Curves and L-functions
List of Participants

Suman Ahmed
Mohali

I work in Iwasawa theory of elliptic curves. So far I have been interested in comparing the lambda invariants, p-Selmer rank, global and local root numbers of two rational elliptic curves with good reduction at an odd prime p and equivalent mod p Galois representations.

Ambreen Ahmed
Lahore

Mohamed Alaaeldin
Cairo

My area of interest is the arithmetic of elliptic curves defined over number fields. I have been working on exploring the rank of elliptic curves in families of quadratic twists. More precisely, I am concerned about the construction of families of tuples of elliptic curves for which simultaneous quadratic twists are of high rank.

Brandon Alberts
University of Wisconsin-Madison

I am a fifth year graduate student interested in algebraic number theory and arithmetic statistics. Currently I am studying nonabelian Cohen-Lenstra heuristics, or more specifically the distribution of unramified nonabelian extensions over quadratic fields.

Samuele Anni
Heidelberg

The main focus of my research is the study of Galois representations and automorphic forms. In particular, I am interested in the interplay between arithmetic geometry and representation theory, also considering the related algorithmic aspects. Currently, I am studying congruences between modular forms and questions regarding the inverse Galois problem for representations attached to torsion subgroups of abelian varieties.

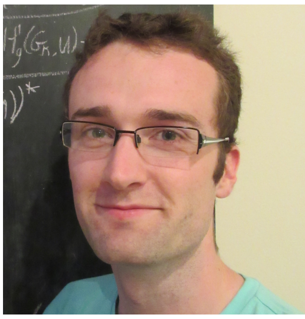
Jennifer Balakrishnan
Boston

My research is motivated by various aspects of the classical and p-adic Birch and Swinnerton-Dyer conjectures, as well as the problem of algorithmically finding rational points on curves. I am particularly interested in explicit methods involving Coleman integration and p-adic heights.

Gregorio Baldi
UCL London

I am mainly interested in Arithmetic Geometry over number fields, in particular Galois representations attached to abelian varieties and K3 surfaces. In both cases their moduli spaces have the structure of a Shimura variety, whose geometry affects the arithmetic. This led me also to more general questions about Shimura varieties.

Alexander Best
Boston



Alexander Betts
KCL

I am primarily interested in applications of the techniques of Minhyong Kim's unipotent motivic anabelian geometry to Diophantine and arithmetic problems, most recently including local and global heights on abelian varieties and curves. Outside this rather general area, I am interested in explicit problems in number theory, mainly focusing on Tamagawa numbers of abelian varieties and their behaviour under changing the variety or base field.

Francesca Bianchi
Oxford

My work mostly concerns the arithmetic of elliptic curves. In particular, my focus has been on analytic p-adic L-functions and their mu-invariants and the behaviour of p-adic heights in families. I am also interested in Coleman integration on hyperelliptic curves. I enjoy both the theoretical and computational aspects of the area.

Matthew Bisatt
King's College London

I am primarily interested in consequences of the Birch–Swinnerton-Dyer conjecture; in particular studying root numbers of abelian varieties and their twists by Artin represesentations. Twisting can conjecturally force high orders of vanishing of the corresponding L-functions so I am also interested in how compatible this theory is with current conjectures.

Jorge Cely

I work on motivic integration (Cluckers - Loeser theory) and applications to representation theory of p-adic groups (e.g. the fundamental lemma). I also have interest in applied model theory.

Stephanie Chan
UCL London

I am a PhD student interested in the arithmetic of elliptic curves. My current research concerns the arithmetic statistics of certain families, in particular the congruent number curves, via methods involving a combination of algebraic and analytic techniques. I am also interested in the computation of rank distributions.

Nirvana Coppola
Pisa

I am a MSc student and I am currently studying modular forms and their properties. In particular, I am working on a theorem by Deligne and Serre, whose aim is to attach a certain Galois representation to a modular form of weight 1, and on the converse problem to associate a modular form to a given Galois representation, that leads to Serre's Conjecture.

Daniele Cozzo

Marco D'addezio
Berlin

Pranabesh Das
New Delhi

I am interested in the explicit solutions of exponential Diophantine equations over integers and more general totally real number fields. I have used modular method, linear forms in logarithms, Chabauty method during my PhD to obtain integral solutions of a class of super elliptic curves. I am also interested in Mahler's method in transcendence and explicit ABC conjecture.

Julie Desjardins
Grenoble

I work on diophantine and analytic number theory questions. I am particularly interested in the density of rational points on algebraic varieties such as elliptic surfaces and del Pezzo surfaces of degree 1. I use various methods, including the study of the variation of the root number, and I'm interested in problems such as the Squarefree conjecture, Chowla's conjecture and the parity conjecture. I am also interested in K3 surfaces and 3-dimensional Fano varieties.

