The 5th Korea-France Conference in Mathematics
Institut de Mathématique de Bordeaux
July 15-18 2025

Abstracts:
Number Theory

Wednesday 11:00 – 12:00 **Hernandez, Valentin**

Affiliation: University Paris Saclay
Title: Patching functors, completed cohomology and undercover p-adic modular forms
Abstract: I will describe a method to study the locally analytic vectors in completed cohomology. I will start by the motivation and introducing the objects and then try to explain how we can introduce ideas from the hypothetical categorical Langlands correspondance to study sheaves on deformation rings to deduce Informations on completed cohomology. Along the way I will try to describe some unexpected behavior concerning p-adic modular forms, in the case of GL_3. This is a joint work with Eugen Hellmann and Benjamin Schraen.

Wednesday 14:00 – 15:00 **Im, Bo-Hae**

Affiliation: KAIST
Title: The rank growth of abelian varieties and Larsen's conjecture
Abstract: The rank of an elliptic curves over a number field or more generally, of an abelian variety over a number field is one of the important research topic in number theory. We will discuss the historical progress on the rank of abelian varieties over certain infinite extensions of a number field, especially we will introduce Larsen's conjecture and its progress.

Thursday 11:00 – 12:00 **Kim, Dohyeong**

Affiliation: Seoul National University
Title: Some arithmetic Chern—Simons functionals as triple symbols
Abstract: The arithmetic Chern-Simons functional was introduced by Minhyong Kim in 2015. In some cases, it was shown to be related to Legendre symbols. In this talk, we relate some other cases to Redei symbols and more generally triple symbols.

Tuesday 16:30 – 17:30 **Kim, Hojin**

Affiliation: University of Caen Normandy
Title: A Linear Independence of the Multiple Zeta Values in Positive Characteristics

Abstract: The Zagier-Hoffman's conjectures describe the dimension and give a basis for the $\mathbb{Q}$-vector space spanned by classical Multiple Zeta Values (MZV's). In the function field setting over $\mathbb{F}_q(\theta)$, the zeta and multiple zeta values in positive characteristics were defined by Carlitz (1935) and Thakur (2004). Recently, the Zagier–Hoffman's conjectures in positive characteristics have been established by Im, Le, Ngo Dac, Pham and the speaker (see also the work of Chang, Chen, and Mishiba). Building on these results, this talk presents ongoing research on the linear independence of the MZV's in positive characteristics over $\mathbb{F}_q$. This is joint work with Bo-Hae Im and Tuan Ngo Dac.

Wednesday 15:15 – 16:00 **Kim, Hyungseop**

Affiliation: University Paris-Saclay

Title: Formal gluings in continuous K-theory

Abstract: The study of descent properties of K-theory plays an important role in understanding its values and behaviour in many geometric contexts. In this talk, I will explain a construction of certain diagrams arising from formal gluing situations for which continuous K-theory, and more generally all localising invariants, satisfy descent, from the perspective of dualisable categories. I will also discuss how this encompasses both Clausen–Scholze's gluing result for analytic adic spaces and an adelic descent result for dualisable categories.

Tuesday 10:30 - 11:30 **Kim, Yeansu**

Affiliation: Chonnam National University

Title: From Fermat to Langlands and Shahidi

Abstract: The Langlands program, introduced by Robert Langlands, is a set of conjectures that attempt to build bridges between two different areas: Number Theory and Representation Theory (Automorphic forms). The program is also known as a generalization of a well-known theorem called Fermat's Last Theorem. More precisely, Andrew Wiles proved a special case of the Taniyama–Shimura–Weil conjecture, showing that a certain class of elliptic curves are modular. This result implied Fermat's Last Theorem since any counterexample would yield a non-modular elliptic curve, contradicting the Taniyama–Shimura–Weil conjecture. Note that the Langlands program is a generalization of the Taniyama-Shimura-Weil conjecture.

In the first part of the talk, we briefly discuss the following topics:

1. Fermat's Last Theorem and the Taniyama-Shimura-Weil conjecture

In the remainder of the talk, we start to explain a bit of the Langlands program.

2. Two main conjectures in the Langlands program: Local Langlands correspondence and Langlands functoriality conjecture
3. (If time permits) Recent progress on two conjectures via Langlands-Shahidi method

Friday 9:30 – 10:30 **Kim, Wansu**

Affiliation: KAIST

Title: On degeneration of $\mathcal{D}^\times$-shtukas over ramified legs

Abstract: Let D be a central division algebra over a global function field F, and choose a parahoric integral model $G = \mathcal{D}^\times$ of $D^\times$ over the smooth projective model of F. We obtain a sufficient condition for properness of moduli stacks of r-legged G-shtukas bounded by some Beilinson–Drinfeld Schubert variety allowing legs, allowing legs to meet the ramification locus of D. In particular, we show that the moduli stack is proper if D is "sufficiently ramified" relative to the number of legs r and the bound. Our sufficient condition is more stringent than the condition for the moduli stack to be proper over the unramified locus for G, obtained by Eike Lau. This is joint work with Yong-Gyu Choi and Junyeong Park.

Thursday 16:30 – 17:30 **Lee, Wonwoong**

Affiliation: University of Hong Kong

Title: Classification of rectangular representations

Abstract: Let $\mathfrak{g}$ be a complex semisimple Lie algebra. We define what it means for a finite dimensional representation of $\mathfrak{g}$ to be rectangular and completely classify faithful rectangular representations. As an application, we obtain new λ-independence results on the algebraic monodromy groups of compatible systems of λ-adic Galois representations of number fields.

