Y-RANT 2025
Conference Booklet

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Organisers:
Alberto Angurel, Lewis Matthews and Frederick Thøgersen

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LONDON MATHEMATICAL SOCIETY
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Venue. The conference is being hosted at the School of Mathematical Sciences at the University of Nottingham, in University Park, Nottingham NG7 2RD.

Talks. All the talks will take place in **Pope building**, close to the School of Mathematical Sciences.
All the plenary talks will take place in room C15.
On Wednesday and Thursday, the parallel sessions will be in C15 (left column) and in C16 (right column).
On Friday, the parallel session will take place in C15 (left column) and in C17 (right column).

Accommodation. Most participants will stay in a single ensuite room in Lenton and Wortley Hall, on Derby Road (NG7 2RB). It is a 10 minute walk from the conference venue.

Conference Dinner. Thanks to the support of our sponsors, the conference dinner is free of charge for all participants. It will be held on Park Plaza Hotel, at 41 Maid Marian Way (NG1 6GD).

Travel. The closest airport to Nottingham is East Midlands Airport. From there there is a direct Skylink bus to University park, being South Entrace the closest stop to the conference venue.
If you are arriving to Nottingham by train, the easiest way to get to campus is by taking the Tram.

Food. There are plenty of places to buy some food in campus. You can find them in this link.

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Conference Schedule

Wednesday 3rd Spetember		
09:00 – 09:30	**Registration**	
09:30 – 10:30	Plenary: Fred Diamond *Langlands reciprocity in finite characteristic*	
10:30 – 11:00	**Coffee Break**	
11:00 – 11:30	Giorgio Navone *Transcendental Brauer groups of cubic generalised Kummer surfaces*	Jiazhi He *Counting wild extensions over gloabal function fields*
11:30 – 12:00	Vincenzo Di Bartolo *Developing Augmented Iwasawa Theory*	Bijay Bhatta *Zilber–Pink Conjecture for Simple PEL Type Assuming LGO*
12:00 – 12:30	William Coram *Formalising Fujisaki's lemma*	Ignacio Muñoz Jiménez *Quaternionic big Heegner points over totally real fields*
12:30 – 14:00	**Lunch Break**	
14:00 – 14:30	Isabel Rendell *Quadratic Chabauty for Atkin-Lehner quotients of modular curves via weakly holomorphic modular forms*	Yufan Liu *Varieties with prescribed finite unramified Brauer groups and subgroups precisely obstructing the Hasse principle*
14:30 – 15:00	Martí Oller Riera *Arithmetic statistics of isogeny Selmer groups*	Calle Sönne *Stratifications on moduli spaces of abelian varieties*
15:00 – 15:30	**Coffee Break**	
15:30 – 16:00	Joseph Harrison *Linear relations in irrational powers*	Martín Ortiz *Torsion vanishing for de Rham cohomology of Shimura varieties*
16:00 – 16:30	Madhuparna Das *A central limit theorem for partitions involving generalised divisor function*	Alexandros Groutides *Integrality of $GL(2) \times GL(2)$ Rankin-Selberg integrals for newforms*
16:30 – 17:00	Asuka Shiga *Infinitely many pairs of non-isomorphic elliptic curves sharing the same BSD invariants*	Sara Varljen *Constructing a fundamental domain for Bianchi groups*

