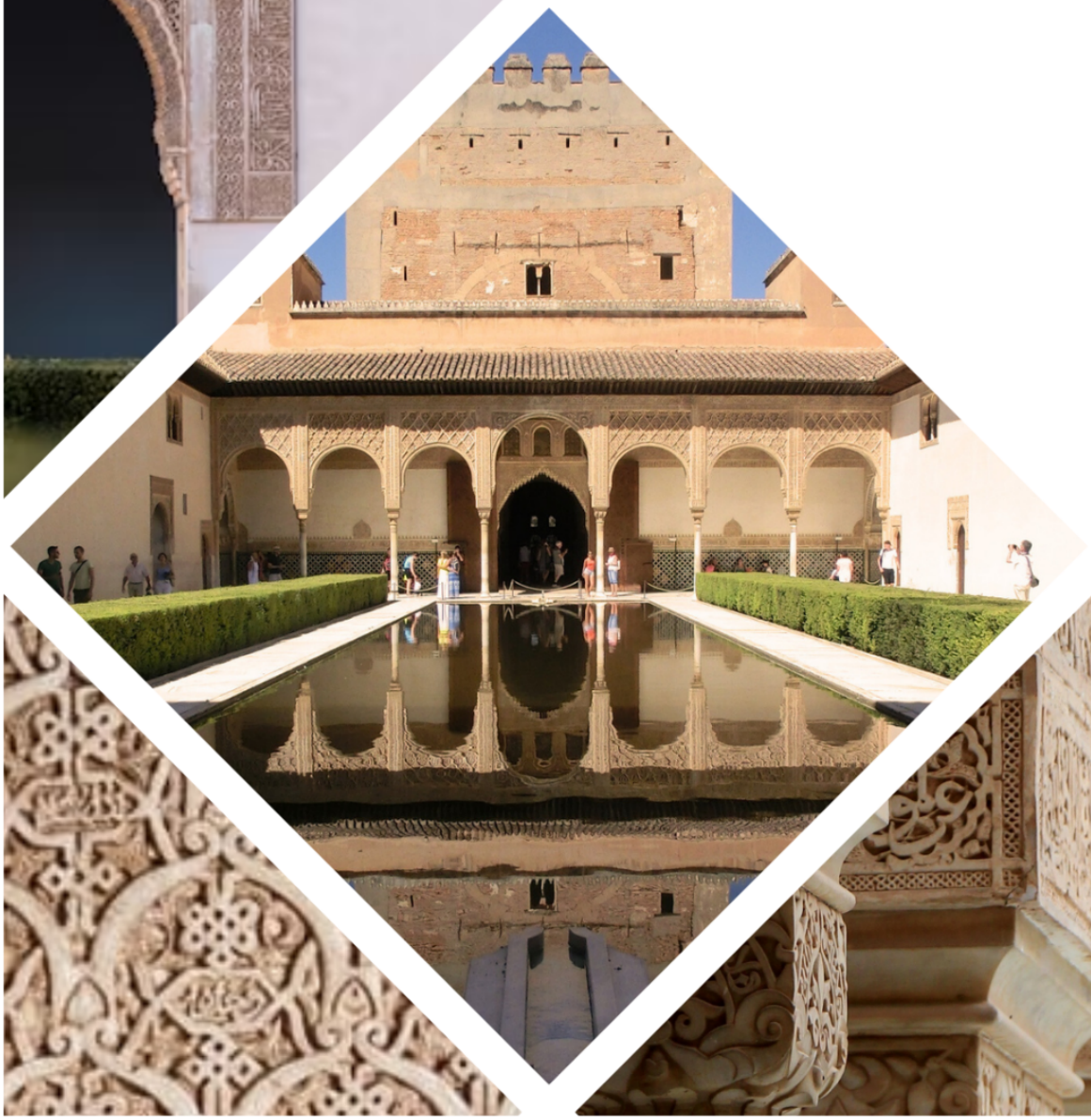
IberoSing International Workshop 2023

Mirror symmetry & Hodge ideals

06 - 10 NOVEMBER

GRANADA (SPAIN)



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AGENCIA ESTATAL DE INVESTIGACIÓN

Red de Geometría Algebraica y Singularidades

Contents

About

IBEROSING

This is the second edition of regular conferences organized by the main staff of the Iberoamerican Webminar of Young Researchers in Singularity Theory and related topics. The event will be held at Instituto de Matemáticas Universidad de Granada in the beautiful city of Granada from 6 to 10 of November 2023.