Friday 11:00 – 12:00 **Ngo Dac, Tuan**

Affiliation: University of Caen Normandy

Title: On degeneration of shtukas

Abstract: In this talk we provide an overview of the geometry of moduli stacks of $\mathrm{GL}(n)$-shtukas. These moduli stacks have been instrumental in the work of V. Drinfeld and L. Lafforgue on the Langlands correspondence for $\mathrm{GL}(n)$ over function fields. Since these stacks are known to be non-proper, we explain several constructions of their compactifications due to L. Lafforgue, E. Lau, Bao-Châu Ngô and ourselves. This is joint work with Y. Varshavsky.

Tuesday 15:15 – 16:00 **Oh, Gyeongwon**

Affiliation: Chonnam National University, Korea

Title: Power-saving error term in counting abelian extensions with local behaviors

Abstract: The enumeration of arithmetic objects such as prime numbers, number fields, and elliptic curves is a challenging problem in number theory. In this talk, we consider the enumeration of a specific family of number fields. Let G be a finite abelian group. We present an asymptotic formula, with a power-saving error term, for the number of G-extensions over a number field K that satisfy given local conditions at a finite set of primes. This result extends the work of Maki and Wood. We further discuss applications of this result, including the computation of moments and the distribution of L-values in certain cases.

Wednesday 9:30 – 10:30 **Park, Chol**

Affiliation: UNIST

Title: Families of strongly divisible modules

Abstract: Strongly divisible modules are semi-linear algebra objects that correspond to Galois stable lattices in semi-stable representations with Hodge–Tate weights in the Fontaine-Laffaille range. In this talk, I will explain how we reduce the construction of rank 2 strongly divisible modules to solving certain systems of equations and inequalities. This project began with the goal of computing the mod-p reductions of 2-dimensional semi-stable representations, and we hope these results can eventually be used to prove certain cases of the Breuil-Mézard conjecture. I will present an example to illustrate how computing the mod-p reduction connects to the conjecture. This is joint work with Seongjae Han.

Thursday 15:15 – 16:00 **Pham,Dat**

Affiliation: IMJ-PRG, Sorbonne Université

Title: Prismatic F-crystals and "Lubin–Tate" crystalline Galois representations.

Abstract: An important question in integral p-adic Hodge theory is the study of lattices in crystalline Galois representations. There have been various classifications of such objects, such as Fontaine–Lafaille's theory, Breuil's theory of strongly divisible lattices, and Kisin's theory of Breuil–Kisin modules. Using their prismatic theory, Bhatt–Scholze give a site-theoretic description of such lattices, which has the nice feature that it can specialize to many of the previous classifications by "evaluating" suitably. In this talk, we will recall their result and explain an extension to the Lubin–Tate context.

Tuesday 14:00 – 15:00 **Poëls, Anthony**

Affiliation: University Claude Bernard Lyon 1

Title: On approximation to a real number by algebraic numbers of bounded degree

Abstract: In his seminal 1961 paper, Wirsing studied how well a given transcendental real number ξ can be approximated by algebraic numbers α of degree at most n for a given positive integer n, in terms of the so-called naive height $H(\alpha)$ of α. He showed that the exponent $\omega_n^*(\xi)$ which measures this quality of approximation is at least $(n+1)/2$. He also asked if we could even have $\omega_n^*(\xi) \geq n$ as it is generally expected. Since then, all improvements on Wirsing's lower bound were of the form $n/2 + O(1)$ until Badziahin and Schleischitz showed in 2021 that $\omega_n^*(\xi) \geq an$ for each $n \geq 4$, with $a = 1/\sqrt{3} \simeq 0.577$. In this talk, I will first present the background and ideas behind the proof of Wirsing's lower bound. Secondly, using a new approach that is partly inspired by parametric geometry of numbers, I will explain how we can obtain $\omega_n^*(\xi) \geq an$ for each $n \geq 2$, with $a = 1/(2 - \log 2) \simeq 0.765$.

Thursday 14:00 – 15:00 **Poyeton, Léo**

Affiliation: University of Bordeaux

Title: Relating two conjectures in p-adic Hodge theory

Abstract: Lately, interest has risen around a generalization of the theory of (φ, Γ)-modules, replacing the cyclotomic extension with an arbitrary infinitely ramified p-adic Lie extension. Computations from Berger suggest that taking locally analytic vectors in some rings of periods should provide such a generalization for any arbitrary infinitely ramified p-adic Lie extension, and this has been conjectured by Kedlaya. In this talk, I will explain what those locally analytic vectors look like in the particular case of $\mathbf{Z}_p$-extensions. Using this result, I will construct, in the anticyclotomic setting and assuming that Kedlaya's conjecture holds, an element in the field of fractions of the Robba ring which "should not exist" according to a conjecture of Berger on substitution maps on the Robba ring.

Thursday 9:30 – 10:30 **Rozensztajn, Sandra**

Affiliation: ENS Lyon

Title: Potentially crystalline deformation rings and the Breuil-Mézard conjecture for PGL_n

Abstract: In this talk, I will explain how we can study the potentially crystalline deformation rings for representations with values in PGL_n by comparing them to the analogous rings for representations with values in GL_n. As a consequence, we get enough information on these rings to be able to state a formula for their multiplicities, generalizing to this situation the Breuil-Mézard conjecture. This is joint work with Agnès David.