Titles and Abstracts

1. Huayi Chen, Institut de Mathématiques de Jussieu - Paris Rive Gauche, Université Paris Diderot - Paris, France

Title: Arithmetic Hodge Index Inequality: Coupling and Transportation of Measures

Abstract: Faltings and Hriljac have proved an arithmetic analogue of Hodge index theorem for arithmetic surfaces, by using the Néron-Tate height of the Jacobian. In this talk, I will explain a new proof of this inequality by coupling of measures on $\mathbb{R}$. Based on this idea, by developing results on the transportation of uniform measures between convex bodies, a relative form of Brunn-Minkowski inequality is established for adelic line bundles on higher dimensional arithmetic varities.

2. Pierre Colmez, Institut de Mathematiques de Jussieu, France

Title: Etale Cohomology of p-adic Analytic Curves

Abstract: We will explain how to compute the p-adic etale cohomology of (overconvergent) affinoids. This has applications to the p-adic local Langlands correspondence for GL_2.

3. Yiwen Ding, Imperial College London, England

Title: Some Locally Analytic Representations of $\mathrm{GL}_2(L)$ in Trianguline Case

Abstract: Let L be a finite extension of $\mathbb{Q}_p$, we associate some locally $\mathbb{Q}_p$-analytic representations of $\mathrm{GL}_2(L)$ to 2-dimensional trianguline representations of $\mathrm{Gal}(\overline{\mathbb{Q}_p}/L)$, and prove some local-global compatibility results.

4. Laurent Fargues, Institut de Mathematiques de Jussieu, France

Title: Geometrization of the Local Langlands Correspondence, an Overview

Abstract: I will explain a conjecture of geometric Langlands type related to the local Langlands correspondence and p-adic Hodge theory. It says that given a discrete local Langlands paramater of a reductive group over a local field one should be able to construct a perverse sheaf on the perfectoid stack of G-bundles on the curve I defined and studied in my joint work with Fontaine. This sheaf should satisfy numerous properties. For example it should be an Hecke eigensheaf, a property that implies Kottwitz conjecture describing the discrete part of the cohomology of Rapoport-Zink spaces.

5. Mathieu Florence, Universit Paris VI, France

Title: Lifting Modulo p Galois Representations

Abstract: Let F be a field, with absolute Galois group G. Let k be a finite field, of characteristic p. Denote by $W(k)$ the ring of (p-adic) Witt vectors built out from k. Let V be a finite-dimensional Galois representation over k, of dimension n, whose

isomorphism class is given by a continuous morphism $f : G \to \mathrm{GL}_n(k)$. We shall be interested in the following problem: is V isomorphic to the reduction mod p of an integral representation of G? In other words, does f lift to a continuous morphism $F : G \to GL_n(W(k))$? We shall show that this is always the case if $n = 2$, and that this formally follows from Hilbert's Theorem 90 (we expect the answer to be positive in all dimensions).

We will discuss several related facts. For instance, we shall give a surprisingly simple proof of the following fact: Any 4-dimensional Galois representation $G \to \mathrm{GL}_4(\mathbb{Z}/2\mathbb{Z})$ can be lifted modulo 4, i.e to a representation $G \to \mathrm{GL}_4(\mathbb{Z}/4\mathbb{Z})$. Our approach is purely algebraic (it holds for any F), and does not use any number-theoretic method. This is joint work with Charles De Clercq.

6. Olivier Fouquet, Université Paris-Sud 11, France

Title: Congruences Between Motives and Congruences Between Special Values of L-functions

Abstract: If two motives are congruent, is it the case that the special values of their respective L-functions are congruent? More precisely, can the formula predicting special values of motivic L-functions be interpolated in p-adic families of motives? I will explain how the formalism of the Weight-Monodromy filtration for p-adic families of Galois representations sheds light on this question (and suggests a perhaps surprising answer).

7. Lei Fu, Department of Mathematics and Yau Mathematical Sciences Center, Tsinghua University, China

Title: Deformations and Rigidity of ℓ-adic Sheaves

Abstract: Let X be a smooth connected algebraic curve over an algebraically closed field, let S be a finite closed subset in X, and let $\mathcal{F}_0$ be a lisse ℓ-torsion sheaf on $X - S$. We study the deformation of $\mathcal{F}_0$. The universal deformation space is a formal scheme. Its generic fiber has a rigid analytic space structure. By studying this rigid analytic space, we prove a conjecture of Katz which says that if a lisse $\overline{\mathbb{Q}}_\ell$-sheaf $\mathcal{F}$ is irreducible and physically rigid, then it is cohomologically rigid, under the extra condition that $\mathcal{F}$ mod ℓ absolutely irreducible or that $\mathcal{F}$ has finite monodromy.

8. Ziyang, Gao, CNRS, IMJ-PRG, France and Princeton University, USA

Title: Heights for families of abelian varieties and its application

Abstract: In the talk we prove a height inequality for a family of abelian varieties over a smooth curve, comparing the canonical heights for the fibers and the height on the base. Then we use apply this height inequality to the Geometric Bogomolov Conjecture. This is joint work with P. Habegger.

9. Philippe Gille, CNRS, Camille Jordan Institute, Lyon

Title: Survey on Recent Results on Maximal Tori of Algebraic Groups

Abstract: Prasad and Rapinchuk investigated the isopectrality problem for certain Riemannian varieties by analysing in which extent a semisimple algebraic group defined over a number field is determined by its maximal tori. We shall report advances on this topic by Chernousov/Rapinchuk/Rapinchuk, Bayer-Fluckiger/Lee/Parimala and others.