Thursday 4th September		
09:30 – 10:00	Hsuan-Hsien Lee *The determinant line bundle on the B^+_{dR} affine Grassmannian*	Lucie Gatzmaga *Geometric Hilbert Modular Forms and Serre's Weight Conjecture for Dihedral Representations*
10:00 – 10:30	Jordi Vilà-Casadevall *The Igusa Zeta Function of an Ideal in a Polynomial Ring*	David Kurniadi Angdinata *Computing Dirichlet L-functions over global function fields*
10:30 – 11:00	Corijn Rudrum *Non-abelian Selmer group Chabauty*	Antao Yang *Continued fractions in the field of p-adic numbers.*
11:00 – 11:30	**CoffeeBreak**	
11:30 – 12:30	Plenary: Judith Ludwig *A glimpse into p-adic aspects of the Kudla programme*	
12:30 – 14:00	**Lunch Break**	
14:00 – 14:30	Thibaut Misme *Effective 2-descent on Jacobians of curves using Odd Theta Characteristics*	Haoran Liang *Local geometry of the eigencurve*
14:30 – 15:00	Alvaro Gonzalez Hernandez *Crazy for three: Quotients of abelian surfaces by a group of order 3 in characteristic 3*	Yiannis Fam *An exceptional L-packet in small residue characteristic.*
15:00 – 15:30	**Coffee Break**	
15:30 – 16:00	Mark Heavey *Picard groups of affinoid spaces*	David Chang Luo *On the Local Converse Theorem for Depth 1/N Supercuspidal Representations of GL(2N, F)*
16:00 – 16:30	Naina Praveen *Duality Theorems*	Ned Carmichael *Non-vanishing of Poincaré Series on Average*
16:30 – 17:00	Sudip Pandit *Explicit Mordell–Lang bound for curves in low rank*	Yicheng Yang *Integral weight one forms*

Friday 5th September		
09:30 – 10:30	Plenary: Vandita Patel *Values of the Ramanujan tau-function*	
10:30 – 11:00	**Coffee Break**	
11:00 – 11:30	Lee Berry *Effective Chabauty-Kim for hyperelliptic curves*	Yan Yau Cheng *A Trace-Path Integral formula over function fields*
11:30 – 12:00	Ruth Raistrick *Galois Module Structure of Unit Groups of Rings of Integers*	Mark Chambers *Congruences, L-Values, and Half-Integral Weight Modular Forms*
12:00 – 12:30	Simon Alonso *A brief intorduction to the Fargues-Fontaine curve*	Hsin-Yi Yang *CM liftability of abelian varieties*
12:30 – 14:00	**Lunch Break**	
14:00 – 14:30	Jakab Schrettner *Reduction types of curves in p-adic families*	
14:30 – 15:00	Tianchen Zhao *The extendability of the automorphisms of K3 surfaces*	Albert Lopez Bruch *Parameters of Hecke algebras for p-adic groups*
15:00 – 15:30	Alejandro José Giangreco Maidana *Totally real algebraic integers and cyclicity of abelian varieties over finite fields*	Xiang Li *S-integral Points on the Thrice-punctured Line over Cyclotomic Fields*
15:30 – 16:00	Nada Baessa *Modular Forms and Representations: A Local Perspective*	Giovanna De Lauri *P-neighbouring graphs of ternary quadratic lattices and Orthogonal modular forms*

Fred Diamond

Langlands reciprocity in finite characteristic

Abstract: The modularity theorem for elliptic curves over Q can be interpreted as a relationship between two types of representations (Galois and automorphic) that satisfies a local-global compatibility property. I'll recall how this works and discuss how it fits into a broader conjectural framework that includes representations in finite characteristic.

Judith Ludwig

A glimpse into p-adic aspects of the Kudla programme

Abstract: Motivated by explicit class field theory I will give an introduction to the concept of rigid cocycles (due to Darmon and Vonk). I will then report on a joint project with Negrini, Pozzi, Rozensztajn and Wiersema, where we define a rigid cocycle and use it to construct an interesting modular generating series.

Vandita Patel

Values of the Ramanujan tau-function

Abstract: The infamous Ramanujan tau-function is the starting point for many mysterious conjectures and difficult open problems within the realm of modular forms. In this talk, I will discuss some of our recent results pertaining to odd values of the Ramanujan tau-function. We use a combination of tools which include the Primitive Divisor Theorem of Bilu, Hanrot and Voutier, bounds for solutions to Thue–Mahler equations due to Bugeaud and Gyory, and the modular approach via Galois representations of Frey-Hellegouarch elliptic curves. This is joint work with Mike Bennett (UBC), Adela Gherga (Warwick) and Samir Siksek (Warwick).

