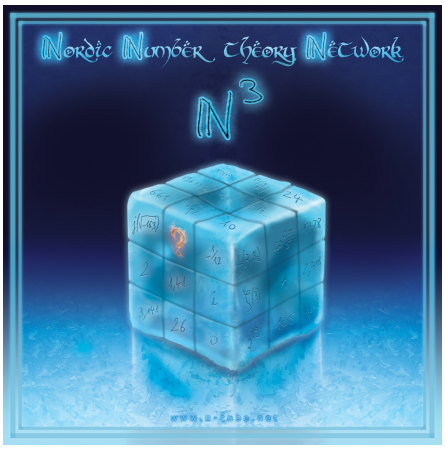
UNIVERSITY OF COPENHAGEN

Nordic Number theory Network Days XIII

University of Copenhagen,
November 26 – November 27, 2020
organized by Lars Kühne (KU) and Fabien Pazuki (KU).



Program

	Thursday 26.11	Friday 27.11
13:00-13:10	*Foreword*	
13:10-14:00	**Fabrizio Andreatta**	**Philippe Moustrou**
14:00-14:20	*Coffee break*	*Coffee break*
14:20-15:10	**Xenia Spilioti**	**Lucile Devin**
15:10-15:30	*Coffee break*	*Coffee break*
15:30-16:20	**Kirsti Biggs**	**Ricardo Menares**
16:20-16:40	*Coffee break*	*Farewell coffee*
16:40-17:30	**Elisa Lorenzo García**	
17:40	*Social event*	

Abstracts

TIME: Thursday, 26th November, 13:10-14:00.
ROOM: Zoom.
SPEAKER: **Fabrizio Andreatta** (University of Milan).
TITLE: *Modular Forms and p-adic L-functions*
ABSTRACT: I will explain the construction of anticyclotomic p-adic L-functions attached to imaginary quadratic fields interpolating special values of classical L-functions of Hecke characters. This was known in the case that the prime p splits in the imaginary field. I will deal with the case that p is inert or ramified, based on the recent progress in the construction of p-adic families of modular forms. This is joint work with Adrian Iovita.

TIME: Thursday, 26th November, 14:20-15:10.
ROOM: Zoom.
SPEAKER: **Xenia Spilioti** (Aarhus University).
TITLE: *Non-commutative harmonic analysis, spectral theory of automorphic forms and application*
ABSTRACT: In this talk, we will present some recent results on the dynamical zeta functions of Ruelle and Selberg and the Fried's conjecture. Moreover, we will present topics related to spectral identities for Fourier coefficients of automorphic forms and methods developed by Reznikov to derive Rankin-Selberg identities.

TIME: Thursday, 26th November, 15:30-16:20.
ROOM: Zoom.
SPEAKER: **Kirsti Biggs** (Chalmers University of Technology and University of Gothenburg).
TITLE: *Efficient congruencing in ellipsephic sets*
ABSTRACT: An ellipsephic set is a subset of the natural numbers whose elements have digital restrictions in some fixed prime base. Such sets have a fractal structure and can be viewed as p-adic analogues of Cantor sets. We are particularly interested in ellipsephic sets generated by sparse digit sets with a specific additive property - this property concerns the number of ways to write integers as sums of a fixed number of such digits.

We use Wooley's efficient congruencing method to bound the number of ellipsephic solutions to the Vinogradov system of diagonal equations. From a harmonic analytic perspective, these bounds are discrete restriction estimates for the moment curve over ellipsephic sets. The key step in the proof relies on the aforementioned additive structure of our digit set, which allows us to improve on certain congruence conditions at a low cost.

TIME: Thursday, 26th November, 16:40-17:30.
ROOM: Zoom.
SPEAKER: **Elisa Lorenzo García** (University of Rennes and University of Neuchâtel).
TITLE: *Primes of bad reduction for CM curves of genus 3 and their exponents on the discriminant (joint work with S. Ionica, P. Kilicer, K. Lauter, A. Manzateanu and C. Vincent)*
ABSTRACT: Let $\mathcal{O}$ be an order in a sextic CM field. In order to construct genus 3 curves whose Jacobian has CM by $\mathcal{O}$, we need to construct class polynomials, and for doing this we need to control the primes in the discriminant of the curves and their exponents. In previous works, I studied the so-called "embedding problem" in order to bound the primes of bad reduction. In the present one, we give an algorithm to explicitly compute them and we bound the exponent

of those primes in the discriminant for the hyperelliptic case. Several examples will be given.

* * * * *

TIME: Friday, 27th November, 13:10-14:00.
ROOM: Zoom.
SPEAKER: **Philippe Moustrou** (University of Tromsø).
TITLE: *Lattices, codes, and sphere packings*
ABSTRACT: The sphere packing problem asks for the highest proportion of space that can be filled with non overlapping spheres of a same radius. Euclidean lattices induce structured arrangements that turn out to be good packings. After giving an overview about the known results in low dimension, we will focus on lattice sphere packings in high dimension, and see how we can construct the densest known lattices by using codes defined over the ring of integers of cyclotomic fields, which yields an effective version of a result by Venkatesh. If time permits, we will also discuss other problems involving lattices, codes and spheres, such as the kissing number.

TIME: Friday, 27th November, 14:20-15:10.
ROOM: Zoom.
SPEAKER: **Lucile Devin** (Chalmers University of Technology and University of Gothenburg).
TITLE: *Low-lying zeros in a family of holomorphic cusp forms*
ABSTRACT: We study the low-lying zeros of L-functions attached to holomorphic cusp forms of level 1 as the weight increases. This family was proved to be of orthogonal type (resp. special orthogonal even or odd when the family is separated with respect to sign of the functional equation) by Iwaniec, Luo and Sarnak who obtained the main term predicted by the heuristic of Katz and Sarnak for the one-level density of the low-lying zeros for test functions having Fourier transform supported in $(-2, 2)$. Building on their work, we obtain lower order terms showing a transition similar to that in the main term when the support of the Fourier transform of the test function reaches the point 1.

This is joint work with Daniel Fiorilli and Anders Södergren.

TIME: Friday, 27th November, 15:30-16:20.
ROOM: Zoom.
SPEAKER: **Ricardo Menares** (Pontifical Catholic University of Chile).
TITLE: *p-adic equidistribution of CM points*
ABSTRACT: A fundamental theorem of Duke, together with a result of Clozel and Ullmo, ensures that CM points of growing (absolute value of) discriminant equidistribute on the complex modular curve with respect to the hyperbolic measure.

In joint work with Sebastián Herrero and Juan Rivera-Letelier, we establish a p-adic analogue of this phenomenon. That is, we elucidate the asymptotic distribution of CM points on the p-adic modular curve. In this situation, there is not a single limit measure. Rather, given a sequence of discriminants with unbounded absolute value, the limit measure depends on the ramification behavior of the discriminants. We present a complete classification of the possible limit measures. If time permits, we will explain how to use these results to deduce (non-effective) finiteness of the set of singular moduli that are S-units, where S is a fixed finite set of primes, thus extending a previous theorem of Habegger.