Netan Dogra
ICL London

I am interested in rational points on algebraic varieties. My main focus has been on determining the set of rational points on curves of genus bigger than 1, using a method due to Minhyong Kim which involves a combination of fundamental groups and p-adic Hodge theory. I am also interested in various related questions concerning the arithmetic information contained in the Galois action on fundamental groups of curves.

Tim Dokchitser
University of Bristol

Most of my work concerns arithmetic of curves, their L-functions and Galois representations. I am currently very interested in various invariants of higher genus curves that are relevant to the Birch-Swinnerton-Dyer conjecture: regular and semistable models, conductors, root numbers, regular differentials and so on. I do quite a lot of algorithmic number theory, especially in Magma. I also have a recent pet project on names of finite groups, groupnames.org.

Vladimir Dokchitser
King's College London

The main focus of my research is the arithmetic of elliptic curves and abelian varieties, especially the various phenomena that are predicted by the BSD and other L-value conjectures. In particular, I'm interested in the parity conjecture and root numbers, Galois representations and various local invariants. Recently I've been working a fair bit on hyperelliptic curves and their Jacobians over local fields (regular models, Galois representations, conductors, Tamagawa numbers...).

Thomas Fisher
Cambridge

I work on the arithmetic of elliptic curves, specifically descent calculations. I have contributed several of the programs in Magma for carrying out higher descents. I am also interested in applications of invariant theory to arithmetic geometry, for example in studying congruences of elliptic curves and visibility of Tate-Shafarevich groups.

Stevan Gajovic
Oldenburg

Hui Gao
Helsinki

Jędrzej Garnek
Poznan

I'm a PhD student interested in arithmetic geometry and algebraic number theory. So far my research focused mostly on p-torsion of elliptic curves over p-adic fields. Recently I've been working also on bounds for the class number of division fields coming from abelian varieties.

Francesca Gatti
Barcelona

I'm a PhD student and I'm working on generalizations of the Elliptic-Stark conjecture. This conjecture, made by H. Darmon, A. Lauder and V. Rotger, relates the central value of a p-adic L-function attached to an elliptic curve (twisted by an Artin representation) to a regulator attached to points on the elliptic curve. More precisely, I'm studying a version of this conjecture in which the role of the elliptic curve is played by a cuspform of weight greater or equal than 2.

Neslihan Girgin
Bogazici Universityl

I am a PhD student and I have just started to work on Arithmetic of Function Fields over Finite Fields. My research is motivated by some results of Cohen, McNay and Chapman which are about an iterative construction of irreducible polynomials of 2-power degree over finite fields of odd order. I am trying to interpret these results on the extensions of function fields over finite fields. After that, I would like to understand finite fields elements of high order arising from modular curves. Also before, I was interested in Modular Forms, Modular Curves, Hecke Operators and Eichler-Shimura Relation for my master thesis.

Bayarmagnai Gombodorj
Ulaanbaatar

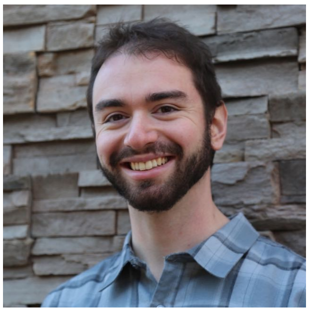
Nadav Gropper
Weizmann Institute of Science

My main research focus is the arithmetic of elliptic curves over number fields. I spent most of my time so far on the study of the Birch-Swinnerton-Dyer conjecture for elliptic curves with complex multiplication and the Tate-Shafarevich groups of such curves. I am also interested in Berkovich's theory of non-Archimedean analytic spaces.

Jeroen Hanselman
Ulm

I'm a Phd student, and I'm mostly interested in the arithmetic of curves of low genus. My research goal is to be able to explicitly glue curves of low genus along their n-torsion. This will allow us to explicitly construct higher genus curves with a specific endomorphism ring.

Sachi Hashimoto
Boston



Daniel Hast
University of Wisconsin-Madison

The main focus of my research is the non-abelian Chabauty-Kim method for studying rational points on higher genus curves. I am currently interested in several related problems in this area, including Selmer varieties for curves over number fields, generalizations to the bad reduction case, and the relation between Selmer varieties and unramified correspondences in the sense of Bogomolov-Tschinkel.

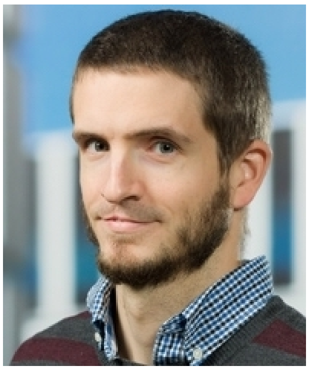
Richard Hatton
Nottingham

I am a PhD student who is interested in the arithmetic of elliptic curves. My current research involves looking at modular points on elliptic curves, specifically self-points, and seeing if I can use them to bound certain Selmer groups with methods similar to Kolyvagin's use of creating derivative classes coming from Heegner points.

