P-adic Hodge Theory and Automorphic Forms

Monday (6.5)

9:30-10:00 Reception

10:00-11:00 Yves Andre (CNRS/ University Paris 6)

Title: Techniques from p-adic Hodge theory in commutative algebra
Abstract: We present some details about the perfectoid Abhyankar lemma and other ingredients which enter our proof of the direct summand conjecture and of the existence of big Cohen-Macaulay algebras.

11:00-11:30 Break

11:30-12:30 David Savitt (Johns Hopkins University)

Title: Components of Galois moduli stacks
Abstract: In this talk I will explain how the geometry of Galois moduli stacks is related to the weight part of Serre's conjecture for GL(2) and to the (geometric) Breuil-Mezard conjecture for potentially Barsotti-Tate representations. This is joint work in progress with Ana Caraiani, Matthew Emerton, and Toby Gee.

14:00-15:00 Zhiwei Yun (Yale University)

Title: Higher Gross-Zagier formula with ramifications
Abstract: Joint with Wei Zhang, we previously proved a higher derivative analogue of the Waldspurger formula and the Gross-Zagier formula for function fields assuming there is no ramification. In this talk, I will talk about our joint work in progress which allows certain ramifications such as those arising from semistable elliptic curves over a function field.

15:00-15:30 Break

15:30-16:30 Wei Zhang (Columbia University)

Title: On some algebraic cycles on unitary shimura varieties
Abstract: this is a report of work in progress on some cycles on unitary shimura varieties and their application to L-functions.

Tuesday (6.6)

9:30-10:30 Ana Caraiani (University of Bonn)

Title: Galois representations and torsion classes
Abstract: We will discuss joint work in progress with Allen, Calegari, Gee, Helm, Le Hung, Newton, Scholze, Taylor, and Thorne on potential automorphy for elliptic curves over CM fields. This work follows the method proposed by Calegari and Geraghty. In this talk, we will outline the ingredients about torsion in the cohomology of locally symmetric spaces for GL_n which are needed to make their method go through. We will then focus on one of the ingredients, namely how to obtain instances of local-global compatibility at p for the Galois representations attached to those torsion classes.

10:30-11:00 Break

11:00-12:00 Patrick Allen (UIUC)

Title: Automorphy lifting for Galois representations over CM fields.
Abstract: We will discuss joint work in progress with Calegari, Caraiani, Gee, Helm, Le Hung, Newton, Scholze, Taylor, and Thorne on potential automorphy for elliptic curves over CM fields. In this talk, we focus on the automorphy lifting part of the argument, following the framework of Calegari-Geraghty. To have an applicable automorphy lifting theorem, it is necessary to use an idea of Khare-Thore, which involves inverting p, in tandem with Taylor's Ihara avoidance, which involves reduction modulo p. We will explain both of these 'tricks' and how to implement them simultaneously.

14:00-17:00 Free discussion

19:00 Conference dinner

Wednesday (6.7)

9:30-10:30 Gabriel Dospinescu (Ecole Normale Supérieure de Lyon)

Title: p-adic étale cohomology of the Drinfeld tower in dimension 1
Abstract: We will explain how the p-adic étale cohomology of the Drinfeld tower for GL_2(Q_p) realizes the p-adic local Langlands correspondence for some de Rham representations of the absolute Galois group of Q_p. The final result is strikingly similar to the l-adic situation. This is joint work with Pierre Colmez and Wieslawa Niziol.

10:30 Group Photo

10:30-11:00 Break

11:00-12:00 Erick Knight (Max-Planck-Institute fur Mathematik)

Title: Patching and the p-adic Jacquet-Langlands Correspondence
Abstract: In this talk, I will explain how to use the Taylor-Wiles-Kisin patching method to study the p-adic Jacquet-Langlands correspondence. I will show that the two constructions of the p-adic Jacquet-Langlands correspondence due to myself and Scholze agree, and also determine the locally algebraic vectors inside the representations of the quaternion algebra. This is joint work with Przemyslaw Chojecki.

14:00-15:00 Kiran Kedlaya (University of California)

Title: Cohomology of p-adic local systems via (phi, Gamma)-modules
Abstract (in TeX): Let $f: Y \to X$ be a smooth proper morphism of rigid analytic varieties over a nonarchimedean field of mixed characteristics (0,p). We show that the higher direct images of a local system on Y with coefficients in any of $\mathbb{F}_p$, $\mathbb{Z}_p$ are again local systems on X; we also obtain a generalization of Scholze's primitive comparison theorem. Our method is based on the embedding of the various categories of local systems into certain categories of relative (ϕ, Γ)-modules; we obtain some statements about the larger category which are themselves of some interest in the study of period mappings. Joint work with Ruochuan Liu.

