New Structures and Techniques
in p-adic Geometry

IHES, October 27-31, 2025

Abstracts

(listed in alphabetical order by speaker's last name)

Johannes ANSCHÜTZ

Divisors on Fargues—Fontaine curves

Abstract: We will explain how vector bundles on different moduli spaces of degree 1 divisors on Fargues—Fontaine curves geometrize (varphi,N,Gal_Q_p)-modules and (varphi,Gamma)-modules, all or with the restriction of being de Rham, and how this leads to a definition of (perfect) analytic prismatization over Q_p.

Ana CARAIANI and Mingjia ZHANG

Igusa stacks I, II, II and IV

Abstract: Igusa stacks are a new tool to study the cohomology of Shimura varieties with both characteristic 0 and torsion coefficients. Let (G,X) be a Shimura datum of Hodge type. The associated Shimura variety with infinite level at p, considered as a diamond over a p-adic field, can be expressed as a fiber product of an Igusa stack with a purely local object, the diamond associated to a flag variety, over the moduli stack Bun_G of G-bundles over the Fargues-Fontaine curve. This Cartesian diagram, called the Igusa stack diagram, allows us to use techniques from the categorical local Langlands program to study the cohomology of Shimura varieties.

In the first lecture, we will discuss the Igusa stack diagram, constructed in various levels of generality by Zhang, Daniels-van Hoften-Kim-Zhang, and Kim. In the next two lectures, we will discuss applications of the Igusa stack diagram to the cohomology of Shimura varieties, specifically to results such as torsion-vanishing, Eichler-Shimura relations, and Ihara's lemma. These are due to a number of researchers, including Koshikawa, Hamann-Lee, Daniels-van-Hoften-Kim-Zhang, Yang-Zhu and Yang. In the last lecture, we will discuss the relative intersection cohomology of the Igusa stack, which is joint work in progress of the two mini-course speakers with Linus Hamann.

Gabriel DOSPINESCU

*On the mod p and p-adic Jacquet-Langlands correspondence for GL_2(Q_p) and D^**

Abstract: I will discuss some consequences of the 6 functor formalism of Mann to the study of the mod p and p-adically completed cohomology of the Drinfeld tower. This is joint work with Colmez and Niziol, and independently with Rodriguez Camargo.

Veronika ERTL

Higher pushforwards in rigid cohomology via motives

Abstract: Berthelot's conjecture states that the higher push-forwards in rigid cohomology of the structure sheaf along a smooth and proper morphism are canonically overconvergent F-isocrystals. I will explain how motivic non-archimedean homotopy theory can be used to define solid relative rigid cohomology and prove a version of Berthelot's conjecture. (Joint work with Alberto Vezzani.)

Eugen HELLMANN and Arthur-César LE BRAS

Geometric aspects of the p-adic locally analytic Langlands correspondence I, II, II and IV

Abstract: The goal of these lectures is to discuss some aspects of the geometrization of the p-adic Langlands program (more precisely, the part of it which deals with locally analytic representations on topological $\mathbb{Q}_p$-vector spaces). The lectures by Hellmann (based on joint work with Hernandez and Schraen and with Heuer) will focus on the « Galois » side, introducing moduli stacks of (variants of) p-adic Galois representations and on the study of their geometry. The lectures of Le Bras (based on joint work with Anschütz, Rodriguez Camargo, Scholze) will focus on the « automorphic » side, explaining how to realize locally analytic representations as sheaves on a variant of Fargues-Scholze's stack of G-bundles on the Fargue-Fontaine curve.

Kalyani KANSAL

Towards mod p local global compatibility for partial weight one Hilbert modular forms

Abstract: Let $p > 5$ be a prime, and let F be a totally real field in which p is unramified. We study mod p Hilbert modular forms for F of level prime to p and weight (k, l), where k and l are tuples of integers. To a mod p Hilbert modular Hecke eigenform of weight (k, l), Diamond and Sasaki associate a two-dimensional mod p Galois representation of $\mathrm{Gal}(\bar{F}/F)$. The local–global compatibility (LGC) conjecture predicts that, at each place above p, the restriction of this representation admits crystalline lifts with Hodge–Tate weights determined explicitly by (k, l). In this talk, we will discuss a proof showing that LGC for regular p-bounded weights (each entry of k between 2 and p+1) implies LGC in the partial weight one p-bounded case (each entry of k between 1 and p+1). Our approach combines computations of scheme-theoretic intersections on the Emerton–Gee stack with weight-changing arguments on quaternionic Shimura varieties, using restriction to Goren–Oort strata. This is joint work in progress with Brandon Levin and David Savitt.

Dongryul KIM

Uniqueness and functoriality of Igusa stacks

Abstract: I will introduce a perspective on Igusa stacks that can be interpreted as providing a uniformization of the p-adic Shimura variety. Using deformation theory and p-adic Hodge theory, I will discuss how this uniformization can be pinned down uniquely. As a consequence, we can deduce that Igusa stacks are canonical objects that are unique.

Shubhodip MONDAL

p-*adic motives and special values of zeta functions*

Abstract: In 1966, Tate proposed the Artin–Tate conjectures, which describe the special values of zeta functions associated to surfaces over finite fields. Building on this, and assuming the Tate conjecture, Milne and Ramachandran formulated and proved analogous conjectures for smooth proper schemes over finite fields. However, the formulation of these conjectures already relied on other unproven conjectures.

In this talk, I will present an unconditional formulation and proof of these conjectures. The approach relies on the theory of F-Gauges, a notion introduced by Fontaine–Jannsen and further developed by Bhatt–Lurie and Drinfeld, which has been proposed as a candidate for a theory of p-adic motives. A central role is also played by the notion of stable Bockstein characteristics, which will be introduced in the talk.

Alberto VEZZANI and Timo RICHARZ

Non-Archimedean Motives I, II, II and IV

Abstract (Alberto Vezzani): We will define the categories of (étale, rational) motives over an adic space S and illustrate their most important properties, focusing on relevant applications in the study of p-adic cohomology theories. In particular, we will present the six-functor formalism they are equipped with, the continuity/spreading-out property, compact generation, and the identification between an analytic motive over a local field and a monodromy operator acting on its nearby cycle. We will sketch the proofs of these facts, highlighting the role of homotopies at each stage. Several applications will be presented, especially concerning the definition and study of rigid, de Rham, and Hyodo-Kato cohomologies.

Abstract (Timo Richarz): The lectures will explore the geometric Satake equivalence in the context of motives. After introducing rational and étale motives over schemes, we will apply this framework to study motives on the Hecke stack. A central theme will be the geometric properties of the spaces involved that are essential for the geometric Satake equivalence in this motivic setting.