Wei Ho
Michigan

I'm interested in a wide range of questions in arithmetic geometry, but most of my work has been related to using algebraic geometry, representation theory, and analytic number theory to attack arithmetic statistics problems. For example, I've spent a lot of time thinking about explicit constructions of moduli spaces for curves (elliptic and otherwise) and other (usually low-dimensional) varieties.

David Holmes
Leiden



I spend most of my time thinking about the geometry and arithmetic of families of nodal curves and of their jacobians. My favourite topics include existence and properties of Néron models, behaviour of heights in families (especially height-jumping), orders of torsion points, cycles on moduli stacks (especially the double ramification cycle), moduli of stable maps, and log geometry.

Elena Ikonnikova
StPetersburg

I am now a PhD student at Saint Petersburg State University, and the area of my research is algebraic number theory and arithmetic geometry. I am currently studying arithmetic of higher dimensional formal modules, including norm pairings. I also find the topic of elliptic curves, and especially their cryptographic applications, very exciting.

Nikoleta Kalaydzhieva
UCL London

I am currently a first year PhD student at UCL under the supervision of Andrew Granville. Currently, I am working on continued fractions over $\mathbb{Q}[x]$ and their connection to hyperelliptic curves and quadratic forms.

Mohammed Kamel
Cairo

I work on certain arithmetic questions related to algebraic curves. More precisely, I am interested in studying different progressions on elliptic curves and the rank of elliptic curves with prescribed torsion groups. Moreover, I have spent some time studying Diophantine m-tuples and their links with elliptic curves.

Matija Kazalicki
Zagreb

In general, I study various problems related to the arithmetic of elliptic curves and modular forms. Recently, I've been working on the construction of rational Diophantine sextuples, on counting Diophantine quadruples over finite fields, and on the connection between the rank of an elliptic curve of prime conductor p, and mod p zeros of the modular form attached to this elliptic curve by the modularity theorem.

Kiran Kedlaya
UCSD

Pinar Kiliçer
Oldenburg

Christian Klevdal
Utah

Daniel Kohen
Buenos Aires

My main research interest is the study of rational elliptic curves. During my PhD thesis I studied generalizations of Heegner point constructions. Now I am trying to understand some topics regarding p-adic L-series and Iwasawa theory.

Roman Kohls
Ulm

I am a PhD student interested in algebraic number theory and L-functions. Currently I am studying L-functions associated to curves and their local constants, such as conductors and root numbers. In particular, I am very interested in the explicit computation of local constants for a given curve.

Zunaira Kosar
Lahore

Sabrina Kunzweiler
Ulm

I have just started doing research in Arithmetic Geometry. Currently, my focus is on elliptic curves over local fields. Motivated by Ogg's formula, I study the behaviour of certain invariants of a curve under ramified extensions of its base field. In particular, I am looking at fields of small residue characteristic (p=2,3).

Emmanuel Lecouturier
Paris 7

Junxian Li

Wanlin Li
University of Wisconsin-Madison

I'm interested in various topics in arithmetic geometry, like ranks of elliptic curves over function fields, maps between hyperelliptic curves, Jacobian varieties and Galois representations.

Xiaobin Li
Swjtu

My current research focus is on computation of higher genus orbifold Gromov-Witten invariants and its possible arithmetic property such as modularity(quasi-modularity). Furthmore, I will investigate its possible relation to L-function.

Guido Lido
Rome

Qing Liu
Bordeaux

My main research interests are arithmetic properties of algebraic curves and abelian varieties, especially those related to their degenerations (stable reduction of curves, Néron models of abelian varieties etc).

Davide Lombardo
Università di Pisa

My research revolves around the arithmetic of abelian varieties over number fields. I am especially interested in the Galois representations arising from the natural Galois action on the torsion points of abelian varieties, and in the interrelations between the arithmetic of curves of low genus and of their corresponding Jacobians. The questions I'm interested in often have strong computational aspects, concerning for example the effective determination of properties of concrete Jacobians, or the algorithmic resolution of diophantine equations.

Céline Maistret
University of Bristol

I'm currently interested in the parity of ranks of abelian surfaces as well as the arithmetic of hyperelliptic curves and their Jacobians. An application of the latter that I particularly care about is the computation of several invariants involved in the Birch-Swinnerton-Dyer conjecture.

Mariagiulia De Maria
University of Luxembourg,
Université de Lille 1

The main topic of my research is modularity for weight one modular forms for modulo prime powers rings and Hilbert modular forms of non-parallel weight one over finite fields. In particular, I am interested in the properties of the Galois representations associated to these forms. I am currently working on q-expansions of Hilbert modular forms of non-parallel weight 1.

