Schedule

Topology and Arithmetic around the Langlands Program

	Tu (Hörsal 4)	We (Hörsal 6)	Th (Hörsal 6)	Fr (Hörsal 6)	Sa (Hörsal 6)
9:00					
9:15					
9:30	Toby Gee	Tony Feng		Arthur-César Le Bras	Wiesława Nizioł
9:45					
10:00					
10:15			Dustin Clausen		
10:30					
10:45					
11:00	Minhyong Kim	Pol van Hoften		Eva Viehmann	Marie-France Vignéras
11:15					
11:30					
11:45			Kęstutis Česnavičius		
12:00	Lunch break			Lunch break	
12:15					
12:30		Lunch break			
12:45					
13:00					
13:15					
13:30	Lucas Mann				
13:45					
14:00		Dennis Gaitsgory		Jessica Fintzen	
14:15					
14:30					
14:45					
15:00	Sug Woo Shin				
15:15					
15:30		Zhiwei Yun		Stefan Patrikis	
15:45					
16:00					
16:15	Mark Kisin				
16:30					
16:45					
17:00					
17:15					

on-site talk	on-line talk	break

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Titles and abstracts

Arthur-César Le Bras: Banach–Colmez spaces

Kęstutis Česnavičius: Reductive group torsors on a complement of a smooth divisor

A conjecture of Nisnevich predicts that for a smooth variety X over a field, a smooth divisor D in X, and a totally isotropic reductive X-group scheme G, every generically trivial G-torsor on $X \setminus D$ trivializes Zariski locally on X. I will discuss this conjecture and related questions about torsors under reductive groups over regular rings.

Dustin Clausen: Artin reciprocity via spheres

I will explain a very strange proof of the Artin reciprocity law. At the heart of it is the construction of a sphere from every locally compact $\mathbb{Q}$-vector space.

Tony Feng: Cyclic base change over function fields

Cyclic base change is an important instance of Langlands' functoriality principle, which in addition to its intrinsic interest has many technical applications, for example to automorphy lifting. It is proved over number fields by trace formula comparisons, but is actually still unknown over function fields, due to complications with the trace formula in positive characteristic. I will talk about a new approach to cyclic base change functoriality over function fields, some of which is joint with Bockle-Harris-Khare-Thorne. A key input is the interplay of equivariant localization in topology, sheaf theory, and geometric representation theory.

Jessica Fintzen: Representations of p-adic groups — with a twist

A fundamental problem on the representation theory side of the Langlands program is the construction of all (irreducible, smooth, complex or mod-ℓ) representations of p-adic groups. I will provide an overview of our understanding of the representations of p-adic groups, with an emphasis on recent progress including joint work with Kaletha and Spice that introduces a twist to the story, and outline some applications.

Dennis Gaitsgory: The stack of local systems with restricted variation and geometric Langlands with nilpotent singular support

We will introduce a new geometric object: the stack of local systems with restricted variation. Using it, we will be able to formulated a version of the geometric Langlands conjecture that makes sense for etale sheaves over an arbitrary ground field; the geometric of the conjecture is the category of automorphic sheaves with nilpotent singular support. We will combine it with a Trace Isomorphism Theorem, to give a description of the space of unramified automorphic functions in terms of Langlands parameters. This is a joint work with Arinkin, Kazhdan, Raskin, Rozenblyum and Varshavsky.

Toby Gee: A categorical p-adic local Langlands correspondence for $\mathrm{GL}_2(\mathbb{Q}_p)$

I will discuss joint work in progress with Andrea Dotto and Matthew Emerton, which constructs a fully faithful functor from the derived category of smooth p-adic representations of $\mathrm{GL}_2(\mathbb{Q}_p)$ to a derived category of coherent sheaves on a stack of etale (φ, Γ)-modules.

Pol van Hoften: Hecke orbits on Shimura varieties of Hodge type

Oort conjectured in 1995 that isogeny classes in the moduli space of principally polarised abelian varieties in characteristic p are Zariski dense in the Newton strata containing them. There is a straightforward generalisation of this conjecture to the special fibres of Shimura varieties of Hodge type, and in this talk, we will present a proof of this conjecture under some minor hypotheses. In fact, we prove the Hecke orbit conjecture of Chai–Oort, which predicts that prime-to-p isogeny classes are dense in central leaves and which implies the above conjecture (by work of Kisin). An important ingredient in our proof is a new theory of "Serre–Tate coordinates" on the formal deformation spaces of central leaves, in terms of so-called Dieudonné–Lie algebras. We also prove new results about monodromy groups of F-isocrystals for smooth varieties over a perfect field of characteristic p, which should be of independent interest. This is joint work with Marco D'Addezio.

