

第5回代数・解析・幾何学セミナー

表記のセミナーを下記の要領で開催致しますのでご案内申し上げます。

日 時：2010年2月15日（月）～18日（木）

場 所：鹿児島大学理学部1号館101講義室

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日本学術振興会先端研究拠点事業「数論幾何・モチーフ理論・ガロア理論の新展開と、その社会的実用」（コーディネーター 松本眞）

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プログラム

2月15日（月）

13:00～14:00 : Eiichi Sato (Kyushu University)

“Infinitely dimensional projective varieties and families of rational curves”

14:10～15:10 : Satoshi Koike (Hyogo University of Teacher Education)

“Various blow-analytic invariants of real analytic singularities”

15:20～16:20 : Yukinobu Toda (IPMU, University of Tokyo)

“On a computation of rank two Donaldson-Thomas invariants”

16:30～17:30 : Kiyoshi Takeuchi (Tsukuba University)

“Motivic Milnor fibers at infinity and mixed Hodge modules”

2月16日（火）

9:20～10:20 : Rei Inoue (Suzuka University of Medical Science)

“Tropical geometry and ultra-discrete integrable systems”

10:30～11:30 : Hiroyuki Nakaoka (University of Tokyo)

“On some homological constructions concerning abelian and triangulated categories”

11:40～12:40 : Kazuhiro Takimoto (Hiroshima University)

“Some theorems on the removability of a singular set for Hessian equation and curvature equation determined by the elementary symmetric function”

14:00～15:00 : Takehiko Yasuda (Kagoshima University)

“A standard noncommutative resolution of a toric singularity via differential operators”

- 15:10~16:10 : Jörg Schürmann (Universität Münster)
“Nearby cycles and characteristic classes of singular spaces”
16:30~17:30 : Masato Wakayama (Kyushu University)
“Prime numbers can produce (elusive) Vacuum energy”
18:30~ Dinner Party

2月17日 (水)

- 9:20~10:20 : Shun-ichi Kimura (Hiroshima University)
“Rationality of motivic Chow series modulo A^1 -homotopy”
10:30~11:30 : Mutsuo Oka (Tokyo Science University)
“Mixed projective curve and its application”
11:40~12:40 : Pedro Luis Del Ángel Rodríguez (CIMAT)
“On a variation of Hodge Structures arising from an equisingular family of Calabi-Yau 3-folds”
14:00~15:00 : Takeshi Torii (Okayama University)
“On a generalization of the Chern character and the comparison of Morava E -theories”
15:10~16:10 : Tatsuo Suwa (Hokkaido University)
“Singular holomorphic distributions and Atiyah classes”
16:30~17:30 : Behrang Noohi (King’s College London)
“Lie theory of 2-groups”

2月18日 (木)

- 9:20~10:20 : Kimiko Yamada (Kyoto University)
“Birational aspects in polarization change of moduli space of stable sheaves on a complex surface”
10:30~11:30 : Hiroyuki Chihara (Kagoshima University)
“Schrödinger flow into almost Hermitian manifolds”
11:40~12:40 : Paolo Aluffi (Florida State University)
“Chern classes of singular varieties, graph hypersurfaces, and Feynman integrals”

(*) 2月16日 (火) の懇親会に出席予定の方は、人数把握のため、遅くとも2月9日 (火) までに與倉までメールでお知らせ下さい。

Abstracts of Talks

- Satoshi Koike (Hyogo University of Teacher Education)

Title: “Various blow-analytic invariants of real analytic singularities”

Abstract: Blow-analytic equivalence is a notion for real analytic function germs, introduced by Tzee-Char Kuo in order to develop the real analytic equisingularity theory. Concerning this equivalence, several invariants are known. In this talk we explain the Fukui invariants, motivic type invariants, the real tree models and isomorphic minimal resolutions, and their relationship, using some concrete examples. This is an introduction of my joint work with Adam Parusiński.

- Yukinobu Toda (IPMU, University of Tokyo)

Title: “On a computation of rank two Donaldson-Thomas invariants”

Abstract: For a Calabi-Yau 3-fold X , I will give an explicit computation of Donaldson-Thomas type invariant counting pairs (F, V) , where F is a zero-dimensional coherent sheaf on X and $V \subset F$ is a two dimensional linear subspace, satisfying a certain stability condition. This is a rank two version of the DT -invariant of rank one, computed by Li, Behrend–Fantechi and Levine–Pandharipande. I use the wall-crossing formula of DT -invariants established by Joyce–Song, Kontsevich–Soibelman.

- Kiyoshi Takeuchi (Tsukuba University)

Title: “Motivic Milnor fibers at infinity and mixed Hodge modules ”

Abstract: By using the theory of mixed Hodge modules we introduce motivic reincarnations of global (Milnor) fibers of polynomial maps and give some methods for the calculations of their mixed Hodge numbers. Since these mixed Hodge numbers contain the information on the monodromy at infinity of the map, we thereby determine its Jordan normal form. In particular, we will describe the numbers of Jordan blocks in the monodromy at infinity in terms of the Newton polyhedron at infinity.