Lukas Melninkas
Strasbourg

My current research concerns various problems regarding Weil–Deligne representations associated to abelian varieties defined over local fields, most notably the computation of the root number. I work in both the classical l-adic setting and the p-adic one, the latter requiring tools from p-adic Hodge theory.

Hartmut Monien
Bonn

Adam Morgan
KCL London

My main research interests are centred around the Birch–Swinnerton-Dyer conjecture and its consequences, with a particular focus on the parity conjecture. Usually, I work with abelian varieties of dimension greater than 1 over number fields and try to understand how phenomena not exhibited for elliptic curves (such as the possibility that the Shafarevich–Tate group may not have square order) influence the behaviour of ranks, Selmer groups and other BSD-related invariants. I'm also interested in the behaviour of ranks and Selmer groups in families, and the various statistical questions one can ask in such situations.

Jan Steffen Muller
Oldenburg

I am mainly interested in explicit methods in arithmetic geometry. Most of my research involves using archimedean and p-adic height functions to study rational points on curves and abelian varieties.

Shoichi Nakajima
Gakushuin University, Tokyo

Formerly I worked on Galois coverings of algebraic curves over fields of positive characteristic, and on class numbers of cyclotomic fields of prime power order. Recently I want to go into the arithmetic of curves over number fields, and I regard this conference a very good occasion for learning the subject. I am especially interested in BSD conjecture for CM elliptic curves (or Jacobians).

Sarah Nakato
Graz

My research area is algebraic number theory, focusing on non-unique factorizations in the ring of integer-valued polynomials over integral domains. My recent work was on sets of lengths in the ring of integer-valued polynomials over the ring of integers of an algebraic number field, and I'm currently investigating factorizations in the ring of integer-valued polynomials over Krull domains.

Bartosz Naskręcki
University of Bristol,
Adam Mickiewicz University

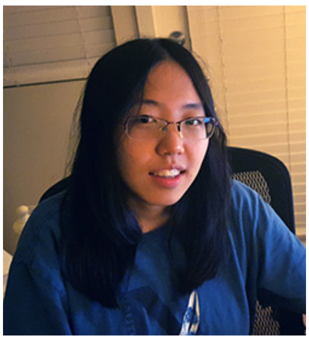
I am interested in arithmetic aspects of algebraic geometry. In particular, families of elliptic curves, elliptic surfaces and Galois representations attached to etale cohomology groups and problems related to modularity and Generalised Fermat Conjecture. Currently I also study hypergeometric motives and explicit realisations of those. Typically algorithmic number theory involves a lot of computations which I usually perform in Magma.

Carlo Pagano
Leiden

I am interested in Arithmetic statistic, Unit equations, Arithmetic of local fields. I worked on finding the joint distribution of 4-ranks of ray class groups and class groups and a Cohen-Lenstra heuristics for ray class groups (with E.Sofos), on establishing bounds for unit equations in positive characteristic depending only on the rank of the group (with P.Koymans), and on determining how a new combinatorial invariant of local fields distributes over the space of Eisenstein polynomials of given degree and relates to ramification invariants.

Jennifer Park
Michigan

Soohyun Park
MIT



I am interested in arithmetic aspects of certain problems in algebraic geometry. One problem that I'm thinking about is related to decomposability of Jacobians over C and number fields. While one major application is to moduli problems in algebraic geometry, there are also some interesting connections to ranks of elliptic curves. In particular, I would like to further explore related work on understanding distributions of ranks of elliptic curves. Some other topics that I like to think about in this general direction are those involving rational points on higher dimensional varieties such as the density of rational points or rational curves on algebraic varieties.

Cihan Pehlivan
Ankara

My research area is number theory, more specifically, analytic number theory. In particular, I am interested in Artin's primitive root conjecture and its generalizations, arithmetic statistics, sieves methods, analytic problems for elliptic curves.

Gal Porat
Jerusalem

I am an M.Sc student, interested in Algebraic Number Theory and Arithmetic Geometry. I am currently working on questions related to Local Class Field theory, in particular to Phi-Gamma modules obtained using Lubin-Tate theory, due to Kisin and Ren. In the near future I am planning to study possible applications to the Iwasawa Theory of elliptic curves.

Gustavo Daniel Rama Morales
Montevideo

David Roberts
Minnesota

My research centers around computational investigations in situations where Galois theory and ramification play important roles. Particular topics include tabulating number fields, tabulating local fields, constructing extreme number fields, Belyi covers, Hurwitz covers, hypergeometric motives, and connections with modular forms.

Óscar Rivero Salgado
Barcelona

I am a PhD student working on several aspects of arithmetic geometry, mainly those related with Euler systems and p-adic L-functions. On the one hand, I am concerned about the relations between the theory of Beilinson-Flach elements and the Elliptic Stark conjecture. On the other, I am starting to deal with some aspects of the theory of Stark-Heegner points and Darmon-Dasgupta units.