10. Yongquan Hu, Academy of Mathematics and Systems Science and Morningside Center of Mathematics, Chinese Academy of Sciences, China

Title: On Two Dimensional Potentially Barsotti-Tate Deformation Rings

Abstract: Let F be a finite unramified extension of $\mathbb{Q}_p$ and $\bar{\rho}$ be a two dimensional residual representation of $\mathrm{Gal}(\bar{F}/F)$. We compare certain different deformation problems attached to $\bar{\rho}$, more precisely, we compare potentially Barsotti-Tate deformation rings of different tame types. We show that they are actually different mod p^2. This is related to the geometric Breuil-Mézard conjecture. We also explain an application to the mod p Langlands program. This is a work in progress with Haoran Wang.

11. Luc Illusie, Université Paris-Sud 11, France

Title: On Vanishing Cycles and Duality, after A. Beilinson.

Abstract: It was proved by Gabber in the early 1980's that $R\Psi$ commutes with duality, and that $R\Phi$ preserves perversity up to shift. It had been in the folklore since then that this last result was in fact a consequence of a finer one, namely the compatibility of $R\Phi$ with duality. In this talk I'll give a proof of this, using a method explained to me by A. Beilinson.

12. Zhi Jiang, Shanghai Center for Mathematical Sciences, China

Title: Some Results on the Eventual Paracanonical Maps

Abstract: In order to improve the Severi inequality, Barja, Pardini and Stoppino defined the so-called eventual paracanonical maps of varieties of maximal Albanese dimensions. They proved that the degrees of these maps of surfaces are bounded by 4. We shall give a complete description of the eventual paracanonical maps of surfaces and give an optimal bound of the degrees of these maps of threefolds. This is a joint work with Zhiyu Tian.

13. Jie Lin, Institut des Hautes Études Scientifiques, France

Title: On the Central Value of Rankin-Selberg L-function

Abstract: The Ichino-Ikeda conjecture, refinement of the Gan-Gross-Prasad conjecture, relates the central value of Rankin-Selberg L-function for unitary groups and automorphic periods. In this talk, we will show how to prove this conjecture up to an algebraic number when the unitary groups are compact and the quadratic extension is an imaginary quadratic extension over a totally real field. If time permits, we will explain the compatibility of our result and the Deligne conjecture. This is joint work with Harald Grobner.

14. Ruochuan Liu, BICMR, Peking University, China

Title: De Rham Rigidity and Applications to Shimura Varieties

Abstract: We will report recent progresses on de Rham rigidity and, over Shimura varieties, a comparison between archimedean and non-archimedean de Rham local systems.

15. Wieslawa Niziol, UMPA, ENS de Lyon, France

Title: Syntomic Cohomology

Abstract: Syntomic cohomology is a p-adic analog of Deligne cohomology. We will survey its construction and some applications.

16. Xu Shen, Academy of Mathematics and Systems Science and Morningside Center of Mathematics, Chinese Academy of Sciences, China

Title: Rapoport-Zink Spaces, Shimura Varieties, and Moduli of K3 Surfaces

Abstract: In this talk, we will introduce some generalized Rapoport-Zink spaces, which can be used to study the local geometric structures of Shimura varieties of abelian type. We will also discuss some applications to K3 surfaces and their moduli.

17. Ye Tian, Academy of Mathematics and Systems Science and Morningside Center of Mathematics, Chinese Academy of Sciences, China

Title: Goldfeld Conjecture for Congruent Elliptic Curves

Abstract: A positive integer n is called a congruent number if it is the area of a right triangle with rational side lengths, or equivalently the elliptic curve $E_n : ny^2 = x^3 - x$ has Mordell-Weil group of rank > 0. Note that for square-free positive integer n, the L-function $L(E_n, s)$ has sign -1 if and only if $n \equiv 5, 6, 7 \mod 8$. Goldfeld conjectured that among all positive square-free integers congruent to 5, 6, 7 modulo 8, those n with $\mathrm{ord}_{s=1} L(E_n, s) = 1$ has density one. In this talk, we show this density is $> 50\%$. This talk is based on our joint work with Xinyi Yuan and Shouwu Zhang, and work of Smith.

18. Emmanuel Ullmo, Institut des Hautes Études Scientifiques, France

Title: Flows on Abelian Varieties and Shimura Varieties

Abstract: I will discuss several questions and some results about algebraic flows, o-minimal flows and holomorphic flows on abelian varieties and Shimura varieties.

19. Dasheng Wei, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China

Title: Strong Approximation for Certain Norm Varieties

Abstract: In this talk, we will introduce some norm varieties which satisfy weak approximation or strong approximation.These norm varieties are a generalization of

universal torsors of Chatelet surfaces. Some applications were also given for rational points and integral points by the descent theory.

20. Junyi Xie, Université Rennes I, France

Title: Algebraic Dynamics of the Lifts of Frobenius

Abstract: In this talk we study some questions in the algebraic dynamics for endomorphisms of projective spaces with coefficients in a p-adic field whose reduction in positive characteristic is the Frobenius. Our method is based on the theory of perfectoid spaces introduced by P. Scholze.

21. Weizhe Zheng, Academy of Mathematics and Systems Science and Morningside Center of Mathematics, Chinese Academy of Sciences, China

Title: Companions on Artin Stacks

Abstract: In his seminal Weil II paper, Deligne made a number of conjectures on Frobenius eigenvalues and traces of ℓ-adic sheaves over a finite field and on ℓ'-companions. In this talk, I will review previous work of Lafforgue, Deligne, and Drinfeld on the conjectures, and discuss generalizations to Artin stacks.