The Arithmetic of Function Fields and Related Topics (2. 18~21)

Time Table

	18	19	20	21
09:00-09:50	registration	Yoonjin Lee	E-U Gekeler	Jae-Hyun Yang
10:10-11:00	Soyoung Choi	J. Yu	Icksun Eom	Q. Yue
11:20-12:10	Y. Taguchi	Sangtae Jeong	M. Papikian	Sangjune Lee
12:10-14:00	Lunch	Lunch	Lunch	Lunch
14:00-14:50	Daeyeol Jeon	A. Bassa	H. J. Chen	
15:10-16:00	A. Petrov	Changheon Kim	Hwanyup Jung	
16:20-17:10	Jaehyun Ahn	X. Zhu	A. Schweizer	
			banquet	

Title and Abastract

Jaehyun Ahn (Chungnam National Univ.)

Title: Counting dihedral and quaternionic extensions in function fields

Abstract: We give asymptotic formulas for the number of biquadratic extensions of $F_q[T]$ that admit a quadratic extension which is a Galois extension of $F_q[T]$ with a prescribed Galois group.

Alp Bassa(Sabanci Univ.)

Title : Rational points on curves over finite fields and Drinfeld modular varieties

Abstract: In the past modular curves of various type (classical, Drinfeld, Shimura) have been used successfully to construct high genus curves with many rational points over finite fields of square cardinality. In this talk I will explain how Drinfeld modular varieties can be used similarly to obtain high genus curves over any non-prime finite field with many rational points. This way we obtain lower bounds for the Ihara constant A(q) for all non-prime q, which are better then all previously known bounds.

Huei Jeng Chen(Academia Sinica)

Title: Diophantine approximation in fields of formal power series over finite fields.

Abstract: For any positive integer n and real number $\lambda \geq 1$, let Kn (λ) be the set of all real numbers θ such that for any $\lambda' < \lambda$, there exist infinitely many algebraic numbers α with degree at most n satisfying $| \theta - \alpha| < H(\alpha)-(n+1)\lambda'$. Moreover we let Kn '$(\lambda)$ be the subset of Kn (λ) consisting of all θ not in Kn (λ') for any $\lambda' < \lambda$. Baker and Schmidt proved that the Hausdorff dimensions of Kn (λ) and Kn '(λ) are both $1/\lambda$. We will give similar results of Baker and Schmidt in function field version.

Soyoung Choi (Dongguk Univ.)

Title : The zeros of certain weakly holomorphic Drinfeld modular forms

Abstract : Let k be an integer such that $k\equiv 0 \pmod {q-1}$. Then there exist unique integers l_k and r_k such that $0\leq r_k\leq q$ and $k=(q^2-1)l_k +(q-1)r_k$. For each integer $m\geq-l_k$,

there exists a unique weakly holomorphic Drinfeld modular form $f_{k,m}$ of weight k for $GL_2(A)$ with a t-expansion of the form
$$f_{k,m}(z)=t^{-(q-1)m} +O(t^{(q-1)(l_k+1)})$$
In this talk, we review some properties of these forms $f_{k,m}$ and prove that the zeros of $f_{k,m}(z)$ in the fundamental domain $\frak{F}$ are on the unit circle $|z|=1$ under a certain condition and in addition, if q is odd then the zeros of $f_{k,m}$ are transcendental over K or elliptic points. Where $\frak{F}:=\{z\in \Omega~:~ |z|=\text{inf}\{|z-a|~ : ~ a \in \Bbb{F}_q[T]\}\geq 1\}$. This is a work with Bohae Im

Ick Sun Eum (KAIST)

Title : Theta constant of odd levels

Abstract : We provide the necessary and sufficient condition for the modularity of certain product of theta constants of given odd levels.

Ernst Urlich Gekeler(Saarland Univ.)

Title : Hyperderivatives and applications

Abstract : n this talk, we first answer the question raised by David Goss on the group of locally analytic endomorphisms on the 1-unit group of a local field of positive characteristic p and then talk about some results for Q-quotients and Fermat quotients over function fields. These results are based on hyperderivatives which will be mentioned as a prerequisite.
Comment:I would like to give a talk on the second day of the conference.

Daeyeol Jeon (Kongju Univ.)

