December 4 (Mon)
10:10 – 10:25 Introduction

10:25 – 11:15 Masanori Morishita (Kyushu University)
On local symbols and the reciprocity law for foliated dynamical systems on 3-manifolds

The theory of local symbols (Hilbert symbols, tame symbols) is a beautiful subject in number theory and algebraic geometry, and plays an important role in class field theory and algebraic K-theory. Following the analogies in arithmetic topology, C. Deninger asked a question to find out a 3D geometric analogue of the Hilbert reciprocity law. In this talk, we introduce a geometric analogue of a Hilbert symbol for a foliated dynamical system on a 3D manifold and show the reciprocity law. For this, we use a foliated version of smooth Deligne cohomology and higher dimensional holonomy integrals. These concepts have been used in the pioneering work of Gawedzki on 2D quantum field theory and then studied extensively by Brylinski and Gomi-Terashima. This is the joint work with Yuji Terashima.

11:30 – 12:30 Shinya Harada *
Hasse-Weil zeta functions of character varieties of hyperbolic 3-manifolds

The $SL_2(\mathbb{C})$-character variety of a 3-manifold plays an important role in the study of 3-dimensional topology, which is known to be an algebraic set over the rational number field. We will talk on an attempt to study character varieties and their zeta functions. Especially we obtain a relationship between the special values of the zeta functions at $s = 2$ and the hyperbolic volume for closed arithmetic hyperbolic 3-manifolds.

14:00 – 14:50 Mirai Onoda (Tokyo Institute of Technology)
Additive higher Chow groups (1-cycle) and module of Kähler differentials

Additive higher Chow group of 0-cycles over a field was introduced to describe the algebraic K-theory of the truncated polynomial ring. The relative K-group of truncated polynomial ring has a direct sum decomposition into modules of absolute Kähler differentials. Park defined the map, called a regulator map, from the additive higher Chow group of 1-cycles with sup modulus to the module of absolute Kähler differentials. In this talk, I explain how to describe the relative K-group of truncated polynomial ring in terms of algebraic 1-cycles with strong sup modulus.

15:05 – 15:55 Kazuhiro Ito (Kyoto University)
On the arithmetic of K3 surfaces with complex multiplication and its applications

As an analogue of the theory of complex multiplication (CM) for abelian varieties, Rizov proved the main theorem of CM for K3 surfaces. In this talk, I will study arithmetic properties of CM K3 surfaces generalizing the results of Shimada for K3 surfaces with Picard number 20. Then, following Taelman’s strategy and using Matsumoto’s good reduction criterion for CM K3 surfaces, I will construct K3 surfaces over finite fields with given L-function, up to finite extensions of the base fields. I will also prove some cases of the Tate conjecture for the product of two K3 surfaces over finite fields by CM lifts and some cases of the Hodge conjecture for the product of two K3 surfaces proved by Mukai and Buskin.
16:10 – 17:00  **Hiroki Kato** (University of Tokyo)
Wild ramification and restrictions to curves

By the work of Saito and Yatagawa, for constructible l-adic sheaves on a smooth variety, the sheaves have the same characteristic cycles if they have the same wild ramification. The notion “same wild ramification” was first formulated by Deligne and slightly modified by Saito and Yatagawa to a weaker form. We gave another formulation of “same wild ramification” by seeing restrictions to all curves and proved that having the same wild ramification in our sense also implies having the same characteristic cycles.

December 5 (Tue)

09:20 – 10:10  **Humio Ichimura** (Ibaraki University)
On the class numbers of real abelian fields of prime conductor

For a fixed integer $n$, let $p = 2n\ell + 1$ be a prime number with an odd prime number $\ell$, and let $F = F_{p,\ell}$ be the real abelian field of conductor $p$ and degree $\ell$ over $\mathbb{Q}$. For each $n$, there are many results on indivisibility of the class number of $F_{p,\ell}$ by several authors with several methods. In this talk, I generalize these results with a unified way by using some results in Iwasawa theory and some idea and technique of Horie.

10:25 – 11:15  **Takenori Kataoka** (University of Tokyo)
Fitting ideals in equivariant Iwasawa theory

In equivariant Iwasawa theory, the Iwasawa modules which we are interested in are often modified appropriately, and the modification prevents us from computing the (initial) Fitting ideals of the Iwasawa modules themselves. However, Greither and Kurihara gave an explicit description of them for the cyclotomic $\mathbb{Z}_p$-extensions of totally real fields in the commutative case. In this talk, I will discuss a generalization of the algebraic theory behind their work, and applications of the generalization to other situations in Iwasawa theory.