15:00-15:30 Break

15:30-16:30 Yifeng Liu (Northwestern University)

Title: Non-Archimedean Dolbeault cohomology and superforms
Abstract: We will introduce a new cohomology theory for varieties over p-adic fields using analytic logarithmic differential forms, and study the corresponding cycle class map. We will see a close relation of this cohomology with superforms defined by Chambert-Loir and Ducros. If times permits, we will discuss how one can expect Hodge isomorphisms through so-called monodromy maps.

Thursday (6.8)

9:00-10:00 Eugen Hellmann (University of Muenster)

Titel: A local model for the trianguline variety and applications to p-adic automorphic forms
Abstract: We investigate overconvergent p-adic automorphic forms (of finite slope) on definite unitary groups. In particular (under mild technical assumptions) we are prove a strong classicality criterion and in determine all ‚companion forms' of a given classical form (i.e. all p-adic forms that have the same system of Hecke-eigenvalues). The main method is to transfer these statements to questions about the geometry of a space parametrizing certain p-adic Galois representations of a local Galois group. We give a complete description of the local geometry of this space using that it is equi-singular to a scheme defined in terms of linear algebraic groups. This 'local model' also allows us to prove a Breuil-Mezard-type multiplicity formula for certain cycles in the deformation space of a crystalline Galois representation. This is joint work with C. Breuil and B. Schraen.

10:00-10:15 Break

10:15-11:15 Yiwen Ding (Imperial College London)

Title: Simple L-invariants for GLn
Abstract: We study a certain class of Fontain-Mazur L-invariants and Breuil's L-invariants, which we call simple L-invariants. And we show their equality by proving some local-global compatibility results in (locally analytic) p-adic Langlands program for GLn.

11:30-12:30 Kentaro Nakamura (Saga University)

Title: A construction of the local epsilon isomorphisms using Colmez's multiplicative convolution

Abstract: For any de Rham representation of $\mathrm{Gal}(\mathbb{Q}\underline{\quad}p/\mathbb{Q}p)$, one can define a canonical trivialization,

which is called the local epsilon isomorphism, of the determinant of its Galois cohomology (precisely, a trivialization of the fundamental line) using the Bloch-Kato's fundamental exact sequence and the local ε-constant of the associated Weil-Deligne representation. In the late 90's, Kazuya Kato proposed a conjecture called the local epsilon conjecture predicting that such a trivialization can be interpolated

to all the families of p-adic representations of $\mathrm{Gal}(\mathbb{Q}\underline{\quad}p/\mathbb{Q}p)$. Up to now, such a trivialization is known

only in some special cases, e.g. the trianguline case and the rank two case (in the latter case, we use p-adic local Langlands correspondence for $\mathrm{GL2}(\mathbb{Q}p)$). In my talk, I propose a conjecture on the construction of the local epsilon isomoprhisms for any families by using Colmez's multiplicative convolution defined on the associated (ϕ,Γ)-modules.

14:00-17:00 Free discussion

Friday (6.9)

9:30-10:30 Vincent Pilloni (CNRS)

Title: Higher Hida Theory
Abstract: we will construct p-adic families of modular forms of singular weights and discuss arithmetic applications.

10:30-11:00 Break

11:00-12:00 Xinwen Zhu (California Institute of Technology)

Title: Correspondences of Shimura varieties via the geometric Satake
Abstract: I will explain a general strategy to construct cohomological correspondences between the mod p fibers of different Shimura varieties via the geometric Satake. In the special case of correspondences from a Shimura set to a Shimura variety, we obtain all the Tate classes in the middle cohomology of the latter, under a certain genericity condition. This is a joint work with Liang Xiao.

14:00-15:00 Ye Tian (AMSS)

Title: Horizontal variation of Shafarevich-Tate groups
Abstract: Tate-Shafarevich group is an arithmetic invariant of an elliptic curve E over a number field K. We discuss the horizontal behavior of its p-part as K varies for a prime p. The approach is based on arithmetic of toric periods and CM points on Shimura set and Shimura curves. This is joint work with Burungale and Hida.

15:00-15:30 Break

15:30-16:30 Henri Darmon (McGill University)

Title: Singular moduli for real quadratic fields: a rigid analytic approach. (Joint work with Jan Vonk.)
Abstract: I will describe an ongoing project with Jan Vonk, which aims to extend the notion of singular moduli to real quadratic fields using rigid analytic methods.