第 13 回仙台広島整数論集会アブストラクト

期間 : 2014 年 7 月 15 日 (火) ~ 7 月 18 日 (金)
会場 : 東北大学大学院理学研究科　川井ホール (数理科学記念館)

新井 啓介/Keisuke Arai (東京電機大学/Tokyo Denki University)

代数体の無限族と $\Gamma_0(p)$ 型志村曲線の有理点

(An infinite family of number fields and rational points on Shimura curves of $\Gamma_0(p)$-type)

We show that there are no points rational over a fixed number field on the Shimura curve of $\Gamma_0(p)$-type for every sufficiently large prime number p under a certain assumption. We also obtain an infinite family of such number fields under the same assumption.

跡部 発/Hiraku Atobe (京都大学/Kyoto University)

Pullbacks of Hermitian Maass lifts

Ichino and Ikeda gave an explicit formula for the restriction of hermitian Maass lifts of degree 2 to the Siegel upper half space of degree 2 in terms of central critical values of triple product L-functions. Ichino gave an explicit formula for pullbacks of Saito-Kurokawa lifts in terms of central critical values of L-functions for $\mathrm{SL}_2 \times \mathrm{GL}_2$. These pullbacks have been used to study the algebraicity of critical values of certain automorphic L-functions. In this talk, we consider pullbacks of hermitian Maass lifts to the space of diagonal matrices. By using these pullbacks, we give an explicit formula for the central values of L-functions for $\mathrm{GL}_2 \times \mathrm{GL}_2$.

Jerome Dimabayao (九州大学/Kyushu University)

On cohomologies of some ordinary p-adic Galois representations

Let G be the absolute Galois group of a p-adic field. A p-adic representation of G is said to be *ordinary* if it has a decreasing, exhaustive and separated filtration of G-stable subspaces such that the inertia subgroup of G acts by a power of the p-adic cyclotomic character at each graded piece. In this talk, we look at some examples of ordinary representations and prove the vanishing of certain Galois cohomology groups with coefficients in such representations. This generalizes a result of Coates, Sujatha and Wintenberger for these cases. In particular, we give a necessary and sufficient condition for the vanishing to hold in the case given by an abelian variety with good ordinary reduction. Using these local results, we give some consequences for Galois cohomology of global Galois representations associated with abelian varieties.

原瀬 晋/Shin Harase (東京工業大学/Tokyo Institute of Technology)

On the lattice structure of Mersenne Twister pseudorandom number generators

The Mersenne Twister MT19937 is a pseudorandom number generator developed by Matsumoto and Nishimura (1998), and it is a successful application of computational number theory. This generator has the following advantages: (i) its generation speed is very fast; (ii) it has a large period of $2^{19937} - 1$; (iii) it has high-dimensional equidistribution property (i.e., 623-dimensionally equidistributed). Thus, MT19937 is considered to be an ideal pseudorandom generator. In this talk, we first survey Mersenne Twister pseudorandom number generators and their assessments using lattice basis reduction. Next, we take a closer look at the lattice structure of MT19937 and investigate properties in dimensions higher than 623. We also introduce recent developments on Mersenne Twisters.

飯島 優/Yu Iijima (京都大学/Kyoto University)

A pro-l version of the congruence subgroup problem for mapping class groups of genus one

Let l be a prime number. In this talk, we discuss a *pro-l version* of the congruence subgroup problem for mapping class groups of genus one. Our main result is that the pro-2 version has an *affirmative* answer, but the pro-l version for $l \geq 11$ has a *negative* answer. In order to give a negative answer to the problem in the case where $l \geq 11$, we also consider the issue of whether or not the image of the natural outer action of the absolute Galois group of a certain number field on the geometric pro-l fundamental group of a modular curve is a pro-l group. This is a joint work with Yuichiro Hoshi.

石川 勲/Ishikawa Isao (京都大学/Kyoto University)

Integrals on p-adic upper half planes and Hida families over totally real fields

Bertolini-Darmon and Mok have proved a formula of the second derivative of the two-variable p-adic L-function of a modular elliptic curve along the Hida family in terms of the image of a global point by some p-adic logarithm map. The theory of p-adic indefinite integrals and p-adic multiplicative integrals on p-adic upper half planes plays an important role in their works. In this paper, we generalize and study these integrals for p-adic measures which are not necessarily $\mathbb{Z}$-valued. Our results have applications to the generalization of their formula to abelian varieties of GL(2)-type associated to Hilbert modular forms of weight 2.

