Student conference of the IRTG 1800

Saturday, 3 September, 2016
Universiteit Leiden

Program

09:00–09:30	Arrival
09:30–10:00	**Maarten Derickx** *Chabauty for symmetric powers of curves and formal immersions*
10:10–10:40	**Niels Lindner** *Hypersurfaces with defect*
10:45–11:05	Coffee break
11:05–11:35	**Eva Martínez** *Stability conditions on holomorphic triples over elliptic curves*
11:45–12:15	**Erik Visse** *Counting rational points of bounded height on some K3 surfaces*
12:30–13:45	Lunch break
13:45–14:15	**Emre Sertöz** *Enumerative geometry of theta characteristics*
14:20–14:50	**Dino Festi** *Computing the Picard lattice of a K3 surface*
14:55–15:25	Coffee break
15:25–15:55	**Daniele Agostini** *On syzygies of abelian surfaces*
16:00–16:30	**Carlo Pagano** *Averages of arithmetic functions over the values of arbitrary integer polynomials*

Abstracts

09:30–10:00

Chabauty for symmetric powers of curves and formal immersions

Maarten Derickx (Universiteit Leiden)

Samir Siksek explicitly spelled out how Chabauty works for symmetric powers of curves, applying his strategy in practice often allows one to explicitly find all rational points on symmetric powers of curves. However his strategy is not applicable when working over p-adic rings whose residue characteristic is smaller then the dimension of the symmetric power you are studying. This is a stumbling block for explicit computer calculations since there for efficiency reasons one often wants to use the smallest possible residue characteristic. Kamienny also has a strategy for determining rational points on symmetric powers of curves using formal immersions. He only wrote down how this strategy works for modular curves. In this talk I will show how to generalize Kamienny's strategy to arbitrary curves, and show that this generalized strategy is superior to symmetric power Chabauty for curves whose Jacobian is of GL_2 type.

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10:10–10:40

Hypersurfaces with defect

Niels Lindner (Humboldt-Universität zu Berlin)

A hypersurface X in $\mathbb{P}^n$ has defect if the Betti numbers $h^i(X)$ and $h^i(\mathbb{P}^n)$ disagree for some $n \leqslant i \leqslant 2n-2$. Any such hypersurface is necessarily singular and it turns out that it actually has "lots of" singularities. This will be made precise for a hypersurface with at most isolated singularities over a field of characteristic zero. In the end, I will discuss some features of the positive characteristic case.

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11:05–11:35

Stability conditions on holomorphic triples over elliptic curves

Eva Martínez (Freie Universität Berlin)

This is joint work with Alejandra Rincón and Arne Rüffer. We use semi-orthogonal decompositions to construct Bridgeland stability conditions on holomorphic triples over elliptic curves. In this talk we will show the description of a connected component of the stability manifold.

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11:45–12:15

Counting rational points of bounded height on some K3 surfaces

Erik Visse (Universiteit Leiden)

At the end of the 1980's, Manin formulated a conjecture on the asymptotic number of rational points of bounded height on Fano varieties over the rational numbers, after having taken a suitable open subset. Recent years have seen much work on this conjecture for surfaces. The next logical step is to study a similar problem for K3 surfaces. These surfaces come in many types, one of which is the case of quartic surfaces. In my talk I will go into some asymptotics implied by the circle method, at least when we restrict ourselves to some special families of quartic surfaces.

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13:45–14:15

Enumerative geometry of theta characteristics

Emre Sertöz (Humboldt-Universität zu Berlin)

The geometry of theta characteristics in the form of contact hyperplanes to the canonical curve has been a classical topic of study. The study of the 28 bitangents to a quadric plane curve has been especially popular but for higher genera classical methods are far less revealing. Cornalba (1989) compactified the moduli space of theta characteristics, allowing the study of a single theta characteristic via degenerate stable curves. Following Cornalba, we compactify the moduli of pairs of theta characteristics, thereby initiating the study of the respective positions of two contact hyperplanes via degeneration. In particular, we calculate the class of the divisor of curves admitting two contact hyperplanes sharing a point of tangency on the curve. We end with a description of the limit stable curves in this divisor and what properties they imply about a general point on the divisor.

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14:20–14:50

Computing the Picard lattice of a K3 surface

Dino Festi (Universiteit Leiden)

The Picard lattice of a K3 surface can give a lot of information about both the geometry and the arithmetic of the surface.

Unfortunately, given a K3 surface, computing its Picard lattice is often complicated. In fact, as of today, there is no practical algorithm that, given a K3 surface, returns its Picard lattice.

In this talk, we are going to give an overview of some theoretical techniques to compute the Picard lattice of a given K3 surface, together with a concrete example of such a computation.

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15:25–15:55

On syzygies of abelian surfaces

Daniele Agostini (Humboldt-Universität zu Berlin)

Syzygies or minimal free resolutions give a way to study the geometry of a projective variety via the relations between its equations: very often, we can use unexpected relations to single out interesting loci in the moduli space. In recent years, much work has been done for curves and K3 surfaces. In this talk we want to present this circle of ideas in the case of abelian surfaces.

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16:00–16:30

Averages of arithmetic functions over the values of arbitrary integer polynomials

Carlo Pagano (Universiteit Leiden)

Studying averages of arithmetic functions over the integers has been one of the most popular research topics in analytic number theory and its surrounding areas in the last 100 years. When one averages arithmetic functions over the sparser set of values of integer polynomials it becomes hard to obtain asymptotics. We shall present new recent work that provides upper bounds of the correct order of magnitude for averages of a large class of arithmetic functions when averaged over the values of any polynomial in arbitrarily many variables, thus extending results of Shiu and Tenenbaum, where the case of polynomials in one variable was treated. This is joint work with E. Sofos (University of Leiden).

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