connection on a trivial bundle $X \times \mathbb{C}^2$ over compact Riemann surface X , the class of its monodromy representation in the SL_2 -character variety. We prove that the Riemann-Hilbert mapping is a local diffeomorphism around any point of genus $g=2$ with irreducible monodromy by using two different strategies.

Work in collaboration with B. Deroin, V. Heu and F. Loray.

See <https://arxiv.org/abs/1605.01916>

16h30-17h20 Michael MCQUILLAN (Roma)

Stable reduction of foliated surfaces

Most of the remaining problems in foliated surfaces suffer from a lack of a good moduli space with similar functorial properties to say $M_{g,1} \rightarrow M_g$. The necessary technical lemma for establishing such a thing is to define a class of foliated surfaces which are the unique limits of foliated surfaces of general type with log-canonical singularities. In particular it involves a subtle extension to a restricted class of foliated 3-folds of known results on foliated 3-folds, i.e. the existence of a resolution of singularities and a minimal model. The lemma is currently being written by Bogomolov's student, Federico Buonerba, and I will report on his progress.

Wednesday, October 25 (IRMA)

9h-9h50 Marcelo HERNANDES (Maringá)

The semiring and semimodule associated to an algebroid curve

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 and 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 . This idea can be apply in other situations, for example to compute the set of values (a semimodule) of an fractionary ideal of the local ring.

10h-10h30 Coffee break + Poster session

10h30-11h20 Helena REIS (Porto)

On reduction of singularities for foliations in dimension 3

A classical result due to Seidenberg states that for every holomorphic foliation on a complex surface, there exists a finite sequence of (one-point) blow-ups such that the transformed foliation possesses only elementary singular points (i.e. singular points possessing at least one eigenvalue different from zero). In dimension 3 however, the natural analogue of Seidenberg theorem no longer holds as shown by Sanz and Sancho. Recently this topic has been the object of two major works: Cano, Roche and Spivakovskiy 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 at least one eigenvalue different from zero. The resulting ambient space is, however, 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.

11h30-12h20 Jorge PEREIRA (Rio de Janeiro)

Effective algebraic integration in bounded genus

We consider birational invariants for foliations on projective surfaces built from the adjoint linear series of positive powers of the canonical bundle of the foliation. They turn out to be useful to investigate the effective algebraic integration of foliations on the projective plane. In particular, we describe the Zariski closure of the set of foliations on the projective plane of degree d admitting rational first integrals with fibers having geometric genus bounded by g . (Joint work with Roberto Svaldi)

12h30 Lunch. The afternoon is free

Thursday, October 26 (IRMA)

9h-9h50 Marcel NICOLAU (Cerdanyola)

On the automorphism group of a transversely holomorphic foliation

It is known that the group of smooth diffeomorphisms preserving a smooth foliation is not necessarily a Lie group (of infinite dimension) in any reasonable sense. However one can expect that, for foliations endowed with certain geometric structures, the corresponding automorphism group are Lie groups in a natural way.

We prove that the automorphism group $\text{Aut}(M, \mathcal{F})$ of a transversely holomorphic foliation \mathcal{F} on a compact manifold M is a Fréchet Lie group, and in fact a strong ILH-group in the sense of Omori. Moreover $\text{Aut}(M, \mathcal{F})$ is naturally endowed with a Lie foliation transversely modeled on the complex simply-connected Lie group associated to the Lie algebra of basic holomorphic vector fields $H^1(M, \Theta_{\mathcal{F}})$, which is of finite dimension as it was proved by X. Gómez-Mont. This is a joint work with Laurent Meersseman.

10h-10h30 Coffee break + Poster session

10h30-11h20 David MARÍN (Cerdanyola del Vallés)

Foliations and webs with continuous symmetries

We will describe the structure of foliations and webs on complex projective surfaces which are invariant by a germ of birational flow. In the case of the projective plane we will present global normal forms and we will characterize planar projective foliations and webs with many infinitesimal symmetries. This is a joint work with Marcel Nicolau.