It aims to be an international meeting place for both young and senior researchers in *Singularity theory*, were some of the recent topics in the theory are addessed in detail through courses and various specialized talks in a highly stimulating environment. From now on, this will be a face-to-face event.

This year, the event will be focus on **Hodge structures and Mirror symmetry**.

Hodge structures are one of the most important objects in the study of analytic and topological invariants in Singularity theory. One of the main attractions of Hodge structures is its transversal place in the theory of singularities, which makes it an important object of study from both purely algebraic techniques and more geometric techniques.

Mirror symmetry is a proposed duality between symplectic geometry and complex geometry. It has led to many new insights and discoveries in both fields and has opened up new avenues for research. Additionally, it has connections to other areas of mathematics such as algebraic geometry (enumerative geometry, for example) and number theory, making it a rich and active area of research.

Organizing committee

Patricio Almirón-Cuadros	Univ. de Granada
Pablo Portilla-Cuadrado	Univ. de Lille
Juan Viu-Sos	Univ. Politécnica de Madrid
Javier Fernandez de Bobadilla	Basque Center for Applied Mathematics

Timetable

	Monday 06 Nov	Tuesday 07 Nov	Wednesday 08 Nov	Thursday 09 Nov	Friday 10 Nov
9-10	Registration & Opening	9:30-11:00 **"ISDM" – Mustaţă** course	9:30-10:30 **Moisés Herradón-Cueto**		9:30-11:00 **"ISDM" – Mustaţă** course
10-11	10:00-11:00 **Jean-Baptiste Campesato**		**5mins ϟ-talks**	10:00-11:00 **Simon Felten**	
11-12	**5mins ϟ-talks**	Coffee break / Posters II	Coffee break / Posters III	Coffee break / Posters IV	Coffee break
12-13	Coffee break / Posters I	11:30-13:00 **"HMS" – Ruddat** course	11:30-13:00 **"HMS" – Ruddat** course	11:30-13:00 **"ISDM" – Mustaţă** course	11:30-13:00 **"HMS" – Ruddat** course
13-14	12:00-13:30 **"HMS" – Ruddat** course				Closing
14-15	**LUNCH TIME**				
15-16	15:30-17:00 **"ISDM" – Mustaţă** course	15:30-16:30 **Josep Àlvarez Montaner**		15:30-16:30 **Ilya Smirnov**	
16-17		Break		Break	
17-18	Break	17:00-18:00 **Hülya Argüz**		17:00-18:00 **Eduardo de Lorenzo**	
	17:30-18:30 **Yenni Cherik**				
			21:00 **Conference dinner**		

Courses

Homological Mirror Symmetry

Helge Ruddat

C

Univ. of Stavanger

We review Kontsevich's homological mirror symmetry conjecture and introduce the main players and different variants of the conjecture. This involves a discussion of the Fukaya category and about what it takes to relate this (a priori $\mathbb{Z}/2$-graded) A_∞-category to the derived category of coherent sheaves of a mirror complex manifold. We take a look at Seidel's proof for the quartic surface and genus two curve and Sheridan's proof for higher dimensional hypersurfaces. We also discuss the Fukaya-Seidel category for a Lefschetz fibration, Orlov's category of singularities and Abouzaid's homological mirror symmetry proof for Fano manifolds. We then develop an approach to prove homological mirror symmetry for general Calabi-Yau manifolds based on T-duality and skeleta. The T-duality here involves another conjecture known as the Strominger-Yau-Zaslow conjecture. The new part of this approach consists of ongoing work by Matessi, Mak, Zharkov and myself that provides a symplectic manifold with Lagrangian torus fibration over any given integral affine manifold with discriminant in codimension two that is well-behaved in a suitable sense.

Invariants of singularities via D-modules

Mircea Mustaţă

C

Univ. of Michigan

D-modules are modules over the sheaf of differential operators and over the years they found many applications in singularity theory. In these lectures I will discuss certain invariants of singularities (of hypersurfaces or, more generally, locally complete intersections) that can can be defined and studied using techniques from D-module theory (especially Saito's theory of Hodge modules), as well as certain classes of singularities characterized by these invariants, that refine the classical notions of rational and Du Bois singularities.

List of Abstracts – Talks

Monday 6th

Motivic, logarithmic, and topological Milnor fibrations

Jean-Baptiste Campesato T

Univ. Politècnica de Catalunya

We compare the topological Milnor fibration and the motivic Milnor fibre of a regular complex function with only normal crossing singularities by introducing their common extension: the complete Milnor fibration for which we give two equivalent constructions. The first one extends the classical Kato-Nakayama log-space, and the second one, more geometric, is based on a the real oriented version of the deformation to the normal cone.