Simon Alonso

A brief intorduction to the Fargues-Fontaine curve

Abstract: Discovered in 2009, the so-called fundamental curve of p-adic Hodge theory is very widely considered as a revolution in the area. In this talk I will try to give a gentle introduction to its construction and applications with a particular emphasis on the motivations that lead Fargues and Fontaine (among others) to define this fascinating object. Hopefully I will have time to present its different modern incarnations and comment on the role played by the curve in the geometrisation of the Langlands correspondence.

David Kurniadi Angdinata

Computing Dirichlet L-functions over global function fields

Abstract: A Dirichlet character over $\mathbb{F}_q(t)$ is a character of the multiplicative group $(\mathbb{F}_q[t]/m)^\times$ for some modulus $m \in \mathbb{F}_q[t]$. I will describe some simple algorithms to evaluate them and to compute their L-functions systematically.

Nada Baessa

Modular Forms and Representations: A Local Perspective

Abstract: Modular forms are classically defined as functions on the upper half-plane which satisfy some holomorphicity conditions and transform nicely with respect to the action of $SL_2(Z)$ on the upper half-plane. In this talk we will discuss how to instead view modular forms from an adelic and representation-theoretic perspective, with the aim of computing modular forms with prescribed local information. We will also discuss some computational aspects, using cohomology and describing how to modify the modular symbols algorithm for our purposes.

Lee Berry

Effective Chabauty-Kim for hyperelliptic curves

Abstract: The Chabauty-Coleman method is a powerful tool for the explicit computation of rational points on higher-genus curves. However, it is limited to curves whose Jacobians have Mordell–Weil rank less than the genus of the curve. To extend its applicability, Kim introduced a significant generalisation of the method - now known as the Chabauty-Kim method - which has led to effective results for a variety of new examples. In this talk, we will give a brief overview of the Chabauty-Kim method and discuss recent developments in its effective application to rational points on hyperelliptic curves.

Bijay Bhatta

Zilber–Pink Conjecture for Simple PEL Type Assuming LGO

Abstract: This talk focuses on problems of unlikely intersections in Shimura varieties of PEL type, and on the Pila–Zannier strategy for addressing them. In particular, we will discuss the arithmetic component of this strategy, namely the parameter height bound, in the context of simple Shimura varieties of PEL types III and IV. Our approach assumes the Large Galois Orbit (LGO) conjecture.

Ned Carmichael

Non-vanishing of Poincaré Series on Average

Abstract: The sequence of Poincaré series (for a given weight, level and character) span the corresponding space of cusp forms, a useful fact which has many applications. Despite this, there are many open questions surrounding the Poincaré series. Perhaps the most basic of these asks: when do they vanish identically? In this talk, we will discuss some new results (joint with Noam Kimmel) addressing this problem.

Mark Chambers

Congruences, L-Values, and Half-Integral Weight Modular Forms

Abstract: Congruences show up in both sides of the Bloch-Kato conjecture - both in terms of L-Values, as well as nontrivial elements in Selmer Groups. I'll discuss a few of these examples, and talk about a refinement of one example in terms of congruences of Theta Lifts of modular forms.

Yan Yau Cheng

A Trace-Path Integral formula over function fields

Abstract: In this talk I will discuss an arithmetic analogue of this phenomena for function fields, where the phase space is replaced with the ℓ-torsion points of the Jacobian of a curve over a finite field, the path integral is replaced with a sum over the points of $J[\ell]$, and the monodromy is instead replaced with the Frobenius action. Time permitting, I will also give a brief outline of the proof of this arithmetic path integral-trace formula.

William Coram

Formalising Fujisaki's lemma

Abstract: Fujisaki's lemma is a classical result about the cocompactness of the units of a finite dimensional division algebra, B, over a global field, F, inside the idele-norm 1 elements of B tensored with the ideles. It implies finiteness of class numbers and the units theorem, and in my research, is important in showing spaces of quaternionic modular forms are finite dimensional.

As part of Kevin Buzzard's FLT project, I have been formalising this result in the Lean programming language. In this talk I will discuss the lemma, overview what Lean is, and point out difficulties I faced when formalising the result.

