Galois Representations and Automorphic Forms
Représentations de Galois et formes automorphes

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ELLEN EISCHEN, University of Oregon
Automorphic forms, congruences, and p-adic L-functions

One approach to studying the p-adic behavior of L-functions relies on understanding p-adic properties of certain automorphic forms, for example congruences satisfied by their Fourier coefficients. In this talk, I will provide an introduction to key techniques used in several constructions of p-adic L-functions. I will start with the earliest examples of p-adic L-functions (due to Serre, Leopoldt, and Kubota) and conclude by mentioning a recently completed construction of myself, Harris, Li, and Skinner.

FLORENCE GILLIBERT, Pontificia Universidad Catolica de Valparaiso
Abelian surfaces with quaternionic multiplication, and rational points on Atkin-Lehner quotients of Shimura curves

Let D be the product of an even number of primes and N an integer prime to D. We are interested in two problems: proving for large families of pairs (D,N) the triviality of rational points of Atkin-Lehner's quotients of Shimura curves of discriminant D and level N, and proving for large families of pairs (D,N), that there is no geometrically simple abelian surface $A/\mathbb{Q}$ with multiplication, over a quadratic imaginary field, by a maximal order O_D in a quaternion algebra of discriminant D and endowed with a rational isogeny of degree N^2 with the kernel O_D-cyclic and isomorphic to $(\mathbb{Z}/N\mathbb{Z})^2$. We shall speak about two results related with these problems: First: let p,q be prime numbers. We consider the quotient of the Shimura curve $X_0^{pq}(1)$, of discriminant pq and level 1, by the Atkin-Lehner involution w_q. We show that the quotient of X^{pq} by w_q has no rational point for $q > 245$ and p large enough compared to q, in the "cas non ramifié de Ogg" $p \equiv 1 \mod 4$ and $q \equiv 3 \mod 4$ and $\left(\frac{p}{q}\right) = -1$. Second: for a fixed quaternion algebra B_D of discriminant D and a fixed quadratic imaginary field K, we find an effective bound for prime l such that there exists a $\Gamma_0(l)$ level structure over GL_2-type geometrically simple abelian surfaces $A/\mathbb{Q}$ having multiplication by a maximal order of B_D over K.

MATÍAS VICTOR MOYA GIUSTI,
Ghost classes in the cohomology of the Shimura variety associated to GSp(4)

We will introduce the definition of ghost classes and we are going to explain some methods to study their existence in the cohomology of Shimura varieties. Finally we will discuss the results obtained when applying these methods to the Shimura variety associated to GSp(4).

DANIEL KOHEN, Universidad de Buenos Aires
Heegner point constructions

Given a rational elliptic curve E and an imaginary quadratic field K that satisfies the so called Heegner hypothesis, we can construct points on E defined over abelian extensions of K called Heegner points. These points, that can be explicitly computed, are crucial in order to understand the arithmetic of the elliptic curve.

Whenever the sign of the functional equation of E/K is -1 we expect to find analogues of Heegner points, even if the Heegner hypothesis is not satisfied, according to a conjecture of Darmon. The main goal of this talk is to show how to obtain these points in both a computational and theoretical way in all cases where we expect a construction to take place in an unramified quaternion algebra.

LUIS LOMELÍ, Instituto de Matemáticas PUCV
Globalization of supercuspidal representations over function fields and applications

Let H be a connected reductive group defined over a non-archimedean local field F of characteristic $p > 0$. Using Poincaré series, we globalize supercuspidal representations of H_F in such a way that we have control over ramification at all other places, and such that the notion of distinction with respect to a unipotent subgroup (indeed more general subgroups) is preserved. In combination with the work of Vincent Lafforgue on the global Langlands correspondence, we present applications, such as the stability of Langlands-Shahidi γ-factors and the local Langlands correspondence for classical groups.