In particular, we recover the topological Milnor fibration by quotienting the motivic Milnor fibration with suitable powers of $(0, +\infty)$. Conversely, we also show that the stratified topological Milnor fibration determines the classical motivic Milnor fibre. (joint work with Goulwen Fichou and Adam Parusiński).

Asymptotic Curvature Concentration in Milnor Fibers

Yenni Cherik T

Aix-Marseille Univ.

Let $(X, 0)$ be a germ of a complex surface embedded in $\mathbb{C}^n$ having an isolated singularity at the origin and let $f : (X, 0) \longrightarrow (\mathbb{C}, 0)$ be a germ of non-constant holomorphic function. The aim of the presentation is to compute the integral of the Gauss curvature on the Milnor fibers $f^{-1}(t) \cap \mathrm{B}_\epsilon$ of the function f as t and ϵ tends to 0. More precisely, we will decompose the surface X into regions and describe those where the curvature concentrates asymptotically and those where the integral of the curvature tends towards 0 via an infinite family of analytic invariants of metric nature associated to the function f called “inner rate”.

Tuesday 7th

Differential operators over rings of invariants of finite groups

Josep Àlvarez Montaner T

Univ. Politècnica de Catalunya

In this talk we will see that some facets of the theory of D-modules over polynomial rings can be extended to the case of rings of invariants of finite groups. A blend of different techniques allow us to define a notion of holonomicity in this setting, we can develop a theory of Bernstein-Sato polynomials, V-filtrations, Hodge ideals and we can study the de Rham cohomology of holonomic modules.

Quivers and curves in higher dimensions

Hülya Argüz T

Univ. of Georgia

Quiver Donaldson-Thomas invariants are integers determined by the geometry of moduli spaces of quiver representations. I will describe a correspondence between quiver Donaldson-Thomas invariants and Gromov-Witten counts of rational curves in toric and cluster varieties.

This is joint work with Pierrick Bousseau (arXiv:2302.02068 and arXiv:arXiv:2308.07270).

Wednesday 8th

Hodge theory of abelian covers of algebraic varieties

Moisés Herradón-Cueto T

Univ. Autónoma de Madrid

Let $f : U \to \mathbb{C}^*$ be an algebraic map from a smooth complex connected algebraic variety U to the punctured complex line $\mathbb{C}^*$. Using f to pull back the exponential map $\mathbb{C} \to \mathbb{C}^*$, one obtains an infinite cyclic cover U^f of the variety U, together with a $\mathbb{Z}$-action coming from adding $2\pi i$ in $\mathbb{C}$. The homology groups of this infinite cyclic cover, with their $\mathbb{Z}$-actions, are the family of Alexander modules associated to f.

In previous work jointly with Eva Elduque, Christian Geske, Laurențiu Maxim and Botong Wang, we constructed a mixed Hodge structure on the torsion part of these Alexander modules.

In this talk, we will talk about work in progress aimed at generalizing this theory to abelian covering spaces of algebraic varieties which arise in an algebraic way, i.e. from maps $f : U \to G$, where G is a semiabelian variety. This is joint work with Eva Elduque.

Thursday 9 th

The Bogomolov–Tian–Todorov theorem for (generically) log smooth pairs $f_0 : (X_0, \mathcal{L}_0) \to S_0$

Simon Felten T

Columbia Univ.

The celebrated Bogomolov–Tian–Todorov theorem states that the functor of infinitesimal smooth deformations of a smooth and proper Calabi–Yau variety X is unobstructed, meaning that any infinitesimal deformation can be lifted along any thickening. The same is true when we deform not only a Calabi–Yau variety, but a pair $(X, \mathcal{L})$ of a Calabi–Yau variety together with a line bundle. In logarithmic geometry, we replace the smooth Calabi–Yau variety with a log smooth space over a log point S_0. By previous work, we know already that the log smooth deformation functor of a proper log Calabi–Yau is unobstructed; in this talk, I will report on work in progress showing that log smooth deformations of a pair of a log smooth log Calabi–Yau $f_0 : X_0 \to S_0$ together with a line bundle $\mathcal{L}_0$ are unobstructed as well.