Madhuparna Das

A central limit theorem for partitions involving generalised divisor function

Abstract: We define an f-restricted partition $p_f(n,k)$ of fixed length k given by the bivariate generating series

$$Q_f(z,u) := 1 + \sum_{n=1}^{\infty}\sum_{k=1}^{\infty} p_f(n,k)u^k z^n = \prod_{k=1}^{\infty}(1+uz^k)^{\Delta_f(k)},$$

where $\Delta_f(n) = f(n+1) - f(n)$. We give an overview of the proof of a central limit theorem for the number of summands in such partitions when $f(n) = \sigma_r(n)$ denotes the generalised divisor function, defined as $\sigma_r(n) = \sum_{d|n} d^r$ for integer $r \geq 2$. This can be considered as a generalisation of the work of Lipnik, Madritsch, and Tichy, who previously studied this problem for $f(n) = \lfloor n^\alpha \rfloor$ with $0 < \alpha < 1$. A key element of our proof relies on the analytic behaviour of the Dirichlet series

$$\sum_{n=1}^{\infty} \frac{\sigma_r(n+1)}{n^s},$$

for $\mathrm{Re}(s) > 1$. We study this problem employing the identity involving the Ramanujan sum. Furthermore, we analyse the Euler product arising from the above Dirichlet series by adopting the argument of Alkan, Ledoan and Zaharescu.

Giovanna De Lauri

P-neighbouring graphs of ternary quadratic lattices and Orthogonal modular forms

Abstract: We investigate the local structure of ternary quadratic lattices L of half-discriminant an odd prime squared. A theorem on even lattices will be presented and we will explore a result for odd lattices with an example, showing transformations that do not increase class numbers.

The theory of isometry classes and genus of L will also be introduced, leading to the notion of p-neighbours and their directed graphs. In particular, we will focus on the Hecke-equivariant isomorphism between the spaces of orthogonal modular forms of level $O(\hat{L})$ and classical modular forms.

(Joint work with Dan Fretwell)

Vincenzo Di Bartolo

Developing Augmented Iwasawa Theory

Abstract: Iwasawa algebras are well studied mathematical gadgets in Number Theory allowing us to understand towers of field extensions. The augmented Iwasawa algebras are referred to locally profinite groups extending the usual notion for profinite groups. We are going to explore properties of these algebras as well as relate them to Number Theory.

Yiannis Fam

An exceptional L-packet in small residue characteristic.

Abstract: In 1876, Klein famously determined the finite subgroups of $SO_3(C)$ - they are cyclic, dihedral or the symmetry group of a platonic solid. When k is a non-archimedean local field, one is interested in the representations of the Weil-Deligne group of k. For inertially discrete representations, these correspond to finite Galois extensions of k with an embedding of the Galois group into a prescribed complex reductive group. In small residue characteristic, these Galois extensions of k can be more exotic, as we shall see for the group $SO_3(C)$. In this talk I will describe similarly exotic behaviour in small residue characteristic for the exceptional group G_2.

Lucie Gatzmaga

Geometric Hilbert Modular Forms and Serre's Weight Conjecture for Dihedral Representations

Abstract: We will briefly introduce geometric Hilbert modular forms in prime characteristic and a Serre weight conjecture due to Diamond and Sasaki, which predicts the weights of Hilbert modular forms giving rise to modular Galois representations. We then apply this theory to dihedral representations to determine for which weights these representations are modular and explain a method to lift our modularity results to characteristic zero by considering Hecke characters and modifying their ramification behaviour.

Alejandro José Giangreco Maidana

Totally real algebraic integers and cyclicity of abelian varieties over finite fields

Abstract: In this talk, I would like to raise some issues concerning totally real (and totally positive) algebraic integers and how this relates to the cyclicity of the group of rational points of abelian varieties defined over finite fields. More precisely, in recent work we obtained that maximal abelian varieties (with a maximal number of rational points, in a certain sense) are cyclic except for some primes that depend on the minimal polynomial of the maximal (in a certain sense) totally positive algebraic integers. In more recent work, we studied the existence of finite fields such that every abelian variety defined over that field has a cyclic group of rational points. This problem is related to the existence of totally real algebraic integers with minimal house.