Soumya Sankar
University of Wisconsin-Madison

My research interests revolve around the arithmetic of curves and abelian varieties. I am interested in questions about p-torsion in characteristic p and about asymptotics of p-ranks and a-numbers. I am also interested in questions about reduction of elliptic Q-curves and associated Galois representations.

Ciaran Schembri
Sheffield

Samuel Schiavone
Dartmouth

I am a PhD student interested in algebraic geometry and algebraic number theory. I am especially interested in the computational aspects of these areas, and often use SageMath or Magma to perform calculations as a part of my work. I am currently working on two projects: one on the computation of explicit equations for Belyi maps, and the other on classifying generalizations of quaternion algebras.

Jeroen Sijsling
Universität Ulm

The leading subject of my research is that of algebraic curves over number fields and their moduli. A current main theme is the explicit calculation of endomorphisms and decompositions of Jacobians. This helps in particular to find the modular form associated to a given curve of low genus. Another theme is that of reconstructing curves from their invariants, and more abstractly the question when the field of moduli is a field of definition. Roughly, this question is as follows: if a curve is isomorphic to all its conjugates over a given field, then does it allow a defining equation over that field? A lot is known on this question, yet strange and interesting phenomena continue to appear when studying it.

Raffael Singer

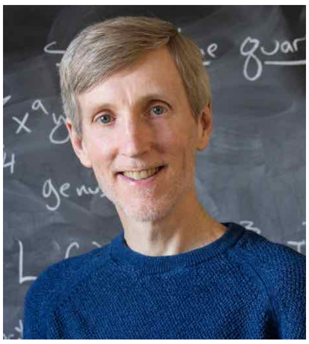
Hironori Shiga
Chiba university

Current focus of the research: (1) To construct new modular functions and modular forms based on the periods of the families of algebraic curves (including families of hyper-elliptic curves), K3 surfaces and Schwarz maps of hypergeometric differential equations. (2) Arithmetic applications of the above functions. Especially, arithmetic properties of the special values at CM points (including Hilbert's 12th problem). (3) Mirror properties coming from the above modular functions.

Michael Stoll
Universität Bayreuth

The focus of my research is on rational points: Given a "nice" (smooth, projective, geometrically integral) variety V defined over $\mathbb{Q}$, what can we say about its set $V(\mathbb{Q})$ of rational points and how can we determine it explicitly? I am mostly considering the case when V is a curve of higher genus. In this case, the set in question is finite and can be specified by listing the points. Natural questions are: (how) can we check that all points have been found?, or what can we say about the number of points? My work covers both theoretical and computational aspects.

Ersin Suer
Istanbul



Andrew Sutherland
MIT

My research focuses on computational aspects of number theory and arithmetic geometry. I am particularly interested in algorithms to explicitly compute zeta functions, L-functions, and Galois representations in ways that allow one to investigate questions related to modularity, BSD, the Sato-Tate conjecture, and other explicit aspects of the Langlands program.

Jack Thorne
Cambridge

I use Galois deformation theory to find provable instances of the conjectural Langlands correspondence between automorphic forms and Galois representations. Currently I am especially interested in the problem of modularity of elliptic curves over imaginary CM number fields (the case of a totally real number field now being relatively well understood).

Gonzalo Tornaría López
Montevideo

Nicholas George Triantafillou
MIT

My research is currently directed towards statistics of Selmer groups of (Jacobians of) curves in families. I also enjoy computational aspects of arithmetic geometry, especially algorithms (theoretical or practical) to determine sets of rational points or to compute zeta functions. I am especially fond of hyperelliptic and superelliptic curves.

Ling Sang Tse
Toronto

Raymond Van Bommel
Universiteit Leiden

My research interests are within algebraic geometry and arithmetic geometry in particular. In particular, I am very interested about computational aspects of arithmetic geometry. For my PhD, I have been working on numerical verification of the Birch and Swinnerton-Dyer conjecture for hyperelliptic curve of genus 2 and 3 over $\mathbb{Q}$.

John Voight
Dartmouth

In the spirit of the Langlands philosophy, I seek to make effective the link between modular forms and geometric objects, with particular attention to the setting of curves of higher genus as well as varieties of higher dimension (such as K3 surfaces). In particular, I like to design and implement algorithms to compute automorphic forms and then to match the resulting automorphic representations with their realizations in the cohomology of varieties over number fields.

Ariel Weiss
Sheffield

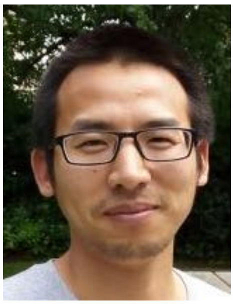
I am interested in the connections between automorphic representations and Galois representations. My research is focused on low weight Siegel modular forms and their associated Galois representations. In particular, for my PhD project, I am studying the images of the Galois representations attached to low weight Siegel modular forms. I'm also interested in the conjectural relationship between weight 2 Siegel modular forms and abelian surfaces.