RICARDO MENARES, Pontificia Universidad Católica de Valparaíso
Non-optimal levels of reducible mod l Galois representations

Let $l \geq 5$ be a prime number and let $\rho : Gal(\overline{\mathbb{Q}}/\mathbb{Q}) \to GL_2(\overline{\mathbb{F}}_l)$ be a semisimple, odd, continuous, Galois representation. When ρ is irreducible, deep works by many people, culminating in Khare and Wintenberger's proof of Serre's conjectures, ensure that ρ is modular and that the level of a modular form giving rise to it can be taken to be equal to the Serre conductor of ρ. Such level is 'optimal' in that every other prime-to-l admissible level is a multiple of it. Moreover, Diamond and Taylor gave a complete classification of such admissible multiples, that were called 'non-optimal levels'.

In this talk, we address the case where ρ is semisimple, odd, continuous and $reducible$. The modularity in this case can be established by elementary methods, that boil down to study congruences between Eisenstein series and cuspidal Hecke eigenforms. An important difference is that the Serre conductor is not always an admissible level. We will present partial results on criteria for the existence of the optimal level and on level-rasing theorems toward the classification of the corresponding non-optimal levels. Such results are valid in weight $k \geq 4$ and can be used to estimate the degree of the field of coefficients of newforms.

This is joint work with Nicolas Billerey.

ARIEL PACETTI, Universidad Nacional de Cordoba
Non-paritious Hilbert modular forms

Buzzard and Gee have formulated a conjecture predicting the existence of Galois representations attached to automorphic representations of reductive groups over number fields that are "L-algebraic" (a condition on the local factors at the infinite places). We investigate this conjecture for the automorphic representations generated by Hilbert modular eigenforms whose weights are not all congruent modulo 2. These are not L-algebraic as automorphic representations of GL_2; but we show that they become L-algebraic after restriction to suitable subgroups intermediate between GL_2 and SL_2 , and we construct the Galois representations into the corresponding L-groups predicted by the Buzzard–Gee conjecture. We will describe algorithms for computing these non-paritious Hilbert modular forms using definite quaternion algebras, and we give an explicit example of such an eigenform of weight $(4, 3)$ over the field $Q(\sqrt{2})$.

AFTAB PANDE, Universidade Federal do Rio de Janeiro
Reductions of Galois Representations

Using the mod p Local Langlands correspondence for $GL_2(Q_p)$, we describe the semisimplification of the mod p reduction of certain 2-dimensional crystalline representations of slope $(2, 3)$. This is joint work with Enno Nagel.

DANIEL BARRERA SALAZAR, UPC
On the exceptional zeros of p-adic L-functions of Hilbert modular forms

The use of modular symbols to attach p-adic L-functions to Hecke eigenforms goes back to the work of Manin et al in the 70s. In the 90s, Stevens developed his theory of overconvergent modular symbols, which was successfully used to construct p-adic

L-functions on the eigenvariety. In this talk we will present a work in collaboration with Mladen Dimitrov and Andrei Jorza in which we generalize this approach to the Hilbert modular setting and prove new instances of the exceptional zero conjecture.

CLAUS SORENSEN, UC San Diego
Insensitivity of deformation rings under parabolic induction

One of the characteristics of the p-adic local Langlands correspondence is that it relates deformations of Galois representations to those of mod p representations of $\mathrm{GL}(2)$ over $\mathbb{Q}_p$. For a general p-adic reductive group G the deformations of its mod p representations are not very well understood. Often the universal deformation ring exists as a pseudocompact ring, but it is not known to be Noetherian in general. In this talk we will present some modest steps towards a better understanding of these rings. For instance, that they are insensitive to parabolic induction. In view of the recent classification of Abe, Herzig, Henniart, and Vigneras, this reduces many questions (such as Noetheriannity) to the case of supersingulars. Our main result is an application of Hauseux's computation of Emerton's higher ordinary parts for parabolically induced representations. This is joint work with Julien Hauseux and Tobias Schmidt.

GONZALO TORNARÍA, Universidad de la República
Waldspurger formula for Hilbert modular forms

In this talk we will describe a construction of preimages for the Shimura map on Hilbert modular and explain how we obtain an explicit Waldspurger type formula relating their Fourier coefficients to central values of twisted L-functions.

Our construction is inspired by that of Gross and applies to any nontrivial level and arbitrary base field, subject to certain conditions on the Atkin-Lehner eigenvalues and on the weight.

This is joint work with Nicolás Sirolli.