Alvaro Gonzalez Hernandez

Crazy for three: Quotients of abelian surfaces by a group of order 3 in characteristic 3

Abstract: Many things have changed since I gave the talk in Y-RANT 2023: "Genus 2 curves in characteristic 2 via Kummer surfaces". The most notable one is that, after two years, I have finally moved on from characteristic 2 to characteristic 3.

Alexandros Groutides

Integrality of $GL(2) \times GL(2)$ Rankin-Selberg integrals for newforms

Abstract: Given newforms f_1 and f_2 of even integral weights, we can associate to them GL(2) automorphic representations π_{f_1} and π_{f_2}. We will introduce a natural local notion of general $(\pi_{f_1} \times \pi_{f_2})$-*integral* data at which the global Rankin-Selberg integral can be evaluated at. Using a reinterpretation of the local Rankin-Selberg integrals, together with works of E.Assing and A.Saha on values of p-adic Whittaker newforms, we obtain an *arithmetic integral* variant for $\pi_{f_1} \times \pi_{f_2}$, of a celebrated

Joseph Harrison

Linear relations in irrational powers

Abstract: Consider the set of positive integers raised to a fixed irrational exponent. The number of distinct sums that can be formed from adding two elements of this set is asymptotically as large as possible. This can be proved by showing that a certain Diophantine equation has very few solutions besides some obvious ones, and this is established using o-minimal point counting and functional transcendence. This talk can be regarded as an introduction to some powerful methods that have found applications in Diophantine geometry, in particular to so-called "unlikely intersections" problems.

Jiazhi He

Counting wild extensions over gloabal function fields

Abstract: In 2004, Malle proposed a conjecture on the asymptotics for the counting function for extensions over number fields with fixed Galois group and bounded norm of the discriminant. In a recent paper by Loughran and Santens, they applied Peyre's formalism for the leading constant in Manin's conjecture to obtain a prediction for the leading constant in Malle's conjecture using algebraic stacks. In this talk, we present our result on counting abelian extensions over global function fields. We will state the leading constant explicitly and compare our result with the prediction made by Loughran and Santens.

Mark Heavey

Picard groups of affinoid spaces

Abstract: The Picard group of a ringed space, including rigid analytic spaces, is the group of invertible sheafs on the space, with tensor multiplication. They arise often in anabelian geometry due to connections with the étale fundamental group, but can arise elsewhere in geometry and they can be researched independently of any particular application.

In general, calculating these groups is difficult, and rigid spaces are no different. Nonetheless, we can make progress on "bounding" their structure in the case of affinoid spaces. In this talk, I will discuss some progress in this area in special cases where the space is assumed to be smooth and integral, and the ground field is "nice" enough.

Hsuan-Hsien Lee

The determinant line bundle on the B_{dR}^{+} affine Grassmannian

Abstract: In de Rham geometric Langlands for a smooth projective curve X over the complex numbers, one way Langlands duality appears is through the Feigin–Frenkel isomorphism. A key role is played by the determinant line bundle on the affine Grassmannian. In this paper, we construct the analogous line bundle in the setting of geometrization of local Langlands of Fargues–Scholze. As a consequence, we construct a central extension of the B_{dR} loop group.

Xiang Li

S-integral Points on the Thrice-punctured Line over Cyclotomic Fields

Abstract: In this talk, I will first introduce the Chabauty-Kim methods, and compare the Galois/motivic version and Lie group/Lie algebra version. Then a description of the Galois action on the global Selmer scheme in some cases will be given. Next, the methods will be applied on S-integral points on P1 minus three points on cyclotomic fields. I will mainly focus on how to produce some points in prior and mention some results on the Galois cohomology over cyclotomic fileds. If time permits, I will shortly introduce multivariate Hensel's lemma and its applications on the computation of our example.

Haoran Liang

Local geometry of the eigencurve

Abstract: The eigencurve is a rigid analytic space that parametrizes p-adic families of Hecke eigensystems. Since its introduction by Coleman and Mazur, the eigencurve (and its variants) has been the focus of significant interest over the past two decades. In this talk, I will present the seminal work of Bellaïche—Dimitrov on the local geometry of the eigencurve at classical weight one points. If time permits, I will also discuss some recent developments and their connections to the theory of p-adic L-functions. This talk is based on a first-year LSGNT mini-project jointly with Lucie Gatzmaga under the supervision of Dr. George Boxer.