Stefan Wewers
Ulm

Most of my past research has been on reduction and lifting of covers of curves over local fields. My main project at the moment is the development of a Sage package for computation with semistable and regular models of curves (including the mathematical background, of course). I am very interested in arithmetic applications of these techniques, to study L-functions and Galois representations, for instance. I have also done some work on the connection between Tate motives and diophantine equations, using the philosophy of Minhyong Kim.

Jeff Yelton

Di Zhang
University of Sheffield



I am a PhD student interested in algebraic number theory, Bianchi modular forms and L-functions. Motivated by results of Kohnen and Zagier for the Shintani lifting, my research focuses on the analogous theta lifting of Bianchi modular forms to Siegel modular forms.

Abstracts

Samuele Anni
The inverse Galois problem for symplectic groups

The inverse Galois problem is one of the greatest open problems in group theory and also one of the easiest to state: is every finite group a Galois group? My interest around this problem is connected to the realization of linear and symplectic groups over finite fields as Galois groups over Q and over number fields. In this talk, I will briefly describe "uniform realizations" using elliptic curves, genus 2 and 3 curves. After this introduction, I will show how to extend these results using Jacobians of higher genus (joint work with Vladimir Dokchitser). Here, Goldbach's conjecture will play a central role.

Jennifer Balakrishnan
Explicit Coleman integration for curves

I will describe an algorithm for explicit Coleman integration on curves, starting from the case of hyperelliptic curves. I will also present a selection of computed examples. This is joint work with Jan Tuitman.

Alexander Betts
Computing Tamagawa numbers of hyperelliptic curves

TBA.

Matthew Bisatt
Root Numbers of Abelian Varieties

The expected sign of the L-function of an abelian variety is known as the root number and this (conjecturally) determines the parity of the Mordell-Weil rank. In this talk, I will give explicit formulae to compute the root number and use my results to find a rational genus 2 hyperelliptic curve with a special property.

Julie Desjardins
Density of rational points on rational elliptic surfaces

For an algebraic variety over Q, we are interested in X(Q) the set of rational points. Is it non-empty ? Is it infinite ? Is it Zariski-dense ? We look at those questions in the case where X is a rational elliptic surface. This class of elliptic surfaces has the special property that the minimal model is either a conic bundle or a Del Pezzo surface.

Netan Dogra
Rational points on hyperelliptic curves via the Chabauty-Kim method

This talk will discuss some joint work with Jennifer Balakrishnan and Steffen Muller in which Kim's generalisation of Chabauty's method is used to determine the set of rational points on certain hyperelliptic curves.

Tim Dokchitser
Models of curves

I will explain an approach to constructing regular and semistable models of curves over DVRs. It is based on the ideas that are well-known for varieties over the complex numbers in toric and tropical geometry, but can be imported to curves over arithmetic schemes as well. This often allows to compute important invariants of the curve ñ conductor, semistable type, etale cohomology etc. in an elementary way.

Vladimir Dokchitser
Arithmetic of hyperelliptic curves over local fields

Let $C : y^2 = f(x)$ be a hyperelliptic curve over a local field K of odd residue characteristic. I will explain how several arithmetic invariants of the curve and its Jacobian, including its potential stable reduction, Galois representation and (in the semistable case) Tamagawa numbers, can be simply extracted from combinatorial data coming from the roots of f(x). This is joint work with Tim Dokchitser, Celine Maistret and Adam Morgan.

Tom Fisher
Visualizing elements of order 7 in the Tate-Shafarevich group of an elliptic curve

Mazur observed that elements of the Tate-Shafarevich group of one abelian variety (say E) can sometimes be explained by elements of the Mordell-Weil group of another abelian variety (say F). I will describe some examples I found where E is an elliptic curve and F is a genus 2 Jacobian.

Wei Ho
Odd degree number fields with odd class number

TBA.

David Holmes
Arakelov geometry of hyperelliptic curves

Arakelov geometry provides elegant machinery for working with canonical (Néron-Tate) heights on abelian varieties. We will begin with a gentle introduction to this theory, with particular emphasis on how it can be used to compute these heights on the jacobians of hyperelliptic curves. We will then explain how the theory of 'height jumping' (first noticed by R. Hain) puts rather strong constraints on how well a naive height can approximate the Néron-Tate height. If time allows we will discuss connections to existence of small points and the strong torsion conjecture.

Kiran Kedlaya
L-functions via deformations: from hyperelliptic curves to hypergeometric motives

The "deformation method" is an approach due to Alan Lauder for computing zeta functions of varieties over finite fields using the Frobenius structures on Picard–Fuchs equations (a/k/a Gauss–Manin connections). We first recall how this is done for hyperelliptic curves, as implemented in Magma. We next propose an analogous computation for hypergeometric motives and explain the advantages it has over other p-adic analytic methods.