11h30-12h20 Erwan ROUSSEAU (Marseille)

Hyperbolicity of some foliated quotient varieties

We will describe some effective criteria which guarantee that a quotient of a hyperbolic manifold still satisfies some strong hyperbolic properties in both analytic and algebraic settings. In particular, we will explain that Hilbert modular varieties, except few possible exceptions, satisfy all expected Lang's type conjectures.

12h30-14h30 Lunch break

14h30-15h20 Andre BELOTTO DA SILVA (Toulouse)

Resolution of singularities of the cotangent sheaf of a singular variety.

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 $\sigma : X \rightarrow X_0$ 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 $\dim X_0 \leq 3$.

15h30-16h Coffee break + Poster session

16h-16h50 Javier RIBON (Fluminense)

Completely integrable vector fields

We introduce several problems concerning germs of vector fields with a maximum number of functionally independent holomorphic first integrals. We will discuss the geometry of the underlying foliation and the noetherianity of the ring of holomorphic first integrals.

20h Social dinner

Friday, October 27 (IRMA)

9h-9h50 Martin KLIMES (Vienna)

Confluence of singularities in non-autonomous Hamiltonian systems and non-linear Stokes phenomenon

The talk is about the relation between nonlinear Stokes phenomenon in complex time-dependent Hamiltonian systems with a non-degenerate irregular singularity of Poincare rank 1

$$x^2 \frac{dy}{dx} = J \nabla_y H(y, x, 0), \quad (y, x) \in (\mathbb{C}^2 \times \mathbb{C}, 0),$$

and the nonlinear monodromy of its 1-parameter perturbation which splits the irregular singularity in two regular ones

$$x(x - \varepsilon) \frac{dy}{dx} = J \nabla_y H(y, x, \varepsilon), \quad (y, x, \varepsilon) \in (\mathbb{C}^2 \times \mathbb{C} \times \mathbb{C}, 0).$$

Such systems provide a general setting for the study of the confluence of Painleve's sixth equation to the fifth one. The problem of local analytic classification is also addressed.

10h-10h30 Coffee break

10h30-11h20 Clément FROMENTEAU (Angers)

About Teichmüller stack of Hopf surfaces

In this talk, I'll describe completely the space of all complex structures on $S^1 \times S^3$ (Teichmüller space) by using stacks theory. I'll give some applications to complex deformations of Hopf surfaces.

11h30-12h20 Pavao MARDESIC (Dijon)

Bounding the length of iterated integrals of the first nonzero Melnikov function

We present the results of a recent joint work with Dmitry Novikov, Laura Ortiz-Bobadilla and Jessie Pontigo-Herrera. We consider small polynomial deformations of integrable systems of the form $dF = 0$, $F \in \mathbb{C}[x, y]$ and the first nonzero term M_μ of the displacement function

$$\Delta(t, \varepsilon) = \sum_{i=1}^{\mu} M_i(t) \varepsilon^i + o(\varepsilon^\mu)$$

along a cycle $\gamma(t) \in F^{-1}(t)$. It is known that M_μ is an iterated integral of length at most μ . The bound μ depends on the deformation of dF . We give a *universal bound* for the length of the iterated integral expressing the first nonzero term M_μ depending only on the geometry of the unperturbed system $dF = 0$. Our result generalizes the result of Gavrilov and Iliev providing a sufficient condition for M_μ to be given by an abelian integral i.e. by an iterated integral of length 1.

12h30-14h30 Lunch break

14h30-15h20 Julio REBELO (Toulouse)

The dynamics at infinity of Airy and of certain Painleve equations

The object of this talk is the study of certain dynamics that arise near infinity for the Airy equation and for certain Painleve equations including P1, P2, and P4. Most of the talk however will be conducted in the simpler setting of Airy equation so as to keep technical details down to a minimum while introducing the main ideas involved in the construction. Our purpose will be to identify the corresponding dynamical system - whose existence is not self-evident - and indicate applications that can be derived from their study. These include the computation of Galois-Malgrange groups as well as accurate estimates on the behavior of the solutions for "large complex time". In the latter direction, we will state a type of probabilistic confinement theorem for the solutions of Airy equation.

15h30-16h The last coffee break