Minhyong Kim: Path integrals and p-adic L-functions

In the 1960s, Barry Mazur noticed an analogy between knots and primes that led to a view of the main conjecture of Iwasawa theory in which the p-adic L-function plays the role of the Alexander polynomial. In the late 1980s, Edward Witten reconstructed the Jones polynomial as a path integral-in the sense of quantum field theory-associated to SU(2) Chern-Simons theory. This talk will review some of this history and present a weak arithmetic analogue of Witten's formula. (This is joint work with Magnus Carlson, Hee-joong Chung, Dohyeong Kim, Jeehoon Park, and Hwajong Yoo.)

Mark Kisin: Heights in the isogeny class of an abelian variety

Let A be an abelian variety over $\bar{\mathbb{Q}}$. I will report on joint work in progress with Lucia Mocz in which we study the following conjecture.

Conjecture: Let $c > 0$. In the isogeny class of A, there are only finitely many isomorphism classes of abelian varieties of height $< c$.

We show the conjecture when the Mumford-Tate conjecture – which is known in many cases – holds for A.

Lucas Mann: A p-Adic 6-Functor Formalism in Rigid-Analytic Geometry

Using the recently developed condensed mathematics by Clausen-Scholze we construct a full p-adic 6-functor formalism on rigid-analytic varieties and more generally on diamonds and small v-stacks. Instead of working directly with $\mathbb{F}_p$-sheaves, this 6-functor formalism is based on a theory of "solid quasi-coherent almost $\mathscr{O}_X^+/p$"-sheaves on X. By proving a version of a p-torsion Riemann-Hilbert correspondence we relate this category to actual $\mathbb{F}_p$-sheaves, which in particular provides a purely local proof of p-adic Poincaré duality in the rigid setting. We also expect many applications of our 6-functor formalism to the p-adic Langlands program.

Wiesława Nizioł: Factorization of the p-adic étale cohomology of coverings of Drinfeld's upper half plane

I will report on a joint work with Pierre Colmez and Gabriel Dospinescu giving a factorization à la Emerton of the p-adic étale cohomology of coverings of Drinfeld's upper half-plane.

Stefan Patrikis: Compatibility properties for local systems on exceptional Shimura varieties

Let (G, X) be a Shimura datum, and let K be a compact open subgroup of $G(\mathbb{A}_f)$. Under mild assumptions on G and K, there are canonical K-valued representations of the fundamental groups of the geometrically connected components (defined over some finite extension of the reflex field) of the Shimura

variety $\mathrm{Sh}_K(G,X)$. Projecting to the ℓ-adic component for each prime ℓ, we obtain systems of ℓ-adic fundamental group representations, about which a great deal is understood when (G,X) is of abelian type, starting from their moduli interpretation. I will discuss ongoing joint work with Christian Klevdal on compatibility (independence-of-ℓ) properties of these fundamental group representations when G is an exceptional group.

Sug Woo Shin: On cohomology of Shimura varieties of abelian type

In a recent paper with Mark Kisin and Yihang Zhu, we proved the stable trace formula for Shimura varieties of abelian type. We will review the result and discuss some follow-ups and applications in joint work in progress with Kisin and Zhu.

Eva Viehmann: Adic Newton strata and the topology of Bun_G

Marie-France Vignéras: "Dimensions" of admissible representations of reductive p-adic groups over an arbitrary field

Zhiwei Yun: Cocenter of the affine Hecke category and functions on the commuting stack

The Betti geometric Langlands conjecture proposed by Ben-Zvi and Nadler predicts that the cocenter of the affine Hecke category is equivalent to the category of automorphic sheaves on an elliptic curve. We explain how to prove the "semistable part" of this conjectural equivalence. As an application, we deduce a formula for the derived coordinate ring of the commuting stack for the Langlands dual group, proving a conjecture of Berest, Ramadoss and Yeung. This is joint work with Penghui Li and David Nadler.