Yufan Liu

Varieties with prescribed finite unramified Brauer groups and subgroups precisely obstructing the Hasse principle

Abstract: On varieties defined over number fields, we consider obstructions to the Hasse principle given by subgroups of their Brauer groups.

Given an arbitrary pair of non-zero finite abelian groups $B_0 \subset B$, we prove the existence of a variety X such that its unramified Brauer group is isomorphic to B and moreover B_0 is the smallest subgroup of B that obstructs the Hasse principle. The concerned varieties are normic bundles over the projective line.

Albert Lopez Bruch

Parameters of Hecke algebras for p-adic groups

Abstract: The category of smooth complex representations of a p-adic group admits a decomposition into full indecomposable subcategories known as Bernstein blocks. Under mild assumptions, and using the theory of types, one can associate a Hecke algebra to each block. The structure of this Hecke algebra encodes valuable information about the representations in the block.

David Chang Luo

On the Local Converse Theorem for Depth 1/N Supercuspidal Representations of GL(2N, F)

Abstract: In this talk, we use type theory to construct a family of depth 1/N supercuspidal representations of GL(2N, F) (F a non-archimedean local field) which we call middle supercuspidal representations. These supercuspidals may be viewed as a natural generalization of simple supercuspidal representations, i.e. those supercuspidals of minimal positive depth. Via explicit computations of twisted gamma factors, we show that middle supercuspidal representations may be uniquely determined through twisting by quasi-characters of F* and simple supercuspidal representations of GL(N, F). Finally, we state a conjecture which gives a refinement of the local converse theorem for p-adic general linear groups.

Thibaut Misme

Effective 2-descent on Jacobians of curves using Odd Theta Characteristics

Abstract: Computing the rational points of a curve often requires to bound the Mordell-Weil rank of the Jacobian of the curve. 2-descent is an explicit method designed to perform this. Unfortunately in order to succeed in practice, the method needs specific information related to the Galois module J[2] of the 2-torsion of the Jacobian J and its natural action. This is generally hard to compute for non-hyperelliptic curves. To circumvent this, Bruin, Poonen and Stoll designed techniques relating this latter to the Odd Theta Characteristics. When the genus of the curve is 3, they took advantage of the geometric interpretation of the Odd Theta Characteristics to compute the necessary data and successfully obtained the desired bound on the rank of the Jacobians of generic non-hyperelliptic curves of genus 3. It even led them to compute and certify the set of rational points of these curves.

Ignacio Muñoz Jiménez

Quaternionic big Heegner points over totally real fields

Abstract: In the same way that one can consider Heegner points attached to elliptic curves or weight-two modular forms, one may extend this construction to fit into a Hida family. These objects, first studied by Howard in 2007, are known as "big Heegner points" because, by specializing them, one recovers the classical Heegner points used by Kolyvagin to prove some instances of the BSD conjecture. In this short talk, I will sketch a work in progress aimed at extending these ideas to a general quaternionic setting over totally real fields, valid for both indefinite and totally definite quaternion algebras. In particular, I will focus on motivating the construction and exploring its applications to the study of special values of L-functions and their derivatives in p-adic families.

Giorgio Navone

Transcendental Brauer groups of cubic generalised Kummer surfaces

Abstract: The transcendental Brauer group of a variety is an interesting cohomological invariant that lacks a general strategy of approach. In this talk, we will present recent work computing the transcendental Brauer group for a family of K3 surfaces, constructed from a planar cubic curve in a similar fashion to Kummer surfaces. If time permits, we'll illustrate the difficulty in dealing with the Hasse principle for these varieties.