A generic freeness theorem for local cohomology via D-modules

Ilya Smirnov T

Basque Center for Applied Mathematics

In connection with Mustata's lectures, I will discuss an application of D-modules due to Gennady Lyubeznik. Local cohomology is one of the central objects of local algebra, but it is very hard to work with as these modules are usually not finitely generated. However, Lyubeznik observed that local cohomology has a natural D-module structure, and it can be, for example over a polynomial ring, finitely generated as a D-module. In such cases, one can work with local cohomology as a finitely generated module over a non-commutative ring D. A novel result of the talk, taken from a joint paper with Yairon Cid-Ruiz, is a generic freeness theorem for local cohomology.

The Arc-Floer conjecture for plane curves

Eduardo de Lorenzo Poza T

KU Leuven - BCAM

Given an isolated hypersurface singularity, the Arc-Floer conjecture relates the cohomology of the associated contact loci with the Floer homology of the monodromy iterates. In this talk we will explain the origin of this conjecture and what is known about it, and we will explore the key ingredients of the proof of the conjecture in the case of plane curve singularities, the only case in which the conjecture is known to hold. This is joint work with Javier de la Bodega, `https://arxiv.org/abs/2308.00051`

Lighting talks

Monday 6th

Fukaya Categorical Description of Derived Categories of Skew Gentle Algebras

Kyoungmo Kim

LT + P

Center for quantum structures in modules and spaces, Seoul National University

Skew gentle algebras are an important class of derived-tame algebra. It is known that skew gentle algebras are strongly related to orbifold surfaces. In this talk, we introduce an categorical equivalence between a certain type of Fukaya categories of orbifold surfaces and the perfect derived categories of skew-gentle algebras.

On some properties of the lattice cohomology of plane curve singularities

Alexander A. Kubasch

LT + P

Alfréd Rényi Institute of Mathematics

We provide an upper bound for the genus of an algebraic link with the orientation on some of its components reversed. We use this to show that the n-grading of the reduced lattice cohomology of a plane curve singularity cannot be positive. We also show that in the case of a single planar branch the lattice cohomology determines the multiplicity of the curve.
Joint work with Gergő Schefler.

Join of Hodge cycles and fake linear cycles

Roberto Villaflor

LT + P

Pontificia Universidad Católica de Chile

We describe the cycle class of joins of Hodge cycles inside hypersurfaces. Using this construction we study the existence of anomalous components of the locus of Hodge cycles, which are called fake linear (and non-linear) cycles.

The fundamental groupoid of 'the stringy Kahler moduli space' acts on derived categories of GIT quotients

Michela Barbieri

LT + P

University College London

Given an algebraic variety X, the mirror symmetry conjecture tells us that there should be a mirror family of symplectic manifolds X^v such that $\mathrm{D^b}(X) \cong \mathrm{Fuk}(X^v)$. Given a parametrising space Y for our symplectic family, we may suspect there should be a way to carry the monodromy action of the symplectic fibration over Y through the 'mirror' onto the algebraic side. In other words, we expect an action of fundamental group of Y on $\mathrm{D^b}(X)$ via autoequivalence.

In the context of toric Geometric Invariant Theory (GIT) this is made precise. GIT is the algebraic geometry theory that tell us how to construct quotients, and note that these quotients are not necessarily unique. Consider an algebraic torus acting on a vector space. If the torus acts in a specific way, all our quotients will be Calabi Yau and derived equivalent. In this context, it is well known how to construct a family of mirrors combinatorially using toric geometry, with base family called the Fayet–Iliopoulos Parameter Space (FIPS). It is conjectured that the fundamental groupoid of this space acts on the derived categories in a specific way, via wall crossing and spherical twists around spherical functors.

Wednesday 8th

Discriminant and Integral Basis of a class of quintic and sextic number fields

Sumandeep Kaur LT + P

Panjab University

Computation of discriminant as well as integral basis of an algebraic number field has been one of the most important problems in algebraic number theory. This has attracted the attention of several mathematicians who determined the discriminant and integral basis of various classes of number fields which are defined over the field of rational numbers by certain types of irreducible polynomials. In this lecture, we discuss this problem for the fields $K = \mathbb{Q}(\theta)$ with θ a root of an irreducible trinomial $f(x) = x^n + ax + b$ belonging to $\mathbb{Z}[x]$ with $n \in \{5,\ 6\}$. For each prime number p, we compute the highest power of p dividing the discriminant of K in terms of the prime powers dividing $a,\ b$ and the discriminant of $f(x)$. An explicit p-integral basis of K will also be given for each prime p.

A simple method will be described to obtain an integral basis of K from these p-integral bases. This is a joint work with S. K. Khanduja and A. Jakhar.