Title: Infinite families of elliptic curves over Dihedral quartic number fields

Abstract: In this talk, we construct infinite families of elliptic curves over quartic number fields with torsion group $\mathbb Z/N\mathbb Z$ with $N = 20,24$. Moreover, we prove that for each elliptic curve E_t in the constructed families,

the Galois group $Gal(L/\mathbb Q)$ is isomorphic to the Dihedral group D_4 of order 8 for the Galois closure L of K

over $\mathbb Q$, where K is the defining field of (E_t ,Q_t)# and Q_t is a point of E_t of order N.

Sangtae Jeong (Inha Univ.)

Title: Shift operators and two applications to $\mathbb Fq[[T]]$

Abstract: This talk comprises two applications of shift operators to characterization of continuous functions and ergodic functions defined on the integer ring of a non-Archimedean local field of positive characteristic.

In the first part of the talk, we establish that digit expansion of shift operators becomes an orthonormal basis for the space of

continuous functions on ${\mathbb{F}}_q[[T]],$ including a closed-form expression for expansion coefficients, and we establish that this is also true for p-adic integers, excluding the coefficient formula.

In the second part, we obtain the necessary and sufficient conditions for ergodicity of 1-Lipschitz functions represented on ${\mathbb{F}}_2[[T]]$ by digit shift operators, recalling the cases with the Carlitz polynomials and digit derivatives.

Hwanyup Jung (Chungbuk National Univ.)

Title: Möbius function in short intervals for function fields

Abstract: Let μ be the Möbius function on the polynomial ring Fq[T] over the nite field Fq of q elements.
We compute the (asymptotic) mean value and variance of Möbius function in short intervals as q→∞.

Changheon Kim (Hanyang Univ.)

Title: Canonical models of modular curves

Abstract: Modular curves parametrize elliptic curves with prescribed torsion structures. In this talk I will investigate torsion of elliptic curves over number fields by applying canonical models of modular curves.

Sang June Lee (KAIST)

Title: The maximum weight of cross−t intersecting families

Abstract: A central result in extremal combinatorics is $\textit{the Erd\H os--Ko--Rado Theorem}$ which investigates the maximum size of $\mathcal{A} \subset \binom{[n]}{k}$ such that for every choice of sets $A_1, A_2 \in \mathcal{A}$ we have $|A_1 \cap A_2| \geq t$. In this talk we consider a version with two families.

Two families $\mathcal{A}$ and $\mathcal{B} \subset \binom{[n]}{k}$ are {\em cross t-intersecting} if for every choice of sets $A \in \mathcal{A}$ and $B \in \mathcal{B}$ we have $|A \cap B| \geq t$. The following `cross t-intersecting version' of the Erd\H os-Ko-Rado Theorem was conjectured: For all $n \geq (t+1)(k-t+1)$ the maximum value of $|\mathcal{A}||\mathcal{B}|$ for two cross t-intersecting families $\mathcal{A}, \mathcal{B} \subset\binom{[n]}{k}$ is $\binom{n-t}{k-t}^2$.

We verified a strongly related \textit{p-weighted version} of the above conjecture for $t \geq 14$. For $0<p<1$, define the p-weight of $\cA$ by $\mu_p(\cA)=\sum_{A\in\cA}p^{|A|}(1-p)^{n-|A|}$.

We showed that for every $t\geq 14$, all $0<p\leq \frac1{t+1}$, and all $n\geq t$ the following holds:

If $\cA,\cB\subset 2^{[n]}$ are cross t-intersecting, then $\mu_p(\cA)\mu_p(\cB)\leq p^{2t}.$

We also considered extremal configurations. This is joint work with Peter Frankl, Norihide Tokushige, and Mark Siggers.

Yoonjin Lee (Eewha Women's Univ.)

Title: Explicit isogeny theorems and different bounds of Drinfeld modules

Abstract: Given two non-isogenous rank r Drinfeld A-modules ϕ and ϕ' over K, where $F = F_q(T)$, $A = F_q[T]$, and K is a finite extension of F, we obtain a partially explicit upper bound (dependent only on ϕ and ϕ') on the degree of primes p of K such that $P_p(\phi) \not= P_p(\phi')$, where $P_p(\ast)$ denotes the characteristic polynomial of Frobenius at p on a Tate module of $\ast$. The bounds are completely explicit in terms of the defining coefficients of ϕ and ϕ', except for one term, which can be made explicit in the rank 2 case by determining the Newton polygons of exponential functions attached to ϕ and the successive minima of the lattice associated to ϕ by uniformization. An ingredient in the proof of the explicit isogeny theorem for general rank is an explicit bound for the different divisor of torsion fields of Drinfeld modules which detects primes of potentially good reduction.