11:30 – 12:30  **Takamichi Sano** * (Osaka City University)
Recent developments on Stark-type conjectures

I will survey recent developments on Stark-type conjectures. I will mainly talk about joint works with D. Burns and M. Kurihara. The topics of this survey talk include an introduction of the Stark conjecture, its integral refinement by Rubin, a conjecture for Rubin-Stark elements proposed by Mazur-Rubin and the speaker, its application to the equivariant Tamagawa number conjecture, and $p$-adic families of generalized Stark elements.

14:00 – 14:50  **Ryotaro Sakamoto** (University of Tokyo)
On the theory of Euler, Kolyvagin, and Stark systems

We will report on the recent progress on the theory of higher rank Euler, Kolyvagin, and Stark systems. We shall describe natural maps from a set of higher rank Euler systems to a set of higher rank Kolyvagin systems and a set of higher rank Stark systems to a set of higher rank Kolyvagin systems. Furthermore, we explain that a certain Stark system control the structure of associated Selmer groups. This is joint work with David Burns and Takamichi Sano.

15:05 – 15:55  **Kazuto Ota** (Keio University)
Anticyclotomic Iwasawa main conjecture for modular forms

We discuss recent developments on the anticyclotomic Iwasawa main conjecture. The conjecture connects a Selmer group with a $p$-adic $L$-function which interpolates special values of the $L$-function of an elliptic modular form twisted by anticyclotomic Hecke characters (of an imaginary quadratic field). In this talk, we explain a strategy toward a half of the conjecture at non-ordinary primes. This is a joint work with Shinichi Kobayashi.
16:10 – 17:00  Takehiro Hasegawa (Shiga University)

An explicit Shimura tower of function fields: An application of Takeuchi’s list

Kisao Takeuchi (1977) gave a complete list of arithmetic triangle groups. Noam D. Elkies (1997) constructed two Shimura curves from two groups in the list, respectively. In this talk, I construct a new Shimura curve from a group in the list by using the method of Elkies, and moreover, I show that Shimura curves cannot be constructed from the other groups in the list. The method of computation is as follows. Since a Shimura curve has no cusps, a Shimura curve cannot be computed by using a \( q \)-expansion. But, a Shimura curve can be determined by using a ramification behavior.

December 6 (Wed)

09:20 – 10:10  Tomokazu Kashio (Tokyo University of Science)

A period-ring-valued gamma function and a refinement of the reciprocity law on Stark units

The theme of this talk is a relation between CM periods, multiple gamma functions, their \( p \)-adic analogues, and the rank one abelian Stark conjecture when the base field is an arbitrary totally real field. We conjecture an explicit formula for their relations, which is a refinement of Hiroyuki Yoshida’s conjecture on “Absolute CM-periods”.

10:25 – 11:15  Masao Oi (University of Tokyo)

Simple supercuspidal \( L \)-packets of quasi-split classical groups

We consider a quasi-split classical group \( G \) over a \( p \)-adic field \( F \). By the local Langlands correspondence for \( G \), which is recently established by Arthur, we have a natural partition of the set of irreducible smooth representations of \( G(F) \) into finite sets (\( L \)-packets) which are parametrized by \( L \)-parameters. In this talk, I will show that simple supercuspidal representations of \( G(F) \) constitutes \( L \)-packets, and determine their \( L \)-parameters by computing the endoscopic character relation, which is the characterization of the local Langland correspondence, explicitly.

11:30 – 12:20  Kaori Ota (Tsuda University)

On power bases for rings of integers and indices of relative Galois extensions (joint work with graduate students)

Let \( L \) be a Galois extension of a number field \( k \) of prime power degree, whose rings of integers are \( \mathcal{O}_L \) and \( \mathcal{O}_k \), respectively. We give sufficient conditions for \( \mathcal{O}_L \) not having a power basis over \( \mathcal{O}_k \). As a corollary, we show the ring of integers of the \( n \)-th layer of the cyclotomic \( \mathbb{Z}_p \)-extension of \( \mathbb{Q} \) does not have a power basis for \( p \geq 5 \). In this case, the index is related to higher degree Fermat quotients. A brief survey of this subject is also given. (This work was carried out in collaboration with graduate students.)