Puiseux pairs and Fukaya Category

Jiyeon Ryu LT + P

Seoul National University

The Puiseux pair of a plane curve singularity determines the topology of its Milnor fiber. We aim to study relations between the Fukaya category and the Puiseux pair.

Saito basis for irreducible plane curves with one Puiseux pair

David Senovilla Sanz LT + P

Universidad de Cantabria

Given the germ of an holomorphic plane curve $C \subset (\mathbb{C}^2, 0)$, the study of its analityc class has lead to discover different analytical invariants. In particular, we can consider the free $\mathcal{O}_C$-module of rank two of holomorphic 1-forms with C invariant, any basis of 1-forms will be called a Saito basis of C. If $\{\eta_1, \eta_2\}$ is a Saito basis, with the property that the sum of multiplicities at the origin $\nu_0(\eta_1) + \nu_0(\eta_2)$ is maximum upon all the possible Saito basis, then, the pair $(\nu_0(\eta_1), \nu_0(\eta_2))$ is an analytic invariant of C up to permutation. For the case when the curve C is irreducible and it has one Puiseux pair, we will show how to compute a Saito basis using part of its analytic information.

L^2-approach to Saito's vanishing theorem

Hyunsuk Kim

LT + P

University of Michigan

Saito's theory on Hodge modules and its vanishing theorem serve as far reaching generalizations of classical vanishing theorems involving ample line bundles, for example, Kodaira vanishing, Kollár's theorem on direct images of dualizing sheaves, which have crucial applications to algebraic geometry over a field of characteristic zero. All the previously known approaches for Saito vanishing have corresponding approaches for Kodaira vanishing which motivates the proof of Saito's vanishing theorem. Today, we will give a new approach to Saito's vanishing theorem using analytic methods, which goes back to the original idea of Kodaira's for his vanishing theorem. We also mention that our method gives a slightly stronger statement, that is, we obtain vanishing theorem for *complex* polarizable Hodge modules in the sense of Sabbah-Schnell, which do not assume the existence of a $\mathbb{Q}$-structure.

This is a summary of my recent article `https://arxiv.org/abs/2306.00313`.

On the relation between LCT and Euler-homogeneity for free divisors

Abraham del Valle Rodríguez

Universidad de Sevilla

In 2002, it was conjectured that a free divisor satisfying the so-called Logarithmic Comparison Theorem (LCT) must be strongly Euler-homogeneous and it was proved for the two-dimensional case. In 2006, it was shown that the conjecture is also true in dimension three, but, today, the answer for the general case remains unknown. First, we will explain the meaning of this conjecture and then we will use the decomposition of a singular derivation as the sum of a semisimple and a topologically nilpotent derivation that commute in order to deal with this problem. By showing that this decomposition preserves the property of being logarithmic, we will be able to give alternative proofs for the low-dimensional known cases.

Poster Sessions

Monday 6th

LT *Participants presenting a lighting talk on Monday will also participate in the poster session.*

Real loci of Fano varieties

Guillaume Kineider P

Aix-Marseille University

The topological classification of real algebraic surfaces of special type is mostly understood now. Among them, the rational of even uniruled surfaces has been classified long time ago by Comessati. An interesting observation is that all orientable components of one of these surfaces is euclidean or spherical. We wish to explore the topology of real uniruled algebraic threefold, focusing on non-singular Fano varieties. Our expectation is to extend the result of Comessati in that case, using the fact that Fano threefolds are rationally connected to show that an orientable component of a real Fano threefold with orientable leaf family spaces has an euclidean or spherical orbifold.

Tuesday 7th

The generating level of weighted Hodge ideals

Henry Dakin P

Technische Universität Chemnitz

In their study of the Hodge theory of divisor complements, Mustaţă and Popa proved a birational criterion for the generating level of the Hodge filtration of the mixed Hodge module given by pushing forward the constant Hodge module along an open embedding of smooth varieties whose complement is a divisor. We state an analogous result concerning the weight filtration steps of this mixed Hodge module. This result aids in the calculation of weighted Hodge ideals. In particular the weighted Hodge ideals of a plane curve are determined entirely by the weighted multiplier ideals.

Milnor Fiber Consistency via Flatness

Alex Hof P

University of Wisconsin-Madison

The Milnor fibration gives a well-defined notion of the smooth local fiber of a holomorphic function at a critical point. Milnor's work in the isolated case suggests that this fiber's topology should be controlled by the scheme-theoretic invariants of the critical locus; we give results which demonstrate that this is true in a relative sense. Specifically, we show that the local smooth fiber varies nicely in families where the embedded critical locus satisfies certain algebraic consistency requirements and discuss various implications.

