Quadratic Lattices in Prague 2026

Charles University

August 17–21, 2026

	Monday August 17	Tuesday August 18	Wednesday August 19	Thursday August 20	Friday August 21
09:00 09:50	Wai Kiu Chan	Byeong-Kweon Oh	Seok Hyeong Lee	Nihar Gargava	Robin Visser
09:55 10:15	Giovanna De Lauri	Katarina Krivokuca	Guilhem Mureau	Giacomo Cherubini	Magdaléna Tinková
10:15 10:45	Coffee	Coffee	Coffee	Coffee	Coffee
10:45 11:05	Ritoprovo Roy	Mathieu Dutour Sikirić	Simona Fryšová	Jakub Krásenský	Nico Lorenz
11:10 12:00	Noy Soffer Aranov	Oleg Karpenkov	Matthew de Courcy-Ireland	Damaris Schindler	Lenny Fukshansky
12:00 13:45	Lunch	Lunch	Lunch	Lunch	Lunch
13:45 14:35	Simon L Rydin Myerson	Cong Ling		Guillermo Mantilla-Soler	
14:40 15:00	Shamik Das	Akanksha Gupta		Sushant Kala	
15:00 15:20	Coffee	Coffee		Coffee	
15:20 15:40	Zilong He	Radan Kučera		Mingyu Kim	
15:45 16:05	Maxwell Forst	Ezra Waxman		Ansgar Freyer	
16:15 16:35	Jongheun Yoon	Daniel Dombek		Romain Ménabé	
16:40 17:00	Constantin Beli	Om Prakash		Srijonee Shabnam Chaudhury	

Constantin Beli (Institute of Mathematics of the Romanian Academy)

Quadratic form over local fields of characteristic 2

We show how results on quadratic lattices over dyadic local fields can be used to prove similar results over local fields of characteristic 2. In particular, we solve the classification problem and the representation problem for lattices over fields in characteristic 2.

Wai Kiu Chan (Wesleyan University)

On recoverable quadratic forms

In their construction of a collection S of positive definite quadratic forms with minimal S-universality criterion sets of different cardinalities, Elkies–Kane–Kominers (2013) showed that any positive definite integral quadratic form representing all proper subforms of $x^2 + y^2 + 2z^2$ must also represent $x^2 + y^2 + 2z^2$. This motivates the notion of a recoverable quadratic form: a positive definite integral quadratic form f is recoverable if every integral quadratic form that represents all proper subforms of f must also represent f. We will survey recent developments concerning recoverable quadratic forms and related questions.

Srijonee Shabnam Chaudhury (IISER Pune)

Different ideals and universality of quadratic lattices over totally real fields

The theory of universal quadratic lattices over number fields seeks to determine when a positive definite quadratic form represents all totally positive algebraic integers. While substantial progress has been made for quadratic and quartic fields, much less is known in higher degrees.

In this talk, we introduce a new arithmetic approach to the universality problem based on the structure of the different ideal. We establish criteria ensuring that the different ideal of a number field is principal, expressed in terms of the class number and discriminant. As a consequence of these results, we discuss evidence suggesting that universal lattices become increasingly rare over higher-degree totally real fields.

Giacomo Cherubini (INdAM, Rome)

Coprime-universal quadratic forms

Given a prime $p > 3$, we characterize positive-definite integral quadratic forms that are coprime-universal for p, i.e. representing all positive integers coprime to p. This generalizes the 290-Theorem by Bhargava and Hanke and extends later works by Rouse ($p = 2$) and De Benedetto and Rouse ($p = 3$). When $p = 5, 23, 29, 31$, our results are conditional on the coprime-universality of specific ternary forms. This is joint work with Matteo Bordignon.

Shamik Das (Indian Institute of Technology Kanpur)

A system of Diophantine equations

A positive integer is called a congruent number if it occurs as the area of a right triangle with rational side lengths. The problem of determining whether a given positive integer is congruent is known as the Congruent Number Problem, one of the oldest problems in number theory.

In this talk, I will discuss three recent papers concerning the Congruent Number Problem and the Cube Sum Problem. In the first part, I will present several necessary conditions for congruent numbers of the form $8k + 3$, together with related results for congruent numbers of the form pq, where p and q are primes satisfying suitable congruence conditions.