Emmanuel Lecouturier
Higher Eisenstein elements in weight 2 and prime level

In his classical work, Mazur considers the Eisenstein ideal I of the Hecke algebra $\mathbb{T}$ acting on cusp forms of weight 2 and level $\Gamma_0(N)$ where N is prime. When p is an Eisenstein prime, *i.e.* p divides the numerator of $\frac{N-1}{12}$, denote by $\mathbf{T}$ the completion of $\mathbb{T}$ at the maximal ideal generated by I and p. This is a $\mathbf{Z}_p$-algebra of finite rank $g_p \geq 1$ as a $\mathbf{Z}_p$-module.
Mazur asked what can be said about g_p. Merel was the first to study g_p. Assume for simplicity that $p \geq 5$. Let $\log : (\mathbf{Z}/N\mathbf{Z})^\times \to \mathbf{F}_p$ be a surjective morphism. Then Merel proved that

$$g_p \geq 2$$

if and only if

$$\sum_{k=1}^{\frac{N-1}{2}} k \cdot \log(k) \equiv 0 \text{ (modulo p)}.$$

We prove that we have $g_p \geq 3$ if and only if

$$\sum_{k=1}^{\frac{N-1}{2}} k \cdot \log(k) \equiv \sum_{k=1}^{\frac{N-1}{2}} k \cdot \log(k)^2 \equiv 0 \text{ (modulo p)}.$$

We also give a more complicated criterion to know when $g_p \geq 4$. Moreover, we prove *higher Eichler formulas*. More precisely, let

$$H(X) = \sum_{k=0}^{\frac{N-1}{2}} \binom{\frac{N-1}{2}}{k}^2 \cdot X^k \in \mathbf{F}_N[X]$$

be the classical Hasse polynomial. It is well-known that the roots of H are simple and in $\mathbf{F}_{N^2}^\times$. Let L be this set of roots. We prove that

$$\sum_{\lambda \in L} \log(H'(\lambda)) \equiv 4 \cdot \sum_{k=1}^{\frac{N-1}{2}} k \cdot \log(k) \text{ (modulo p)}$$

and, if $g_p \geq 2$,

$$\sum_{\lambda \in L} \log(H'(\lambda))^2 \equiv 4 \cdot \sum_{k=1}^{\frac{N-1}{2}} k \cdot \log(k)^2 \text{ (modulo p)} .$$

Qing Liu
New points on algebraic curves (Joint work with Dino Lorenzini)

Let K be a field and let L/K be a finite extension. Let X/K be a scheme of finite type. A point of X(L) is said to be *new* if it does not belong to $\cup_F X(F)$, where F runs over all proper subfields $K \subseteq F \subset L$. Fix now a separable extension L/K of degree $d := [L : K]$. We investigate whether there exists a smooth proper geometrically connected curve of genus $g > 0$ with a new point in X(L). We show that if K is infinite with $\mathrm{char}(K) \neq 2$ and $g \geq \lfloor d/4 \rfloor$, then there exist infinitely many hyperelliptic curves X/K of genus g, pairwise non-isomorphic over $\overline{K}$, and with a new point in X(L). When $1 \leq d \leq 10$, we show that there exist infinitely many elliptic curves X/K with pairwise distinct j-invariants and with a new point in X(L).

Davide Lombardo
Computing twists of hyperelliptic curves

Two curves over a field K are said to be twists of each other if there exists an extension of K over which they become isomorphic. The twists of a given curve correspond to elements of a suitable cohomology group, and there is a general recipe to describe a twist in terms of the corresponding cohomology class. However, writing down explicit equations for a given twist can be challenging in practice: in this talk I will explain why hyperelliptic curves are particularly interesting in this context, and how to quickly compute models for the twists of any such curve. This is joint work with Elisa Lorenzo-GarcÌa.

Celine Maistret
Parity of ranks of abelian surfaces

Let K be a number field and A/K an abelian surface. By the Mordell-Weil theorem, the group of K-rational points on A is finitely generated and as for elliptic curves, its rank is predicted by the Birch and Swinnerton-Dyer conjecture. A basic consequence of this conjecture is the parity conjecture: the sign of the functional equation of the L-series determines the parity of the rank of A/K. Under suitable local constraints and finiteness of the Shafarevich-Tate group, we prove the parity conjecture for principally polarized abelian surfaces. We also prove analogous unconditional results for Selmer groups.