Hodge cycles inside Klein varieties

Jorge Duque P

Universidad de Chile

We describe the spectral decomposition which refines and is compatible with the Hodge decomposition on a Klein variety. This allows us to describe their space of Hodge cycles and verify whether they are generated by rational algebraic cycles in some cases.

Roots of the Bernstein-Sato polynomial for plane branch deformations

Roger Gómez López P

Universitat Politècnica de Catalunya

An algorithm is presented to compute the stratification of the roots of the Bernstein-Sato polynomial given a deformation with constant Milnor number of a plane branch. The singularity may have multiple characteristic exponents and its monodromy must have different eigenvalues. Resolution of singularities is used to compute the residues of the poles of the complex zeta function and obtain the desired stratification. The resulting algorithm is implemented in Magma. Novel examples are provided of stratifications of plane curves with two characteristic exponents. This is joint work with G. Blanco.

Correspondence between Projective bundles over $\mathbb{P}^2$ and Threefolds in $\mathbb{P}^4$

Shivam Vats P

Indian Institute of Science Education Research Tirupati

Null-correlation bundle on $\mathbb{P}^3$ belonged to the first known examples of indecomposable 2-bundles on $\mathbb{P}^3$. In [W. Barth Some Properties of Stable rank-2 Vector Bundles on $\mathbb{P}^n$ Math. Ann. 226, 125–150 (1977)] Barth gave three descriptions of the null-correlation bundle on $\mathbb{P}^3$ and discussed this bundle's properties. It is a stable bundle over $\mathbb{P}^3$ but its restriction to any hyperplane in $\mathbb{P}^3$ is not stable but semi-stable. It is uniquely determined up to tensoring by line bundles and up to automorphisms of $\mathbb{P}^3$. Later in [Dan, Krishanu, Nagaraj, D. S Null correlation bundle on $\mathbb{P}^3$. J. Ramanujan Math. Soc. 28A (2013)] D.S. Nagaraj and Krishanu Dan gave another description of the null-correlation bundle. They constructed a rank two bundle Q on $\mathbb{P}^3$ and showed that it is a null correlation bundle.

We restrict Q to any hyperplane in $\mathbb{P}^3$ and take its projectivization then the tautological bundle over projectivization defines a non-degenerate mapping to $\mathbb{P}^4$. We show that the image of this map is quadric hypersurface in $\mathbb{P}^4$ and projectivization is isomorphic to a blow-up of quadric along a line in $\mathbb{P}^4$. We also see that the quadric is smooth. Further, we show that there is an infinite family of vector bundles over $\mathbb{P}^2$ whose projectivization corresponds to family smooth quadrics in $\mathbb{P}^4$. Further, We generalize these ideas we obtain an infinite family of vector bundles over $\mathbb{P}^2$ whose projectivization corresponds to a family of rational threefolds of degree n in $\mathbb{P}^4$.

Wednesday 8th

LT *Participants presenting a lighting talk on Wednesday will also participate in the poster session.*

Affine bundle over complex manifolds

Naoufal Bouchareb P

Aix-Marseille Université

Let E be a holomorphic vector bundle over a complex manifold X. The goal is to classify affine bundles A over X whose linearization is isomorphic to E (up to isomorphism). This set is in bijection with $H^1(X, E)/Aut(E)$. We will also discuss a possible generalization in the context of principal bundles. We will study the case where E is a rank 2 vector bundle on the Riemann sphere $\mathbb{P}^1$ and explain the connection with the Jacobian ideal of a polynomial.

Thursday 9th

Perfect complexes and smoothness

Matteo Montagnani P

SISSA

Given a complex algebraic (or analytic) variety X, it is possible to associate with X the stable infinity category of perfect complexes, Perf(X). It is also possible to define the notion of a proper and smooth category, and has been proved that if X is algebraic, then X is proper and smooth if and only if Perf(X) is also proper and smooth.

Unfortunately, this does not hold if X is analytic. In this talk, I will try to explain why the notion of a proper and smooth category is not suitable in the analytic setting and how we can attempt to modify it.

New algorithms for algebraic integrability of foliations on Hirzebruch surfaces

Elvira Pérez Callejo P

Universitat Jaume I

Under the knowledge of some data and certain conditions, we propose several algorithms to decide on the algebraic integrability of foliations on Hirzebruch surfaces. In the affirmative case, they compute a rational first integral. The required data are the bidegree of the rational first integral, or its genus, or "sufficient" invariant by the foliation curves.

