

Symposium on Arithmetic & Geometry

Kyushu University, Fukuoka, JAPAN

June 1 - June 2, 2012

Takeshi Abe (Kumamoto Univ)

Title: On the moduli space of pure one-dimensional sheaves with $c_1 = 5$ and $\chi = 0$ on $\mathbb{P}^2$

Abstract: Le Potier's strange duality conjecture for sheaves on $\mathbb{P}^2$ motivates us to compute the holomorphic Euler characteristic of a line bundle on the moduli space of semistable pure one-dimensional sheaves on $\mathbb{P}^2$. In this talk we study the structure of the moduli space of semistable pure one-dimensional sheaves with $c_1 = 5$ and $\chi = 0$ on $\mathbb{P}^2$, especially the locus consisting of sheaves with non-vanishing cohomology.

Shin Hattori (Kyushu Univ)

Title: Canonical subgroups via Breuil-Kisin modules

Abstract: The U operator for p -adic modular forms of a reductive algebraic group is an analog of the U_p operator for classical modular forms, and it has p -adic information of p -adic modular forms. The theory of canonical subgroups of abelian varieties is a basic tool to analyze the action of the U operator. In this talk, I will explain a new construction of canonical subgroups using the Breuil-Kisin classification of unipotent finite flat group schemes and ramification theory.

Shouhei Honda (Kyushu Univ)

Title: Ricci curvature and angles between geodesics

Abstract: In this talk, we will consider the following question: Is the angle between given two minimal geodesics from a fixed point on a (singular) space with a lower Ricci curvature bound (in some sense) well-defined? It is known that the answer of the sectional curvature version of this question is YES. However, recently, Colding-Naber showed that in general, an answer of the question above is NO. In this talk, we will discuss the question above on the limit spaces of Riemannian manifolds.

Takashi Ichikawa (Saga Univ)

Title: On the Mumford form

Abstract: The Mumford form gives an isomorphism between the tautological line bundles on the moduli space of algebraic curves. In this talk, we will consider explicit formulas for the Mumford form which are connected with Siegel and Teichmüller modular forms, Serre's problem, Klein's amazing formula and Selberg zeta values.

Tomokazu Kashio (Tokyo Univ of Science)

Title: Frobenius actions on Fermat curves and cyclotomic units

Abstract: Coleman calculated Frobenius actions on Fermat curves. Its well-known application is Gross' conjecture over $\mathbb{Q}$. That is, algebraicity of special values of p -adic Gamma functions and describing the Galois action on them. In this talk, we see another application for an alternative proof of Stark's conjecture over $\mathbb{Q}$. More precisely, we give a description of the Galois action on cyclotomic units, up to roots of unity, by computing the action of Weil group on p -adic periods of Fermat curves. We also discuss some generalizations.

Fumiharu Kato (Kumamoto Univ)

Title: Accessory parameter in degenerations

Abstract: We discuss deformation of Fuchsian differential equations related, in either way by Fuchsian or Schottky uniformizations, to degeneration of orbifolds (= Riemann surface + finitely many points with branching degree). We will see, entirely by geometrical approach, that in these cases the limit of the accessory parameter can be calculated. Our argument recovers the former result by I. Kra on limit of Fuchsian accessory parameters.

Yuji Sano (Kumamoto Univ)

Title: A dynamical approach to balanced metrics with automorphism group

Abstract: Balanced metrics on a polarized manifold can be considered as a fixed point of some discrete dynamical system on the space of Kahler metrics (or Bergman metrics) introduced by Donaldson. I try to extend this picture to the case where the automorphism group is not discrete.

Wing Keung To (National Univ of S'pore)

Title: Syzygies of compact complex hyperbolic manifolds

Abstract: In this talk, I will discuss some joint works with J.-M. Hwang. In particular, I will report on a recent joint work on the syzygies of the canonical bundle of compact complex hyperbolic manifolds.

Nobuo Tsuzuki (Tohoku Univ)

Title: p -adic Clemens-Schmid exact sequence

Abstract: Let X be a proper semistable family of complex varieties over the unit disk with a singular fiber X_0 at 0. Then the kernel and cokernel of the monodromy operator on the limit cohomology $H_{\text{lim}}(X_0)$ of the semistable fiber are precisely given by Clemens-Schmid exact sequence. This exact sequence is a consequence of weight theory for the limit Hodge structure. In this talk we will present a p -adic analogue of Clemens-Schmid exact sequence for proper semistable families over curves of characteristic p . This is a joint work with Bruno Chiarellotto.

Lin Weng (Kyushu Univ)

Title: Tamagawa number conjecture and new zeta functions for Riemann surfaces

Abstract: For the field of rationals, the volume v_n of fundamental domain for $SL_n(\mathbb{Z})$, according to Siegel, is equal to $\widehat{\zeta}(1)\widehat{\zeta}(2)\cdots\widehat{\zeta}(n)$. This is a starting point of the Tamagawa number conjecture of Weil for global fields. Moreover, the volume u_n of the so-called semi-stable points within is given by the residue of rank n zeta function at $s = 1$; and u_n 's and v_n 's are related by a pair of formulas, due to Kontsevich-Soibelman and ourselves, respectively, following parabolic reduction. In parallel, for function fields over finite fields, we have a pair of similar relations for the total mass and the partial mass associated to semi-stable bundles, thanks to the works of Harder-Narasimhan, Desale-Ramanan and Zagier.

Motivated by this unified theory in terms of the special values of classical abelian zeta and our high rank zetas, and the paper of Atiyah-Bott on 'Yang-Mills Equations over Riemann Surfaces', we now have yet another parallel world, namely, that of Riemann surfaces. In this talk, we first introduce new zeta functions for Riemann surfaces, both abelian and non-abelian. Then we formulate some conjectures in the above content, using these new zetas and Witten's volume formula for moduli spaces of semi-stable bundles.