

**Chun Yin Hui**

**Title:** *On distribution of supersingular primes of abelian varieties and K3 surfaces*

**Abstract:** Let  $X$  be an abelian variety or a K3 surface defined over a number field  $K$ . We prove that the density of the supersingular primes of  $X/K$  is zero if  $X$  is non-CM. By applying an effective Chebotarev density theorem of Serre, we obtain asymptotic upper bounds of the counting function for these supersingular primes.

**Pengyu Yang**

**Title:** *Representation of binary quadratic forms by quaternary quadratic forms*

**Abstract:** We discuss the local-global principle of the representation of binary quadratic forms by quaternary quadratic forms. The talk is based on a joint work in progress with Wooyeon Kim and Andreas Wieser.

**Luochen Zhao**

**Title:** *On the arithmetic of Bernoulli–Hurwitz periods*

**Abstract:** Let  $E$  be an elliptic curve having good ordinary reduction at a prime  $p$ . The values of the classical Eisenstein series at  $E$  are algebraic and are called Bernoulli–Hurwitz numbers, and they admit a  $p$ -adic interpolation by specializing Katz’s one-variable Eisenstein measure at  $E$ . We will explain that the periods of this  $p$ -adic measure are modular, i.e., are special values of certain weight one higher level Eisenstein series. Furthermore, we explain a new proof of the interpolation by this modularity, as well as how one can get a  $p$ -adic Kronecker’s first limit formula.

**Jiahong Yu**

**Title:** *Rational Hodge–Tate Crystals over Valuation Rings and  $F$ -Singularities*

**Abstract:** Prismatic theory provides a powerful tool for  $p$ -adic Simpson theory. A key step in this theory is the establishment of a correspondence between rational Hodge–Tate crystals and topologically nilpotent Higgs fields for a smooth formal scheme over  $O_{\mathbb{C}_p}$  equipped with a  $\delta$ -lift over  $A_{\text{inf}}$ . In this talk, we will establish an analogue of this correspondence for the valuation rings of analytic fields and investigate the existence problem of  $\delta$ -lifts using  $F$ -singularity techniques.

**Shaoshi Chen** (AMSS, Chinese Academy of Sciences)

**Title:** *Arithmetic Dynamics around Linear Differential Equations*

**Abstract:** We will talk about two types of dynamical systems coming from linear differential equations. The first dynamical system is defined by the coefficient sequence of a linear differential equation. We present a Skolem-Mahler-Lech type theorem on this dynamical system. The second dynamical system is defined by iterated integration of solutions of a linear differential equation. We present some stability results on the order of linear differential equations satisfied by the iterated integrals of these solutions.

**Xu Shen**

**Title:**  *$p$ -adic locally symmetric varieties*

**Abstract:** We will discuss the theory of  $p$ -adic uniformization of Shimura varieties and some applications in the Langlands program. More precisely, we will discuss a basic uniformization result for the Kisin-Pappas-Zhou integral models of Shimura varieties of abelian type, generalizing various known results in the literature. As applications, we obtain new cases of the compatibility between classical local  $L$ -parameters and the Fargues-Scholze parameters, and new cases of Fargues' eigensheaf conjecture. This is joint work with Peihang Wu.

**Zhizhong Huang**

**Title:** *Quadratic forms and the circle method*

**Abstract:** This goal of this talk is to present recent results (partly joint with D. Schindler and A. Shute) on counting integer solutions related to quadratic forms, with a view towards quantitative strong approximation. Our approach is based on the  $\delta$ -variant of the Hardy–Littlewood circle method developed by Heath-Brown.

## Shengkai Mao

**Title:** *Canonical extensions of  $p$ -adic shtukas on compactifications of Shimura varieties*

**Abstract:** We will discuss extensions of  $p$ -adic shtukas on (integral models of) toroidal compactifications of Shimura varieties. We present the theory in a general framework and explain how such extensions can be constructed for toroidal compactifications. We also discuss applications including the well-position of many strata over the special fiber, the degeneration of shtukas along the boundary, and the uniqueness and functoriality of compactifications. This is based on joint work in preparation with Peihang Wu.

## Mikulas Zindulka

**Title:** *Negative bias in moments of universal families of elliptic curves*

**Abstract:** Elliptic curves (over a finite field) with a fixed *trace of Frobenius* are essentially counted by *Hurwitz class numbers*. The generating function for these numbers is in turn *a mock modular form*. This was the starting point for several recent equidistribution results for the traces by Kathrin Bringmann, Ben Kane, and Ken Ono. In this talk, I will apply these techniques to certain families of elliptic curves, namely universal families with a point of order  $N$ . The influential *Negative Bias Conjecture* of S. J. Miller states that the bias in the second moment is negative for every family with a non-constant  $j$ -invariant. I will show that for the *Legendre family* (case  $N = 4$ ), the negative bias persists also in higher moments. Then I will discuss an extension of this result for other  $N$ . The talk is based on a recent joint work with Ben Kane.

## Ye Tian

**Title:** *Non-vanishing of  $L$ -values*

**Abstract:** We discuss non-vanishing of  $L$ -values over vertical anti-cyclotomic extensions.

## Mo Dick Wong

**Title:** *On the limiting distribution of partial sums of random multiplicative functions*

**Abstract:** In this talk, I will discuss the asymptotic behaviour of a random walk associated with a Steinhaus multiplicative function, i.e. the increments are completely multiplicative and uniformly distributed on the complex unit circle. This model is motivated by a conjecture of Helson on Hankel forms in harmonic analysis, and also offers insights into fundamental arithmetic objects such as Dirichlet characters. Building on Harper's seminal work on the striking phenomenon of better-than-square-root cancellation, I will present a central limit theorem under nonstandard scaling, featuring a random variance that is closely related to the statistics of the Riemann Zeta function on the critical line. This is based on joint works with Ofir Gorodetsky.

