SM-Hefei2019

Organisers : Liang, Yongqi University of Science and Technology of China
QIAN, Zicheng Université Paris-Sud
Wang, Xiaozong Université Paris-Sud

Mai 06 - 10, 2019 University of Science and Technology of China, Hefei, China

1 Title : Equidistribution of special subvarieties in a Hodge variety

CHEN, Jiaming *Université Paris Diderot*

Abstract : I will talk about the equidistribution of positive dimensional special subvarieties of a Mumford-Tate domain which can be seen as a generalization of previous results of Clozel and Ullmo (2005), Ullmo (2007) on the equidistribution of positive dimensional special subvarieties of a Shimura variety to the non-classical case. This is also the geometric part of the André-Oort conjecture for integral polarized variation of Hodge structures formulated by Bruno Klingler recently.

2 Title : Modular ℓ representations of p-adic groups and Bernstein decomposition

CUI, Peiyi *Sorbonne Université*

Abstract : Let F be a p-adic field, and G be $GL_n(F)$ and G' be $SL_n(F)$. We endow a p-adic topology on G and G', of which we consider the category of k-smooth representations $\mathrm{Rep}_k(G)$ and $\mathrm{Rep}_k(G')$. Here k is an algebraically closed field, with character $\mathrm{char}(k) = \ell$ and ℓ is different from p. My talk will introduce the Bernstein decomposition of $\mathrm{Rep}_k(G)$, and the uniqueness of supercuspidal support of irreducible k-representations of G'.

3 Title : A method for meromorphic continuations of height zeta functions

DARDA, Ratko *Université Paris Diderot*

Abstract : Let X be a Fano variety over a number field F. Let H be a height function corresponding to the anti-canonical divisor. The conjecture of Manin-Peyre predicts that if rational points of X are Zariski-dense, then on a certain Zariski-open subset U of X the number of rational points of the height at most B is asymptotically $CB(\log B)^{r-1}$, where r is the rank of the Picard

group of X and C is a constant linked to certain adelic volume. One can tackle the problem by studying the convergence and the meromorphic continuation of $Z(s) := \sum_{x \in U(F)} H(x)^{-s}$, for $s \in \mathbb{C}$. The proof for toric varieties uses estimates for functions having λ-poles.

4 Title : Algebraic independence for values of integral curves

FONSECA, Tiago *University of Oxford*

Abstract : After a brief introduction to the theory of transcendental numbers, I will discuss Nesterenko's 1996 celebrated theorem on the algebraic independence of values of Eisenstein series, and some related open problems. This motivates the second part of the talk, in which I will report on a recent geometric generalization of Nesterenko's method.

5 Title : Representability of group algebraic spaces

GUO, Ning *Université Paris-Sud*

Abstract : In this talk, we discuss Anantharaman's theorem that every group algebraic space over a discrete valuation ring is a scheme and its extended version for the case when the base scheme is valuation ring of height one.

6 Title : Projective threefolds admitting nowhere vanishing holomorphic 1-forms

HAO, Feng *Mathematisches Institut der Universität München*

Abstract : A celebrated result of Popa and Schnell states that on a smooth complex projective variety of general type any holomorphic 1-form has at least one zero, the existence of a holomorphic 1-form without zeros forces the variety to be of special type. In this talk I will give a full classification of smooth projective threefolds which admit nowhere vanishing holomorphic 1-forms. This is a joint work with S. Schreieder.

7 Title : ramification of l-adic sheaves on varieties over curves

HU, Haoyu *Nanjing University*

Abstract : Using the theory of singular supports and characteristic cycles for l-adic sheaves, developed by Beilinson and Saito respectively, we studies the ramification bound of nearby cycles of l-adic sheaves on schemes smooth over equal characteristic traits. Applying this boundedness result, we studies the ramification we studies the ramification of l-adic sheaves along a vertical divisor of schemes over curves. This is a joint work with J.-B. Baptiste.