Adam Morgan
Parity of Selmer ranks in quadratic twist families

We study the parity of 2-Selmer ranks in the family of quadratic twists of a fixed principally polarised abelian variety over a number field. Specifically, we prove results about the proportion of twists having odd (resp. even) 2-Selmer rank. This generalises work of Klagsbrun-Mazur-Rubin for elliptic curves and Yu for Jacobians of hyperelliptic curves. Several differences in the statistics arise due to the possibility that the Shafarevich-Tate group (if finite) may have order twice a square.

Jan Steffen Mueller
Canonical heights on Jacobians of curves of genus two

To find explicit generators for the Mordell-Weil group of an abelian variety over a global field, and to compute its regulator, one needs algorithms to compute canonical heights of rational points and to enumerate all rational points of bounded canonical height. In my talk, I will discuss how this can be done efficiently for Jacobians of curves of genus 2. This is joint work with Michael Stoll.

Bartosz Naskrecki
Hypergeometric motives of low degrees and their connection to elliptic and hyperelliptic curves

In this talk we will discuss the construction of hypergeometric motives as Chow motives in explicitly given algebraic varieties. The class of hypergeometric motives corresponds to Picard-Fuchs equations of hypergeometric type and forms a rich family of pure motives with nice L-functions. Following recent work of Beukers-Cohen-Mellit we will show how to realise certain hypergeometric motives of weights 0 and 2 as submotives in elliptic and hyperelliptic fibrations. An application of this work is a computation of minimal polynomials of hypergeometric series with finite monodromy groups and proof of identities between certain hypergeometric finite sums, which mimic well-known identities for classical hypergeometric series.

Jennifer Park
A heuristic for boundedness of elliptic curves

I will discuss a heuristic that predicts that the ranks of all but finitely many elliptic curves defined over Q are bounded above by 21. This is joint work with Bjorn Poonen, John Voight, and Melanie Matchett Wood.

David Roberts
An inverse Hodge problem and some solutions from hypergeometric motives

We pose a general "inverse Hodge problem" whose purpose is to provide a framework for exploring the category of motives defined over $\mathbb{Q}$ with coefficients in $\mathbb{Q}$. The problem asks to find a full such motive for any given Hodge vector $h = (h^{w,0}, \dots, h^{0,w})$. Here “full” means that the motivic Galois group is as large as possible, and fullness is imposed in order to avoid cheap solutions. For $h = (g, g)$, a generic genus g curve provides a positive solution. For more exotic Hodge vectors like $h = (1, 2, 0, 0, 2, 1)$, there are no simple varietal sources. We show that the motives underlying classical hypergeometric functions provide positive solutions for a wide range of h.

Jeroen Sijsling
Databases of curves

We discuss databases of curves, the information that they contain, and the relevant interconnections with other mathematical objects. The genus 2 case can be explored on the LMFDB; we will also see some preliminary results in genus 3.

Michael Stoll
Arithmetic of hyperelliptic curves in Magma

I will give a live demonstration of some of the available functionality for hyperelliptic curves and their Jacobians in Magma, with a focus on rational points.

Andrew Sutherland
Computing L-series of hyperelliptic curves

Let $X/\mathbb{Q}$ be a hyperelliptic curve of genus g whose L-function $L(X, s)$ satisfies its conjectured functional equation. I will present an algorithm to compute the first n Dirichlet coefficients of $L(X, s)$ with a running time that is quasi-linear in n. This is joint work with Andy Booker, David Harvey, and David Platt.

Gonzalo Tornaria
Explicit modularity for typical genus 2 curves

I will describe the computations we used to prove the (para)modularity of the genus 2 curve of conductor 277. Joint work with Armand Brumer, Ariel Pacetti, Cris Poor, John Voight and David Yuen.

John Voight
Explicit modularity for atypical genus 2 curves

We discuss what it means for a genus 2 curve over the rationals to be modular when it acquires extra endomorphisms over an extension field. More precisely, to every genus 2 curve X we discuss conjectures and theorems that attach to X a modular form with a matching L-function: the description depends on the Galois module structure of the geometric endomorphism algebra of the Jacobian of X. This is joint work with Andrew Booker, Jeroen Sijsling, Drew Sutherland, and Dan Yasaki.

Raymond Van Bommel
Numerical verification of the Birch and Swinnerton-Dyer conjecture

We discuss recent work numerically verifying the BSD conjecture for several hundred hyperelliptic curves of genus 2 and genus 3 (up to squares), with particular emphasis on the computation of a Néron differential (which is necessary for the real period). If time allows, we will discuss some particular examples and ideas for future research.

Stefan Wewers

MCLF - a Sage toolbox for computation with models of curves

In my talk I will present a first and very premature version of the Sage toolbox MCLF (Models of Curves over Local Fields). It is based on the 'mac$_l$ane' infrastructure written by Julian Rueth. Future versions will hopefully be able to compute regular and semistable models of arbitrary curves. For the moment, it is able to compute semistable models of superelliptic curves of degree p, given by an equation $y^p = f(x)$, over the p-adic numbers.