Martí Oller Riera

Arithmetic statistics of isogeny Selmer groups

Abstract: In their celebrated paper, Bhargava and Shankar proved that the average rank of elliptic curves was bounded by determining the average size of their 2-Selmer groups. Later, this result was generalised for n-Selmer groups of other families of curves, implicitly or explicitly using the framework of Vinberg theory. Using this framework, in this talk we introduce a new representation that allows us to obtain new statistical information about the average size of certain isogeny Selmer groups, where the isogeny is not multiplication by n.

Martín Ortiz

Torsion vanishing for de Rham cohomology of Shimura varieties

Abstract: Inspired by the results on the torsion vanishing of generic etale cohomology of Shimura varieties by Caraiani-Scholze and Hamann-Lee, we study mod p de Rham cohomology of Shimura varieties with coefficients. We take as coefficients some automorphic vector bundles with connection labelled by p-restricted weights, in analogy with the Serre weights appearing in the etale cohomology. In this setting we prove generic concentration for the Picard modular surface, corresponding to G=GL3, by proving a generalized mod p BGG decomposition.

Sudip Pandit

Explicit Mordell–Lang bound for curves in low rank

Abstract: In this talk, we will discuss a p-adic proof of Mordell–Lang for curves in low rank yielding an explicit bound. This is a joint work with Netan Dogra.

Naina Praveen

Duality Theorems

Abstract: This talk will introduce duality theorems in representation theory. We will first discuss the Schur-Weyl Duality, which connects the representation theory of the symmetric group with that of the general linear group. Following this, we will briefly discuss its generalisations before introducing Howe Duality, which arises in the context of the local theta correspondence.

Ruth Raistrick

Galois Module Structure of Unit Groups of Rings of Integers

Abstract: Given a number field K of unit rank 1 and an extension L/K of degree 2 and unit rank 2 what is the Galois module structure of the lattice given by the unit group of L quotiented by its torsion? Precisely, given we know said lattice can only take two possible structures as a $\mathrm{Gal}(L/K)$-module, as L varies how often do we see each structure? The unexpected answer, given in this talk, reveals we should be asking a different question.

Isabel Rendell

Quadratic Chabauty for Atkin-Lehner quotients of modular curves via weakly holomorphic modular forms

Abstract: Quadratic Chabauty is a method to explicitly compute the rational points on certain modular curves of genus at least 2. The current algorithm, due to Balakrishnan-Dogra-Müller-Tuitman-Vonk, requires as an input an explicit plane model of the curve. The coefficients of such models grow rapidly with the genus of the curve and so are inefficient to compute with when the genus is at least 7. Therefore, we would like to replace this input with certain modular forms associated to the curve, hence creating a 'model-free' algorithm. In this talk I will provide an overview of an algorithm to compute the first stage of quadratic Chabauty on Atkin-Lehner quotients of modular curves using weakly holomorphic modular forms.

Corijn Rudrum

Non-abelian Selmer group Chabauty

Abstract: The Chabauty-Coleman method can be used to determine the set of rational points on certain curves. A common obstruction to applying the method in practice is that it requires computation of explicit generators of the Mordell-Weil group of the Jacobian. The Selmer group Chabauty method described by Stoll in 2017 can be used to circumvent this problem in certain cases. In this talk, I will give a brief overview of Stoll's method and discuss work in progress on a "non-abelian" version of this method inspired by Kim's generalisation of the Chabauty-Coleman method.

Jakab Schrettner

Reduction types of curves in p-adic families

Abstract: Many invariants of curves over p-adic fields are computed from the mod p reduction of these curves. These invariants should vary continuously in p-adic families, which in this case means they are locally constant. For example, it is a consequence of Tate's algorithm that for an elliptic curve $y^2 = x^3 + ax + b$ over Z_p, the reduction type, Tamagawa number and conductor all depend only on the classes of a and b mod p^N for some suitable N. In this talk I will explain this and similar results for general smooth projective curves.