Mihran Papikian (Penn. State Univ.)

Title: Optimal quotients of Mumford curves and component groups

Abstract: Let X be a Mumford curve. We say that an elliptic curve is an optimal quotient of X is there is a finite morphism $X\to E$ such that the homomorphism $\pi: Jac(X)\to E$ induced by the Albanese functoriality has connected and reduced kernel. We consider the functorially induced map $\pi_\ast: \Phi_X\to \Phi_E$ on component groups of the Neron models of $Jac(X)$ and E. We show that in general this map need not be surjective, which answers negatively a question of Ribet and Takahashi. Using rigid-analytic techniques, we give some conditions under which $\pi_\ast$ is surjective, and discuss

arithmetic applications to modular curves. This is a joint work with Joe Rabinoff.

Alexandar Petrov (Texas A&M at Qatar)

Title: On A-expansions of Drinfeld modular forms and vectorial Drinfeld modular forms.

Abstract: In this talk we will present recent results that show the existence of infinitely many cuspidal Drinfeld eigenforms that possess A-expansions. In addition, we will give examples (some of which conjectural) of vectorial Drinfeld modular forms with A-expansions.

Andreas Schweizer (KAIST)

Title: On automorphisms of prime order of Riemann surfaces, function fields, or algebraic curves

Abstract: Let X be a compact Riemann surface (or equivalently, a function field over the complex numbers, or equivalently a smooth projective curve over the complex numbers) of genus at least 2. A cyclic subgroup of prime order p of

Aut(X) is called properly (p,h)-gonal if it has a fixed point and the quotient surface has genus h. We show that if $p>6h+6>11$, then a properly (p,h)-gonal subgroup of Aut(X) is unique.

Yuichiro Taguchi (Kyushu Univ.)

Title: On congruences of Galois representations of global fields

Abstract: We give a simple criterion for two v-adic Galois representations of a global field K to be locally isomorphic at another place u in terms of their reductions mod v. Such a study is motivated by the Rasmussen-Tamagawa conjecture for Abelian varieties.

Jae-Hyun Yang(Inha Univ.)

Title: Some Results on Harmonic Analysis on Siegel-Jacobi Space

Abstract: The Jacobi group, the semi-direct product of the symplectic group and the Heisenberg group is one of the simplest

and most important examples of a non-reductive Lie group. Its associated non-reductive homogeneous space is the so-called Siegel-Jacobi space that is very important arithmetically and geometrically. In this lecture, I develop the theory of harmonic analysis on the Siegel-Jacobi space. I plan to introduce some results about harmonic analysis on the Siegel-Jacobi space obtained by J.-H. Yang, E. Balslev, F. Gay-Balmaz, C. Tronci, S. Berceanu, A. Gheorge, H. Ochiai and M. Itoh.

Jing Yu (National Taiwan Univ.)

Title: Automorphic forms of Drinfeld type and the basis problem.

Abstract: For any function field k, together with a fixed place called the infinity, we give explicit construction of "theta series" from Eichler orders of definite quaternion algebra over k. These theta series are recognized as automorphic forms of Drinfeld type for GL2 over k. Description of the space generated by these theta series inside all Drinfeld type automorphic forms is given. This gives an answer to the basis problem for Drinfeld type automorphic forms.

Qin Yue (Nanjing Univ. of Astronautics and Aeronautics)

Title: Class groups under relative quadratic extensions

Abstract: Let E be a relative quadratic extension of a number field F, the 2-Sylow subgroup of the class group of F elementary abelian, and the S-ideal class number of F odd, where S is a set consisting of all infinite primes and some finite primes of F ramifying in E. In this paper, we compute the 2-rank and 4-rank of the class group of E.

Xiao-Meng Zhu (Nanjing Univ. of Astronautics and Aeronautics)

Title: Determining Whitman's generalized cyclotomic numbers of order 4

Abstract: Let p and q be distinct primes with $\gcd(p-1,q-1)=4$, Whiteman gave the sixteen cyclotomic numbers depending solely upon one of the two decompositions: $pq=a^2+4b^2=a'^2+4b'^2, a\equiv a'\equiv 1\pmod 4$. In this paper, we will determine the sixteen cyclotomic numbers of order four depending on unique a, b if we choose a common primitive root of p and q.