加藤 遼/Ryo Kato (京都大学/Kyoto University)

A remark on the Wiener-Ikehara Tauberian theorem

An extension of the Wiener-Ikehara Tauberian theorem is given by Delange and Kable. In particular, Kable has given an extension for the case where the Dirichlet series has a pole of order "$1/m$". In this talk, we show that the proof of Kable's result works for the case where the order of the pole is "l/m".

喜友名 朝也/Tomoya Kiyuna (九州大学/Kyushu University)

The Kaneko-Zagier equation for Jacobi forms

Kaneko and Zagier introduced a certain differential equation for elliptic modular forms, called the Kaneko-Zagier equation. Explicit modular/quasimodular solutions of the equation were given by Kaneko and Koike. In this talk, we carry out similar studies for Jacobi forms. First, we introduce the Kaneko-Zagier equation for Jacobi forms. Next, we give explicit Jacobi solutions of the equation.

小松 亨/Toru Komatsu (東京理科大学/Tokyo University of Science)

与えられた位数のイデアルをもつ虚 2 次体の組について

(On pairs of imaginary quadratic fields with ideals of given order)

Let n and m be rational integers greater than 1. We make a pair of imaginary quadratic fields $\mathbb{Q}(\sqrt{D})$ and $\mathbb{Q}(\sqrt{mD})$ which have ideals of order n. In a previous paper of the case $n = 3$ we prove the class number divisibility by the existence of an unramified extension and due to class field theory. In this talk we construct ideals of order n by using Yamamoto's result(1970).

三原 朋樹/Tomoki Mihara (東京大学/University of Tokyo)

Berkovich スペクトルや adic スペクトルの Tate 非輪状性と一様性について

(On Tate's Acyclicity and Uniformity of Berkovich Spectra and Adic Spectra)

I will talk on the following four open questions asked by Peter Scholze a few months ago: (i) "Is the uniformity of an adic ring preserved under rational localisations?", (ii) "Does the uniformity of an adic ring imply the sheaf condition?", (iii) "Does an adic ring satisfy the sheaf condition if every rational localisation of it is uniform?", and (iv) "Does the condition 'affinoid + perfectoid' of an adic space imply 'affinoid perfectoid' ?" I will show counter-examples for (i) and (ii), a proof of (iii), and a partial answer to (iv) in my talk. I will also show counter-examples for counter-parts of (i) and (ii) for Berkovich spectra.

望月 哲史/Satoshi Mochizuki (中央大学/Chuo University)

Projective varieties over a category

In the lecture, I make out and look through the notion of projective varieties over categories and work out nilpotent invariant localizing theories of certain varieties. Our notion embraces the class of algebraic varieties over the field with one element and these researches are involved with the theory of motives. For example I disclose what makes motives $\mathbb{A}^1$-homotopy invariant and I also go into the relationship between these concept and weight of algebraic varieties.

森澤 貴之/Takayuki Morisawa (東京理科大学/Tokyo University of Science)

On the ℓ-part of class numbers in $\mathbb{Z}_p$-extensions of $\mathbb{Q}(\sqrt{-1})$ with restricted ramification

Let p and ℓ be distinct prime numbers. It is an interesting problem to study the ℓ-indivisibility of the class numbers of the intermediate fields of the cyclotomic $\mathbb{Z}_p$-extension of $\mathbb{Q}$. On this problem, Horie and others showed several results. In this talk, we consider a non-cyclotomic analogue of it over $\mathbb{Q}(\sqrt{-1})$. This is a joint work with J. Lamplugh.

中村 健太郎/Kentarou Nakamura (北海道大学/Hokkaido University)

Local ε-isomorphisms for rank two p-adic representations of $\mathrm{Gal}(\overline{\mathbb{Q}}_p/\mathbb{Q}_p)$ and a functional equation of Kato's Euler system

Local ε-isomorphisms are conjectural bases of the determinants of the Galois cohomologies of families of p-adic representations of $\mathrm{Gal}(\overline{\mathbb{Q}}_p/\mathbb{Q}_p)$, which p-adically interpolate the de Rham ε-isomorphisms which are explicitly defined by using local constants and Bloch-Kato's exponential maps for de Rham representations. Up to now, such bases have been constructed for the rank one case by Kazuya Kato, (the cyclotomic deformation of) the crystalline case by Benois-Berger and Loeffler-Venjakob-Zerbes, and the trianguline case by the speaker. In this talk, using Colmez's theory of p-adic Langlands correspondence for $\mathrm{GL}_2(\mathbb{Q}_p)$, we define such bases for (almost) all rank two families of p-adic representations. As an application, we prove a functional equation of Kato's Euler systems associated to modular forms without any condition at p.