8 Title : Dimensions of Bianchi modular forms and mod p representations of $GL_2(Q_p)$

HU, Yongquan *CAS MCM*

Abstract : Given a level N and a weight k, we know the dimension of the space of (classical) modular forms. This turns out to be unknown if we consider Bianchi modular forms, that is, modular forms over imaginary quadratic fields. In this talk, we consider the asymptotic behavior of the dimension when the level is fixed and the weight grows. I will first explain an upper bound obtained by Simon Marshall using Emerton's completed cohomology and the theory of Iwasawa algebras. Then I explain how to improve this bound using the mod p representation theory of $GL_2(Q_p)$.

9 Title : Recognizing rational homogeneous spaces of Picard number one by the varieties of minimal rational tangents

LI, Qifeng *Korea Institute for Advanced Study*

Abstract : Let G/P be a rational homogeneous space of Picard number one, and X be a Fano manifold of Picard number one. In this talk we will show that if the VMRT (varieties of minimal rational tangents) at a general point of X is projectively equivalent to that of G/P, then X itself is isomorphic to G/P. Roughly speaking, by the VMRT of X at a general point x we mean the set of tangent directions of those rational curves which have minimal degree among the rational curves on X passing through x. The long root cases of this characterization of G/P are obtained by Mok and Hong-Hwang in 2008. In joint works with Hwang, and Hwang-Timashev, we settle the short root cases.

10 Title : Hall algebras and sheaves on surfaces

MINETS, Alexandre *IST Austria*

Abstract : Hall algebra of an abelian category C is an object which keeps track of most of the information about short exact sequences in C. This notion first rose in prominence in the 1990s, when Ringel used it to construct quantum groups out of representations of quivers. I will start with a gentle recollection of this result, and then proceed to more recent developments, namely constructing the action of various Hall algebras on moduli of coherent sheaves over algebraic surfaces.

11 Title : Exceptional invariants of some K3 type Galois representations

TAYOU, Salim *Ecole Normale Supérieure de Paris*

Abstract : Given a number field K and a Galois representation of K3 type associated to a K-point of an orthogonal Shimura variety, we prove under some approximation condition the

existence of a place of K with an exceptional invariant. This has application to Picard rank jumps of specializations of a K3 surface defined over a number field.

12 Title : Obstructions to weak approximation for reductive groups over p-adic function fields

TIAN, Yisheng *Université Paris-Sud*

Abstract : In this talk, we consider weak approximation for a reductive group G over p-adic function fields. We will introduce some arithmetic duality results on short complexes of tori associated to G which enable one to construct a 12-term Poitou–Tate style exact sequence. On the other hand, dualities allow one to analyse obstructions to weak approximation for G. Our main result is that the defect of weak approximation is controled by some sort of Tate–Shafarevich groups of short complexes of tori associated to G. We will also give two different ways to compute the defect of weak approximation. Namely, one way is using unramified cohomology and the other is based on the group of multiplicative type whose character module is the algebraic fundamental group of G. Finally, we will give an application to homogenous spaces under G with connected stabilizers.

13 Title : Iwasawa main conjecture for modular forms

WANG, Shanwen *Fudan University*

Abstract : In this talk, we will introduce IMC for modular forms and explain some known results on this conjecture.

14 Title : On the total cohomological characteristic class of a constructible etale sheaf

YANG, Enlin *Peking University*

Abstract : We will define the total cohomological characteristic class of a constructible etale sheaf on a projective smooth variety over a perfect field. Its degree 0 part is the characteristic class defined via a cohomological pairing due to Verdier (SGA5). We will also discuss its relation with the characteristic cycle defined by T. Saito. This is a joint work with Yigeng Zhao.

