

京都保型形式研究集会

Kyoto conference on automorphic forms

Abstract of talks :

10月5日(金曜日) Oct. 5 (Fri.)

13:00 – 14:00 雪江明彦 (京都大学) Akihiko Yukie (Kyoto University)

Title: On \mathbb{Z}_p -orbits of prehomogeneous vector spaces

Abstract: \mathbb{Z}_p -orbits of prehomogeneous vector spaces can be used to investigate local orbital integrals of prehomogeneous vector spaces. In this talk we discuss an interpretation of the classical notion of Jordan decomposition from the viewpoint of geometric invariant theory.

14:10 – 15:10 若槻聡 (金沢大学) Satoshi Wakatsuki (Kanazawa University)

タイトル: 階数 2 のシンプレクティック群に関するユニポテント軌道積分の係数について

アブストラクト: これは Werner Hoffmann 氏との共同研究である。アーサー跡公式の幾何サイドは重み付き軌道積分の線型結合で表される。その展開におけるユニポテント軌道積分の係数の性質は一般的に分かっていない。まず $GL(2)$, $SL(2)$, $GL(3)$, $SL(3)$ の場合に関する係数についての既知の結果を復習する。それらの場合の係数はデデキントゼータ関数の $s=1$ におけるローラン展開の定数項やヘッケ L 関数の $s=1$ の特殊値などによって記述される。次に階数 2 のシンプレクティック群のユニポテント軌道積分の係数に関する我々の主結果について述べる。その場合にはデデキントゼータ関数とヘッケ L 関数に加えて 2 元 2 次形式の空間に関する新谷ゼータ関数の $s=3/2$ におけるローラン展開の定数項によって係数が表されることを示す。さらに、これらの結果と安定化との関係についても解説する。

Title: On coefficients of unipotent orbital integrals for the symplectic group of rank 2

Abstract: This is a joint work with Werner Hoffmann. The geometric side of the Arthur trace formula is expressed as a linear combination of weighted orbital integrals. In the expansion, coefficients of unipotent orbital integrals are not understood in general. First, we review some known results on coefficients for $GL(2)$, $SL(2)$, $GL(3)$, and $SL(3)$. In such the cases, the coefficients are expressed by the constant term of the Laurent expansion of the Dedekind zeta function at $s=1$, special values of Hecke L -functions at $s=1$, and so on. Next, we mention our main result on coefficients

of unipotent orbital integrals for the symplectic group of rank 2. We show that the coefficients are expressed by the constant term of the Laurent expansion of the Shintani zeta function for the space of binary quadratic forms at $s=3/2$ in addition to the Dedekind zeta function and Hecke L-functions. Furthermore, we explain relations between these results and stabilization.

15:20 – 16:20 佐藤文広 (立教大学) Fumihiro Sato (Rikkyo University)

Title: On non-prehomogeneous local functional equations

Abstract: Let V be a finite-dimensional real vector space and V^* its dual space. Let P_1, \dots, P_n (resp. P_1^*, \dots, P_n^*) be homogeneous polynomials with coefficients in \mathbb{R} on V (resp. V^*). We put

$$\Omega = \{x \in V | P_1(x) \cdots P_n(x) \neq 0\}, \quad \Omega^* = \{y \in V^* | P_1^*(y) \cdots P_n^*(y) \neq 0\}$$

and assume that Ω and Ω^* decompose into the same number of connected components: $\Omega = \Omega_1 \cup \cdots \cup \Omega_\nu$, $\Omega^* = \Omega_1^* \cup \cdots \cup \Omega_\nu^*$. If the Fourier transform of $|P_1(x)|^{s_1} \cdots |P_n(x)|^{s_n}|_{\Omega_i}$ can be written as a linear combination of $|P_1^*(y)|^{s_1^*} \cdots |P_n^*(y)|^{s_n^*}|_{\Omega_j^*}$ ($j = 1, \dots, \nu$) for some inhomogeneous linear forms s_1^*, \dots, s_n^* of s_1, \dots, s_n , we call such an identity a *local functional equation*. As is well-known by the theory of prehomogeneous vector spaces, if P_1, \dots, P_n and P_1^*, \dots, P_n^* are the fundamental relative invariants of a regular prehomogeneous vector space and its dual, respectively, then a local functional equation holds.

Recently we found 2 series of homogeneous polynomials satisfying local functional equations, which can not be obtained from prehomogeneous vector spaces. In this talk, we explain the construction of such non-prehomogeneous examples of local functional equations.

16:30 – 17:30 石井卓 (成蹊大学) Taku Ishii (Seikei University)

Title: Archimedean zeta integrals for the exterior square L -functions on $GL(n)$

Abstract: Bump and Friedberg (1990) discovered a zeta integral which interpolates the standard and the exterior square L-functions on $GL(n)$ simultaneously. We compute the real archimedean zeta integral when the real component of automorphic representation is isomorphic to the principal series representation. We show that the archimedean zeta integral coincides with the product of two archimedean L-factors. If time permits, I will talk about similar result for the standard and the spinor L-functions on $GSp(2)$.

10月6日(土曜日) Oct. 6 (Sat.)