This is a joint work with Y. Matsui.

- Kazuhiro Takimoto (Hiroshima University)

“Some theorems on the removability of a singular set for Hessian equation and curvature equation determined by the elementary symmetric function”

Abstract: We are concerned with the second-order elliptic or parabolic fully nonlinear PDEs, such as so-called k -Hessian equations which contain Laplace equation and Monge–Ampère equation, and k -curvature equations which contain mean curvature equation and Gauss curvature equation. In this talk, we shall obtain the removability of a singular set for these equations.

- Jörg Schürmann (Universität Münster)

“Nearby cycles and characteristic classes of singular spaces”

Abstract: A natural problem in complex geometry is the relation between invariants of a singular complex hypersurface X (like Euler characteristic and Hodge numbers) and the geometry of the singularities of the hypersurface (like the local Milnor fibrations). For the Euler characteristic this is for example a special case of the relation between the MacPherson- and Fulton- Chern classes of X , whose differences are the now well studied Milnor classes of X . Their degrees are related to Donaldson-Thomas invariants of the singular locus.

A very powerful approach to this type of questions is by the theory of the nearby and vanishing cycle functors. For example a classical result of Verdier says that the MacPherson Chern class transformation commutes with specialization. Here we explain the corresponding result for our motivic Chern- and Hirzebruch class transformations, i.e. they also commute with specialization defined in terms of nearby cycles. Here one can work either in the motivic context (with relative Grothendieck groups of varieties), or in the Hodge context (with Grothendieck groups of mixed Hodge modules). The key underlying specialization result is about the filtered de Rham complex of suitable filtered D -modules in terms of the Malgrange–Kashiwara V -filtration.

- Mutsuo Oka (Tokyo Science University)

Title: “Mixed projective curve and its application”

Abstract: We construct mixed projective curves of a given genus with degree 1 in P^2 .

- Pedro Luis Del Ángel Rodríguez (CIMAT)

Title: “On a variation of Hodge Structures arising from an equisingular family of Calabi-Yau 3-folds”

Abstract: We will give a brief description of what Hodge Structures are as well as an easy example of variation of Hodge structures related to curves, then we introduce the concept of a Calabi–Yau variety and introduce the family we are interested on. Finally we will analyze the monodromy action on that family and will see how the interesting sub Hodge structure looks like, as well as the action on the corresponding Higgs bundle.

- Takeshi Torii (Okayama University)

Title: “On a generalization of the Chern character and the comparison of Morava E -theories”

Abstract: In the talk I will discuss a generalization of the Chern character from the point of view of stable homotopy theory. Then I will talk about comparison of Morava E -theories of different heights.

- Behrang Noohi (King’s College London)

Title: “Lie theory of 2-groups”

Abstract: In classical Lie theory a homomorphism of Lie groups $f : H \rightarrow G$, with H simply connected, is uniquely given by its effect on the Lie algebras $Lie(f) : Lie(H) \rightarrow Lie(G)$. We prove an analogue of this for Lie 2-groups. Namely, when H is a 2-connected Lie 2-group (i.e., $\pi_i H$ vanish for $i = 0, 1, 2$), a weak morphism $f : H \rightarrow G$ of Lie 2-groups is uniquely given by $Lie(f)$, where $Lie(f) : Lie(H) \rightarrow Lie(G)$ is the induced morphism in the derived category of 2-terms differential graded Lie algebras. We also exhibit a functorial construction of the 2-connected cover $H < 2 >$ of a Lie 2-group H .

- Hiroyuki Chihara (Kagoshima University)

Title: “Schrödinger flow into almost Hermitian manifolds”

Abstract: We present a short-time existence theorem of solutions to the initial value problem for Schrödinger maps of a closed Riemannian manifold to a compact almost Hermitian manifold. The classical energy method breaks down for this problem since the almost complex structure of the target manifold is not supposed to be parallel with respect to the Levi–Civita connection. To overcome this difficulty, we introduce a bounded pseudodifferential operator acting on sections of the pullback bundle, and essentially eliminate the loss of one derivative from the Schrödinger map equation.

- Paolo Aluffi (Florida State University)

Title: “Chern classes of singular varieties, graph hypersurfaces, and Feynman integrals”

Abstract: Numerical evidence indicates that the value of individual contributions of graphs to Feynman integrals are linear combinations of multiple zeta values. This fact can be interpreted as a statement concerning certain hypersurfaces of projective space determined by graphs. I will report on work aimed at understanding this phenomenon. Characteristic classes of singular varieties play an important role in this study, by quantifying the singularity of graph hypersurfaces, and by giving an algebro-geometric construction of invariants satisfying ‘Feynman rules’. This is joint work with Matilde Marcolli.