12:30 – Meeting of the steering committee (mainly for the committee members)

December 7 (Thu)

09:20 – 10:10  Nao Komiyama (Nagoya University)

On special values of multiple zeta functions at non-positive integers

It is known that there are infinitely many singularities of multiple zeta functions, and almost all of non-positive integer points are located in their singularities. The special values of these functions are indeterminate, and several approaches to give the “meaningful” values have been taken. I will talk about the special values obtained by the renormalization method (à la Connes and Kreimer) and the values obtained by the desingularization method. I will explain my result that these two values are actually equivalent, i.e. they are expressed as linear combinations of each other.
10:25 – 11:15 Nobuo Sato (NCTS, National Taiwan University)
Confluence relations for the multiple zeta values

In this talk, we consider iterated integrals on a projective line minus generic four points and introduce a new class of linear relations among the MZVs, which we call confluence relations. We start with Goncharov’s notation for iterated integrals, review some basic notions and properties of iterated integrals, and define a class of relations among iterated integrals, which naturally arise as “solving differential equations step by step”. Confluence relations are defined as the limit of these relations when merging two out of the four punctured points. One of the significance of the confluence relations is that it is a rich family and seems to exhaust all the linear relations among the MZVs. As a good reason for this, we show that confluence relations imply the extended double shuffle relations as well as the duality relations. This is a joint work with Minoru Hirose at Kyushu University.

11:30 – 12:30 Shuji Yamamoto *(Keio University)
A generalization of integral expression of multiple zeta values and its applications

Multiple zeta values (MZVs), defined by certain multiple infinite series, have also the iterated integral expression, and the interplay of the series and integrals is a source of rich properties of MZVs. In recent years, I have introduced and studied a generalization of iterated integrals based on certain combinatorial data (called 2-posets). It has turned out that we can apply it to obtaining a large class of linear relations among MZVs, and to analyzing the regularizations of divergent MZVs, in a quite elementary way (joint work with Prof. Masanobu Kaneko). In this talk I explain these methods and results.

14:00 – 14:50 Arata Minamide (RIMS, Kyoto University)
On a direct product decomposition related to the Grothendieck-Teichmüller group

Let \( n \geq 2 \) be an integer and \( k \) an algebraically closed field of characteristic zero. Write \( \Pi_n \) for the étale fundamental group of the \( n \)-th configuration space of \( \mathbb{P}^1_k \setminus \{0, 1, \infty\} \) and \( \text{Out}(\Pi_n) \) for the group of outer automorphisms of \( \Pi_n \). It is well-known that the [profinite] Grothendieck-Teichmüller group GT may be identified with a certain subgroup of \( \text{Out}(\Pi_n) \). In this talk, we will show that there exists a direct product decomposition \( \text{Out}(\Pi_n) = GT \times S_{n+3} \), where we write \( S_{n+3} \) for the symmetric group on \( n+3 \) letters. As an application, we give a simple purely group-theoretic characterization of GT. This is a joint work with Yuichiro Hoshi and Shinichi Mochizuki.

15:05 – 15:55 Kazumi Higashiyama (RIMS, Kyoto University)
Reconstruction of function fields from pro-p second configuration space groups

The \( n \)-th configuration space of a hyperbolic curve is the scheme which parametrizes \( n \)-tuples of pairwise distinct points in the hyperbolic curve. Mochizuki proved the Grothendieck conjecture for hyperbolic curves. We discuss a certain pro-p version of the Grothendieck conjecture for hyperbolic curves. In this talk, we reconstruct group-theoretically the function field of a hyperbolic curve of type \( (0, 3) \) from the pro-p fundamental group of the associated second configuration space equipped with the collection of decomposition groups.

16:10 – 17:00 Shota Tsujimura (RIMS, Kyoto University)
Geometric Version of the Grothendieck Conjecture for Universal Curves over Hurwitz Stacks

Hurwitz stacks are algebraic stacks that parametrize simple coverings. In this talk, we consider a certain geometric version of the Grothendieck Conjecture for universal curves over Hurwitz stacks and sketch the proof in the hyperelliptic case. This result generalizes a similar result obtained by Hoshi and Mochizuki in the case of universal curves over moduli stacks of pointed smooth curves.