## Yongquan Hu

**Title:** *Recent progress in mod  $p$  Langlands program for  $GL_2$*

**Abstract:** In the mod  $p$  Langlands program, it is important to study the Hecke eigenspaces of mod  $p$  cohomology of Shimura varieties which give rise to admissible smooth representations of  $GL_n$ . In this talk, I will discuss some recent progress in the case of  $GL_2$  over an unramified extension of  $\mathbb{Q}_p$ . The talk is based on joint work with Haoran Wang, and with Breuil-Herzig-Morra-Schraen.

## Mulun Yin

**Title:** *Iwasawa theory of elliptic curves at Eisenstein primes*

**Abstract:** Recent decades have seen many advances in arithmetics of elliptic curves of analytic rank 0 and 1 at a prime  $p$ , most of which are restricted to curves whose  $p$ -torsion is an irreducible  $\text{Gal}(\bar{\mathbb{Q}}/\mathbb{Q})$ -module. In 2022, Castella–Grossi–Lee–Skinner first proved so-called anticyclotomic Iwasawa Main Conjectures for elliptic curves in the residually reducible case ('Eisenstein case') at primes of good ordinary reduction. We will discuss generalizations and subsequent works on Iwasawa theory of elliptic curves at Eisenstein primes, leading to new cases of the BSD conjecture.

**Weizhe Zheng**

**Title:** *Distribution modulo one of linear recurrent sequences and wandering domains*

**Abstract:** Recently, Astorg and Boc Thaler constructed examples of holomorphic self-maps of  $C^2$  possessing wandering domains of rank one. They gave almost sharp Diophantine conditions on the parameters  $\alpha$  and  $\beta$ . I will present necessary and sufficient conditions on the parameters in the case where  $\alpha$  is an algebraic number, answering questions of Astorg and Boc Thaler in this case. I will also discuss related results on the distribution modulo one of linear recurrent sequences of real numbers, which extend theorems of Pisot, Dubickas, and others. This talk is based on joint work with Zhangchi Chen and Zihao Ye.

**Yu Min**

**Title:** *Prismatic construction of crystalline deformation ring up to  $p$ -power torsion*

**Abstract:** Kisin proved that there exists a quotient of the unrestricted local deformation ring, which parametrizes crystalline representations with Hodge—Tate weights lying in a fixed interval. We will introduce how to use prismatic theory to give a moduli construction of this deformation ring up to  $p$ -power torsion.

**Ziquan Yang**

**Title:** *On arithmetic Noether-Lefschetz loci*

**Abstract:** Suppose that  $f : X \rightarrow S$  is a smooth proper family of varieties. The Noether-Lefschetz locus is the set of points over which the geometric fiber has a Picard rank larger than that of the geometric generic fiber. In short, it is the locus where the fibers acquire “more” divisors. In this talk, I will present some progress on understanding the Noether-Lefschetz locus in an arithmetic setting, including joint works with David Urbanik, Ananth Shankar and Ruofan Jiang.

**Kei Yuen Chan**

**Title:** *Branching laws for  $p$ -adic general linear groups: algorithms and Rankin-Selberg integrals*

**Abstract:** Branching laws for classical groups over local fields are important examples in the relative Langlands program. The connection to  $L$ -functions is a major theme in the Gan-Gross-Prasad program. In this talk, I shall discuss about algorithms in computing some examples of general linear  $p$ -adic groups (some computed by Basudev Pattanayak). In number theoretic side, I shall explain how Rankin-Selberg integrals play a role.

**Xuhua He**

**Title:** *Cohen-Macaulayness of Local Models via Shellability of the Admissible Set*

**Abstract:** The singularities of integral models of Shimura varieties are encoded in their local models, schemes over the  $p$ -adic integers whose special fibers are unions of affine Schubert cells. A fundamental question is whether these local models are Cohen-Macaulay. In this talk, I will present a solution for local models with arbitrary parahoric level structure, valid uniformly across all residue characteristics. The proof is centered on a combinatorial property of the admissible set, which parametrizes the cells in the special fiber. We prove that the admissible set is dual EL-shellable, thereby resolving a conjecture of Görtz from over two decades ago. From this purely combinatorial result, we deduce the Cohen-Macaulay property for the corresponding local models. This work provides a uniform, characteristic-independent approach that contrasts with and complements prior geometric methods. I will explain the key combinatorial ideas and their translation into this geometric consequence. This talk is based on my joint work with Felix Schremmer and Qingchao Yu.

**Fei Liu**

**Title:** *The Bass-Quillen Phenomenon for Reductive Group Torsors*

**Abstract:** The Bass-Quillen conjecture states that for a Noetherian regular ring  $R$ , every vector bundle on the relative affine space  $\mathbb{A}_R^N$  descends to  $R$ . This conjecture

has been resolved in the geometric setting, namely, when  $R$  is essentially smooth over a DVR, thanks to the works of Quillen, Lindel, and Popescu. However, it remains an open problem in the general case. In this talk, I will outline the necessary modifications required to extend the conjecture from  $GL_n$ -torsors (i.e., rank  $n$  vector bundles) to general reductive group torsors. I will also review recent developments in the understanding of reductive group torsors, including the Grothendieck-Serre conjecture and  $\mathbb{P}^1$ -weak invariance. Finally, I will present a proof in the equi-characteristic case and discuss a special case in mixed characteristic. This is joint work with Ning Guo.