小原 まり子/Mariko Ohara (東北大学/Tohoku University)

The classification for GL_n-torsors in quasi coherent sheaves on functors.

We explain the infinity category of quasi coherent sheaves on a functor X introduced by Lurie. We define GL_n-torsors on X and prove an infinity categorical version of classification that GL_n-torsors are classified by BGL_n.

大垣 翔/Sho Ogaki (大阪大学/Osaka University)

On a p-adic Hodge realization functor and its applications

Deligne constructed the mixed Hodge structure associated with any complex variety. Later, Levine extended this correspondence to the (realization) functor from his own triangulated category of motives. We will explain there exists a p-adic analogue of this functor, whose domain is his triangulated category of motives over a ring of p-adic integers. As far as

time permits, we will also explain applications to p-adic Hodge theory for open varieties and (rigid) syntomic cohomology theory.

大竹 秀一/Shuichi Otake (早稲田大学/Waseda University)

Orthogonal decompositions of integral trace forms of cyclotomic fields

It is well-known that for any number field K, the trace $\mathrm{Tr}_{K/\mathbb{Q}}$ defines a non-degenerate symmetric $\mathbb{Q}$-bilinear form on K, called the trace form of K and its restriction to the ring of integers defines a symmetric $\mathbb{Z}$-bilinear form, called the integral trace form of K. Since the 1980's, many mathematicians have been studied to determine all trace forms, which inseparably connects to explicit computations. Then the same problem arises when we consider integral trace forms. In this talk, we give orthogonal decompositions of integral trace forms of cyclotomic fields explicitly and as a result, we can get canonical forms of them over the ring of p-adic integers.

小澤 友美/Tomomi Ozawa (東北大学/Tohoku University)

総実代数体上定義される Eisenstein 級数の定数項について

(Constant terms of Eisenstein series over a totally real field)

In this talk, we compute constant terms of Eisenstein series defined over a totally real field, at each equivalence class of cusps. Ohta defined and computed congruence modules related to Eisenstein series defined over $\mathbb{Q}$ in a paper published in 2003. His theory of congruence modules has been applied to several important problems in number theory, particularly in Iwasawa theory. In his computation, the constant terms of Eisenstein series over $\mathbb{Q}$ at all the equivalence classes of cusps are necessary. If time allows, we consider a generalization of the theory of congruence modules to a totally real field case.

関 真一朗/Shin-ichiro Seki (大阪大学/Osaka University)

On the structure of Selmer groups of p-adic Galois representations associated to modular forms over the cyclotomic $\mathbb{Z}_p$-extension of $\mathbb{Q}$

Under some mild conditions, we prove that Pontryagin duals of Selmer groups of p-adic Galois representations associated to modular forms over the cyclotomic $\mathbb{Z}_p$-extension of the field of rational numbers do not have non-trivial finite submodules. This is based on a Matsuno's result giving a sufficient condition for non-existence of non-trivial finite submodules for Selmer groups of general p-adic Galois representations.

谷本 祥/Sho Tanimoto (Rice University)

Distribution of S-integral points on SL_2-orbit closures of binary forms

In this talk, we discuss the distribution of S-integral points on SL_2-orbit closures of binary forms and prove an asymptotic formula for the number of S-integral points of bounded height. This extends a result of Duke, Rudnick, and Sarnak. Our proof is based on the method of mixing developed by Eskin-McMullen and Benoist-Oh, Chambert-Loir-Tschinkel's study of asymptotic volume of height balls, and Hassett-Tschinkel's description of log resolutions of SL_2-orbit closures of binary forms in terms of moduli spaces of stable maps. This is joint work with James Tanis.

呼子 笛太郎/Fuetaro Yobuko (東北大学/Tohoku University)

Mass formula for supersingular abelian varieties

It is well known that the number of isomorphism classes of supersingular elliptic curves over an algebraically closed field of characteristic $p > 0$ is finite. Its weighted number is expressed as a simple polynomial in p. This is called the Eichler-Duering mass formula. We show a mass formula for supersingular abelian three-folds of a-number 1.