Birational Invariance of Hodge Numbers for Non-Singular Calabi-Yau Varieties via Motivic Integration

Soumik Ghosh P

Yale University

Motivic Integration was introduced by Maxim Kontsevich in 1995 to give an affirmative answer to the following conjecture of Batyrev:

Conjecture. Let X and Y be birationally equivalent Calabi-Yau manifolds. Then $h^{p,q}(X) = h^{p,q}(Y)$.

In this talk, we shall give an overview of motivic integration and give Kontsevich's proof of the birational invariance of Hodge numbers for Calabi-Yau manifolds. Time permitting, we shall also indicate its applications to the study of singularities by introducing Batyrev's "stringy invariants" for varieties with mild singularities and sketch the strong McKay correspondence.

Wrapped Fukaya categories using microlocal sheaves

Shomrik Bhattacharya P

University of Southern Denmark

My PhD project is based on a series of papers on wrapped Fukaya categories by Sheel Ganatra, John Pardon, and my supervisor, Vivek Shende.

The ultimate result of the series of papers is that the Fukaya category of a Weinstein manifold can be computed in terms of microsheaves on its core. To do this one has to do three things: (1) Find an interesting class of Weinstein manifolds to study; (2) Compute their skeleta; (3) Compute microsheaves on their skeleta.

The simplest case to verify this is the following:

The Weinstein Manifold is the moduli space of degree 1 rank 2 Higgs bundles on a curve of genus 2, where the moduli space is 6 dimensional.

The skeleton is known to be the global nilpotent cone. In the degree 1 rank 2 genus 2 case, the skeleton has two components:

one of them is the intersection X of two quadrics in $\mathbb{P}^5$,

the other one is attached to it along a certain curve.

The first and probably main geometric step to computing the category of microsheaves here is to compute the fundamental group of X-S. This is the problem I am working on right now.

Of course there are other examples of interesting Weinstein manifolds where one can compute the Fukaya category, by computing the microsheaves on the skeleton. For this particular example, (1) and (2) are already done. Another reason this example is interesting is the relation of Higgs moduli to geometric Langlands questions.

Constructing mirror models for the quantum cohomology of homogeneous spaces

Peter Spacek P

TU Chemnitz

The *quantum cohomology* of a variety is a deformation of the (intersection) cohomology including "intersections at a distance". These can be used to calculate numerical invariants not (easily) obtainable from the ordinary cohomology of the variety. The most basic example is the number of curves going through a given number of points. A *mirror model* (also known as a *Landau-Ginzburg* model) describes the quantum cohomology of a given variety as a *Jacobi ring*, i.e. the coordinate ring of its mirror modulo relations generated by the derivatives of a function, known as the *(super)potential*.

In the case of *homogeneous spaces*, i.e. projective varieties with a transitive group action, progress has been made in finding such LG-models in various descriptions. Moreover, these mirror models have even been found to play a role in mirror symmetry on the level of $\mathcal{D}$*-modules*, as well as in *homological mirror symmetry* for certain Grassmannians (the variety of subspaces of fixed dimension in $\mathbb{C}^n$) after modification.

We will introduce the construction of LG-models for homogeneous in the simplest case during the presentation, and expand to more general cases on the poster.

Examples of non-smoothable toroidal crossing varieties with singular log structures

Andrés David Gómez Villegas P

Aarhus University and Hamburg University

We explore the deformation space of a singular algebraic variety X_0 by introducing an additional structure on its central fiber, called a logarithmic structure. Thus, we study flat deformations $f : \mathcal{X} \to A^1_C$ with X_0 as its central fiber, and using the classification that Gross and Siebert did for logarithmic structures of toroidal crossing spaces, we show that X_0 equipped with a particular log smooth structure does not arise as a degeneration of a smooth variety. The cases considered are motivated from the classification of toric degenerations of Fano manifolds. This being part of the ongoing research of my advisor Prof. Helge Ruddat and his collaborator Prof. Alessio Corti.