15 Title : Fundamental local equivalence in Geometric Langlands

YANG, Ruotao *Université de Lorraine*

Abstract : This short presentation focuses on Dennis Gaitsgory's local fundamental equivalence (FLE) of the Langlands quantum program. Its origin is the geometric equivalence Satake. In order to deform the original equivalence, we have to switch to the Whittaker model (objects $(N(K), \chi)$ -equivalents of a category). The fundamental equivalence is to establish an equivalence between the Whittaker category and the Kazhdan-Lusztig category. In this presentation, I will explain why

people are interested in this program and recent progress in this area. If we have more time, I will focus on my recent work on FLE between the twisted Whitter category on affine flag and the mixed representation category of the quantum group.

16 Title : Perverse sheaves, Lagrangian fibrations, and hyper-Kaehler geometry

YIN, Qizheng *Peking University BICMR*

Abstract : The P=W conjecture of de Cataldo, Hausel, and Migliorini relates the topology of Hitchin systems to the Hodge theory of character varieties via Simpson's nonabelian Hodge theory. Here P and W stand for the perverse and weight filtrations on the cohomology of the corresponding moduli spaces. While the original conjecture remains open, the P=W phenomenon can be observed in a much wider context. In recent joint work with Junliang Shen, we proved a compact version of the P=W conjecture, which relates the topology of holomorphic Lagrangian fibrations to the Hodge theory of compact hyper-Kaehler manifolds. I will present the circle of ideas together with some applications of our result.

17 Title : Counting ℓ-adic local systems over a curve

YU, Hongjie *IST Austria*

Abstract : Let X_1 be a projective, smooth and geometrically connected curve over $\mathbb{F}_q$ with $q = p^n$ elements where p is a prime number, and let X be its base change to an algebraic closure of $\mathbb{F}_q$. The Frobenius element permutes the set of isomorphism classes of irreducible ℓ-adic local systems ($\ell \neq p$) with a fixed rank on X. In 1981, Drinfeld has calculated the number of fixed points of this permutation in the rank 2 case. Curiously, it looks like the number of $\mathbb{F}_q$-points of a variety defined over $\mathbb{F}_q$. In this talk, we generalize Drinfeld's result to higher rank case. Our method is purely automorphic, in fact we do that by using Arthur-Lafforgue's trace formula.

18 Title : Arithmetic of Siegel modular forms

ZHANG, Xiaoyu *Université Paris 13*

Abstract : Siegel modular forms are natural generalizations of modular forms from $GL(2)$ to $GSp(2n)$. There are various arithmetic objects attached to these modular forms, such as p-adic Galois representations, Selmer groups, automorphic L-functions, congruence ideals, etc. In this talk, I will start with an introduction to Siegel modular forms, then introduce some of the above arithmetic objects and proceed to state some results which relate these objects under certain conditions (automorphic type Bloch-Kato conjecture). If time permits, I will say something about the idea of the proofs of these results.

19 Title : Twisted cubics on cubic fourfolds and stability conditions

ZHAO, Xiaolei *University of California, Santa Barbara*

Abstract : It is a classical result of Beauville and Donagi that Fano varieties of lines on cubic fourfolds are hyper-Kahler. More recently, Lehn, Lehn, Sorger and van Straten constructed a hyper-Kahler eightfold out of twisted cubics on cubic fourfolds. In this talk, I will explain a new approach to these hyper-Kahler varieties via moduli of stable objects on the Kuznetsov components, and further generalizations. An application towards the study of 0-cycles on these hyper-Kahler varieties will also be discussed. This is based on a joint work with Chunyi Li and Laura Pertusi.

20 Title : Landau-Ginzburg/Calabi-Yau correspondence via matrix factorizations

ZHAO, Yizhen *Sorbonne Université*

Abstract : We will introduce two curve-counting theories : Gromov-Witten theory and Fan-Jarvis-Ruan-Witten theory. We relate the two theories by analytic contiunation. This is the so-called Landau-Ginzburg/Calabi-Yau correspondence. We will also introduce the derived category of matrix factorizations, and show that the LG/CY correspondence matches an equivalence of triangulated categories.