9:30 – 10:30 権寧魯 (九州大学) Yasuro Gon (Kyushu University)

Title: Class numbers of binary quadratic forms and Ruelle type zeta functions for Hilbert modular varieties

Abstract: We study certain Selberg type zeta functions and Ruelle type zeta functions attached to the Hilbert modular group of a totally real number field. We show that they have meromorphic extensions to the whole complex plane and satisfy functional equations. Besides as applications, we have a certain "Prime geodesic theorem" for Hilbert modular varieties and "Weyl's law" for the space of Hilbert-Maass forms. We also have an asymptotic average of the class numbers of indefinite binary quadratic forms over the totally real algebraic integer ring.

10:40 – 11:40 山名俊介 (九州大学) Shunsuke Yamana(Kyushu University)

Title: Symplectic periods of the spectrum of $GL(2n)$

Anstract: I provide a formula for the symplectic period of an Eisenstein series of $GL(2n)$ and determine when it is not identically zero.

11:50 – 12:50 谷口隆 (神戸大学) Takashi Taniguchi (Kobe University)

Title: Counting cubic extensions over a number field

Abstract : The secondary term in the counting function for cubic fields over Q , the rational number field, was recently proved by two methods; one by geometry of numbers and the other by analytic theory of Shintani zeta functions. By extending the zeta function approach, we here improve the error estimate for the function counting relative cubic extensions over an arbitrary number field F , where the primary term for this case has been obtained by Datskovsky and Wright. In particular, when F is quadratic, we prove the secondary term. This is a joint project with Bhargava and Thorne.

14:00 – 15:00 Ja Kyung Koo (Kaist)

Title: Construction of normal bases of ray class fields over imaginary quadratic fields

Anstract: We develop a criterion for a normal basis, and prove that the singular values of certain Siegel functions form normal bases of ray class fields over imaginary quadratic fields other than $\mathbb{Q}(\sqrt{-1})$ and $\mathbb{Q}(\sqrt{-3})$. This result would be an answer for the Lang-Schertz conjecture on a ray class field with modulus generated by an integer (≥ 2).

15:10 –16:10 Dong Hwa Shin (Hankuk University of Foreign Studies)

Title: Ring class invariants over imaginary quadratic fields

Anstract: Given an imaginary quadratic field K , let $H_{\mathcal{O}}$ be the ring class field of an order \mathcal{O} of K . We know a classical result from the theory of complex multiplication that the j -invariant

$j(\mathcal{O})$ generates $H_{\mathcal{O}}$ over K . In this talk, we show by adopting Schertz's argument with Siegel-Ramachandra invariants that the singular value of certain Δ -quotient generates

$H_{\mathcal{O}}$ over K , where

$$\Delta(\tau) = (2\pi i)^{12} q \prod_{n=1}^{\infty} (1 - q^n)^{24} \quad (q = e^{2\pi i \tau})$$

is the Dedekind Δ -function. We further give an algorithm to find its minimal polynomial whose coefficients are quite smaller than those of $j(\mathcal{O})$.

16:20 – 17:20 河村尚明 (北海道大学) Hisaaki Kawamura (Hokkaido University)

Title: On semi-ordinary Λ -adic Eisenstein series for the symplectic group and related topics

Anstract: For a given rational prime p , the theory of Λ -adic modular forms was introduced by Hida and Wiles, where Λ denotes the Iwasawa algebra. In particular, it is well-known that the ordinary *Lambda*-adic Eisenstein series for $GL(2)$ is a typical example of such forms, and plays an important role in Wiles' proof of the Iwasawa main conjecture over \mathbb{Q} . In this talk, we'll show that for the group of symplectic similitudes $GSp(2g)$ over \mathbb{Q} , a satisfactory generalization of the Λ -adic Eisenstein series can be obtained by means of a certain p -stabilization procedure for the classical Siegel Eisenstein series generalizing Serre's ordinary p -stabilization in the case where $g = 1$. In addition, if time permits, we'll also explain some applications of the above-mentioned result, for instance, (i) a Λ -adic analogue of the Saito=Kurokawa/Duke-Imamoglu lifting (à la Ikeda); (ii) some constructions of p -adic L -functions for $GSp(r) \times GSp(s)$, where $r + s = g$.

10月7日(土曜日) Oct. 7 (Sun.)

9:30 – 10:30 古澤昌秋 (大阪市立大) Masaaki Furusawa (Osaka City University)

Title: On a certain simple relative trace formula for $GSp(4)$

Abstract: We would like to discuss a certain simple relative trace formula for $GSp(4)$ which is related to the central critical values of the spinor = L -functions for $GSp(4)$. This is a joint work with Kimball Martin.

10:40 – 11:40 小木曾岳義 (城西大学) Takeyoshi Kogiso (Josai University)

Title: Quadratic maps to PV's and local functional equations

Abstract: Let P and P^* be homogeneous polynomials in n variables of degree d with real coefficients. It is an interesting problem both in Analysis and in Number theory to find a condition on P and P^* under which they satisfy a local functional equation, roughly speaking, of the form

$$\text{the Fourier transform of } |P(x)|^s = \text{Gamma factor} \times |P^*(y)|^{-n/d-s}.$$

According to the theory of prehomogeneous vector spaces, the basic relative invariant of a regular prehomogeneous vector space satisfies LFE. These are typical examples.

In 2007, F.Sato proved a pullback theorem of local functional equation and gave a new construction of polynomials with the property above. In this talk, we make self-dual non-degenerate quadratic mapping to the quadratic spaces by using representations of $C_p \otimes C_q$. Then we construct polynomials (of degree 4) which satisfy local functional equations by using the pull back theorem. Furthermore we will talk about the existence of dual quadratic mapping to another prehomogeneous spaces. This is joint work with Fumihiro Sato.