Asuka Shiga

Infinitely many pairs of non-isomorphic elliptic curves sharing the same BSD invariants

Abstract: The BSD conjecture for abelian varieties predicts that the leading coefficient in the expansion of the L-function at $s = 1$ can be expressed in terms of BSD invariants (Mordell–Weil group, regulator, real period, Tamagawa numbers, and the Tate–Shafarevich group). When all BSD invariants coincide, this condition imposes strong constraints on abelian varieties; however, Jamie Bell constructed an example of a non-isomorphic pair of 22-dimensional abelian varieties for which the BSD invariants (excluding the real period) and the Selmer groups and Tate modules coincide (over any number field). In this talk, I will discuss my results on infinite families of pairs of non-isomorphic elliptic curves that share BSD invariants and Kodaira symbols. Controlling the Tate–Shafarevich groups of two elliptic curves by density theorem for twist of Selmer groups is a key point.

Calle Sönne

Stratifications on moduli spaces of abelian varieties

Abstract: A stratification is a certain way of decomposing a space into separate pieces. For moduli spaces, this can be thought of as dividing the underlying objects into various classes in a way which is also meaningful geometrically. A simple example of this can be obtained by dividing elliptic curves (in characteristic p) into "ordinary" or "supersingular" ones. In this talk, we will introduce various ways of generalizing this stratification to moduli spaces of abelian varieties in characteristic p, and then hint at how these stratifications also play an important role in the theory of (mod p) automorphic forms.

Sara Varljen

Constructing a fundamental domain for Bianchi groups

Abstract: Bianchi groups are groups of the form $\mathrm{PSL2}(\mathcal{O}_k)$, where $\mathcal{O}_k$ is the ring of integers of an imaginary quadratic field k. My aim is to present a way of constructing a fundamental domain for the action of Bianchi groups on the hyperbolic 3-space. I will briefly recall the classical case of $\mathrm{PSL2}(\mathbb{Z})$ acting on the hyperbolic plane, which is in some ways similar to the Bianchi setting. By the end, we should see some nice 3D pictures I have been working on.

Jordi Vilà-Casadevall

The Igusa Zeta Function of an Ideal in a Polynomial Ring

Abstract: The Igusa zeta function of a polynomial f with integer coefficients is a meromorphic function defined using p-adic integration, and it is closely related to the problem of counting roots of f modulo prime powers. Jan Denef gave an explicit formula for this zeta function when f has a resolution of singularities with good reduction and, together with Diane Meuser, established a functional equation when f is homogeneous. In this talk I will present a generalization of these results for the Igusa zeta function associated to an ideal in a polynomial ring.

Antao Yang

Continued fractions in the field of p-adic numbers.

Abstract: Continued fractions have played a central role in number theory and Diophantine approximation over the real numbers, yet their analogues in the p-adic setting remain far less understood. This talk begins with a brief review of classical continued fractions, setting the stage for the development of p-adic continued fractions and the pioneering algorithms proposed by mathematicians such as Ruban, and Browkin. We will survey the progress made in understanding convergence, periodicity, and approximation properties in the p-adic field, highlighting both successes and longstanding open problems that have resisted resolution for decades. The talk aims to provide a coherent overview of the topic, sparking interest in unresolved questions and new approaches in the study of p-adic continued fractions.

Hsin-Yi Yang

CM liftability of abelian varieties

Abstract: We study when an abelian variety over a finite field, which has sufficiently many complex multiplications (smCM) by a CM field $L/\mathbb{Q}$, lifts to an abelian variety in characteristic zero with complex multiplication (CM) by L, i.e., when it admits a CM lifting.

Yicheng Yang

Integral weight one forms

Abstract: I will introduce the Katz-Mazur model for the modular curve and use integral Hecke operator to investigate the properties of weight one forms at level $\Gamma_0(p)$ and $\Gamma_1(p)$.

Tianchen Zhao

The extendability of the automorphisms of K3 surfaces

Abstract: Let K be a complete discretely valued field of characteristic 0 with perfect residue field. Let X be a K3 surface over K with good reduction and G be a finite group acting on X. In this report, we deduce an l-adic criterion on whether the G-action extends to some smooth proper model of $\mathcal{X}$. In particular, this is true if the G-action is symplectic and the residue characteristic does not divide the order of G. This criterion can be applied to show that singular K3 surfaces have potential good reduction modulo odd primes. Also, it allows us to relate the good reduction of the Enriques surfaces with that of their K3 covers.

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