18:00 – 20:00 Conference Banquet
December 8 (Fri)

09:20 – 10:10 Shusuke Otabe (Tohoku University)
On a purely inseparable analogue of the Abhyankar Conjecture for affine curves

Let $U$ be an affine smooth curve defined over an algebraically closed field $k$ of positive characteristic $p > 0$. The Abhyankar Conjecture (proved by Raynaud and Harbater in 1994) describes the set of finite quotients of Grothendieck’s étale fundamental group of $U$. In this talk, I will consider a purely inseparable analogue of this problem, formulated in terms of Nori’s profinite fundamental group scheme. I will give a partial answer to it.

10:25 – 11:15 Yu Yang (RIMS, Kyoto University)
The anabelian geometry of curves over algebraically closed fields of positive characteristic (after Tamagawa)

The philosophy and conjecture of anabelian geometry were posed by A. Grothendieck in the 1980s. The main question of interest in the anabelian geometry of curves is, roughly speaking, the following: “how much geometric information about the isomorphism class of a curve is contained in various versions of its fundamental group?”

Grothendieck’s anabelian conjecture for curves was proved in many cases. For example, when the base fields are number fields, the conjecture was proved by H. Nakamura (genus 0), A. Tamagawa (affine), and S. Mochizuki (in full generality). All the proofs of the Grothendieck conjecture for curves over non-algebraically closed fields require the use of the highly nontrivial outer Galois representation induced by the fundamental exact sequence of étale fundamental groups.

On the other hand, Tamagawa also considered an analogue of Grothendieck’s anabelian conjecture for curves over algebraically closed fields of positive characteristic. In the case of algebraically closed fields, the Galois groups of the base fields are trivial, and the étale (or tame) fundamental group coincides with the geometric fundamental group (note that the geometric fundamental groups of curves in characteristic 0 depend only on the genera and the number of cusps). Then, in this situation, the anabelian geometry for curves over algebraically closed fields of positive characteristic is quite different from that over non-algebraically closed fields.

In this talk, I will explain Tamagawa’s conjectures concerning the fundamental groups for curves over algebraically closed fields of positive characteristic and some results obtained by Tamagawa, A. Sarashina, and the speaker.

11:30 – 12:20 Akira Sarashina (RIMS, Kyoto University)
Reconstruction of one-punctured elliptic curves in positive characteristic by their geometric fundamental groups

The principal theme for anabelian geometry is the reconstruction of the geometry of algebraic varieties over number fields by their étale fundamental groups. When the characteristic is positive, it is expected that their geometric fundamental groups have much information. Tamagawa proved that the isomorphism class as a scheme of curves over an algebraic closure of $\mathbb{F}_p$ can be reconstructed by their étale fundamental groups when the genus is 0. In this talk, we will discuss the genus 1 case, and prove a similar result when the genus is 1, the cardinality of cusps is 1 and the characteristic is not equal to 2.

14:00 – 14:50 Yoshiaki Okumura (Tokyo Institute of Technology)
A Drinfeld module analogue of the Rasmussen-Tamagawa conjecture

Drinfeld modules defined over global function fields are an analogue of elliptic curves over number fields. In this talk, we will introduce the non-existence result on Drinfeld modules with certain constrained torsion points. In particular, this gives special cases of a function field analogue of the conjecture of Rasmussen and Tamagawa related with non-existence of certain Abelian varieties over number fields.
15:05 – 15:55 **Nobuo Tsuzuki** (Tohoku University)

Constancy of Newton polygons of $F$-isocrystals on Abelian varieties over finite fields and its application

An $F$-isocrystal on a variety of characteristic $p$ is obtained as relative cohomologies of families. A variation of Newton polygons of such $F$-isocrystals on a variety is related to arithmetic and geometry of the variety. In this talk we will prove constancy of Newton polygons of $F$-isocrystals on Abelian varieties over finite field by using $L$-functions. As an application, we show isotriviality of projective smooth families of curves over Abelian varieties.

15:55 – 16:10 Closing

* Invited speakers

Program Committee:
Hiroshi Tsunogai (Sophia University),
Takao Yamazaki (Tohoku University),
Yasushi Mizusawa (Nagoya Institute of Technology)