List of Participants

Abdelmalek Mohammed	École superieure de management de tlemcen-ALGERIA
Abraham del Valle Rodríguez	Universidad de Sevilla
Agustín Romano	Universidad Nacional de México
Alapan Mukhopadhyay	École polytechnique fédérale de Lausanne
Alberto Castaño Domínguez	Universidad de Sevilla
Alberto Cobos Rabano	University of Sheffield, UK
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Eki Gartzia González	BCAM - University of the Basque Country
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Emeryck Marie	Technische Universität Chemnitz
Guillaume Kineider	Aix-Marseille University
Hanine Awada	BCAM - Basque Center for Applied Mathematics
Helge Ruddat	Univ. of Stavenger
Henry Dakin	TU Chemnitz
Houda Amzil	University Mohammed V of Rabat
Hülya Argüz	Univ. of Georgia
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Kyungmin Rho	Universität Paderborn
Luis Narváez Macarro	Universidad de Sevilla
Manousos Manouras	Université de Pau, Universidad Zaragoza
Manuel Gonzalez Villa	CIMAT, Universidad de Zaragoza
Maria Alberich Carramiñana	Universitat Politècnica de Catalunya - BarcelonaTech
Maria del Rosario Gonzalez Dorrego	Depart. Matemáticas, UAM, Madrid (Spain)
Marta Aldasoro	Basque Center for Applied Mathematics
Matteo Montagnani	SISSA
Michela Barbieri	University College London
Mircea Mustata	University of Michigan
Moisés Herradón	Universidad Autónoma de Madrid
Moisés Herradón-Cueto	Univ. Autónoma de Madrid
Naoufal Bouchareb	Aix Marseille university
Nina Morishige	University of Luxembourg
Oswaldo Sevilla	Universidad Nacional Autónoma de Honduras
Öznur Turhan	Galatasaray University
Pablo Sánchez	Universidad de Granada
Pablo Portilla-Cuadrado	Univ. de Lille
Patricio Almirón	Instituto de Matemáticas Universidad de Granada
Pedro Gonzalez Perez	Universidad Complutense de Madrid
Peter Petrov	Institute of Mathematics, Bulgarian Academy of Sciences
Peter Spacek	TU Chemnitz
Pramod K. Mishra	Banaras Hindu University-Varanasi
Roberto Villaflor	Pontificia Universidad Católica de Chile
Roger Gómez López	Universitat Politècnica de Catalunya
Shivam Vats	Indian institute of science education research Tirupati
Simon Felten	Columbia Univ.
Soumik Ghosh	Yale University

Sumandeep Kaur	Panjab University
Terry Song	University of Cambridge
Wim Veys	KU Leuven
Xianyu Hu	Technical University of München
Yenni Cherik	Aix Marseille université

Useful Information

Talks will take place at the conference room (ground floor) of the Instituto de Matemáticas Universidad de Granada.

CVIUGR Wi-Fi will be available during the conference:
Username: iberosing@invitados.ugr.es
Password: sing+23+UGR

The **conference dinner** will be held at the "Carmen de la Victoria" (Cta. del Chapiz, 9) at 20:00. A "Carmen" is a typical estate of the historic neighborhoods of Granada, descendants of the pleasure gardens that the Granada Arabs owned in the outskirts of the city. Today, they are domestic gardens that maintain an old tradition of pleasant retreat for their owners. Carmen de la Victoria is located on the Albayzín hill. Acquired by the University of Granada, it is the only public carmen in the city that has not lost its character as a living garden. Today is a Guest Residence, always open to the enjoyment of university students. Although its buildings have expanded over time, the layout of the gardens has remained as it was over a hundred years ago. That is why it is one of the least altered carmens in Granada, preserving the traditional garden forms of 19th-century Granada regionalism.

Some places to eat

"Everyday places" near IMAG

- Casa Braulio (Menu 11€) and La Laguna (Menu 12€): traditional food.
- Café Botánico (Menu 15€): more elaborate food, international style.
- Cafetería ETSIE (cheaper, university prices): menu, tapas or sandwiches.

Vegetarian and vegan options

- Hicuri Vegan Restaurant (Menu 15€).
- El Ojú (Vegan, tapas).
- Wild Food (Vegetarian with vegan options, 15-20€).

"Tapas style"

In the streets Gonzalo Gallas and Pedro Antonio de Alarcón you can find an student area with the cheapest bars of the city. Some of them are:

- El Peruano (especially crowded, they only accept cash).

- Café Bar Garden (Hamburguesas and pizzas).
- Grifos y Tapas (sandwiches, great variety)
- El Pesaor (Traditional tapas, great variety).
- El Vinillo (Traditional tapas).
- Tango Bar (little pizzas).

How to get to the IMAG?

The IMAG building has two entrances. The entrance to the institute is through Rector López-Argüeta street (by the parking of the Centro de Documentación Científica). This entrance has a door separating the institute from the area of the Centro de Documentación Científica, equipped with an electronic card reader; however, during the conference the doors will be open without the need of an electronic card. Also, the access by Ventanilla street will stay open during until 17:00.