In the latter part of the talk, I will introduce the Cube Sum Problem and present our recent results on certain root number 1 cases. In particular, I will describe connections between cube sum elliptic curves and the class numbers of cubic number fields.

Matthew de Courcy-Ireland (Stockholm University)

Room for one more? Saturation probability of random lattice sphere packings

This talk is based on joint work with Anders Södergren, motivated by the question of whether the densest sphere packings in high dimensions are ordered or disordered. A strong form of translational order is the structure of a lattice, where the packing is just a single sphere per fundamental cell repeated periodically. In high dimensions, there are many possibilities for the shape of the cell, leading to a rich space of lattices. A natural way to explore this space is to choose a lattice at random according to the invariant measure with respect to the special linear group. We show that, with high probability as the dimension of space grows, there is enough room to insert additional spheres into the packing given by a random lattice. In this sense, most lattices fail quite badly to give dense packings.

Giovanna De Lauri (Lancaster University)

Hecke modules and ternary quadratic lattices

We consider Hecke modules of orthogonal modular forms attached to definite lattices of discriminant $2p^2$ and $8p^2$. With the aid of examples, we will prove explicit Jacquet-Langlands style correspondences with spaces of classical modular forms. A state-of-the-art overview of my current research will also be provided. This is joint work with Dan Fretwell.

Daniel Dombek (Czech Technical University in Prague)

On biquadratic fields: when 5 squares are not enough

In this talk we study the Pythagoras number $\mathcal{P}(\mathcal{O}_K)$ for the rings of integers in totally real biquadratic fields K. We continue the work of Tinková towards proving the conjecture by Krásenský, Raška and Sgallová that a biquadratic K satisfies $\mathcal{P}(\mathcal{O}_K) \geq 6$ if and only if it contains neither $\sqrt{2}$ nor $\sqrt{5}$, with only finitely many exceptions. We fully solve two out of three remaining classes of fields by proving that all but finitely many K containing $\sqrt{6}$ or $\sqrt{7}$ satisfy $\mathcal{P}(\mathcal{O}_K) \geq 6$. Furthermore, we present ideas and computations which further support the conjecture also for K containing $\sqrt{3}$. This enables us to refine the conjecture by explicitly listing the exceptional fields.

Mathieu Dutour Sikiric (MSM Programming)

Exact computation of the robust covering density of lattices

The robust covering density of a Euclidean lattice $L \subset \mathbb{R}^n$, introduced in arXiv:2508.06446 as a tool toward improved upper bounds on Rogers' lattice covering constant Θ_n, is defined from the smallest radius $r(x)$ such that the lattice points within distance $r(x)$ of an arbitrary point $x \in L \otimes \mathbb{R}$ contain an integer parallelepiped of volume 1. We describe algorithms for this invariant and their implementation in the `polyhedral_common` library.

An exact algorithm enumerates the cells of a new polyhedral decomposition: each cell, called a P-polytope, is indexed by a pair (P, v) of a volume-1 sublattice parallelepiped together with the vertex of P realizing the maximum distance to x, with auxiliary inequalities coming from competing parallelepipeds. The objective $|x-v|^2 \leq \max_{w\in \mathrm{vert}(P')} |x-w|^2$ is piecewise quadratic and not linearizable, so the canonical cell is in general a generalized polytope—a finite union of convex polytopes. We address the resulting loss of canonicity by separating hard facets (coming from (P, v) itself) from soft facets (coming from auxiliary parallelepipeds), by realizing cell adjacency through a flipping operation analogous to the enumeration of Delaunay polytopes. Closed-form upper bounds control the diameter of the cells and certify completeness of the enumeration.

Maxwell Forst (Aalto University)

On counting primitive points in polytopes

A linearly independent collection of points $x_1, \dots, x_k$ in a n-dimensional lattice L is called primitive if there exist points $x_{k+1}, \dots, x_n$ so that $x_1, \dots, x_n$ is a basis for L. It is generally well-known that the number of ways to choose a single primitive point of $\mathbb{Z}^n$ in the box $[0,t]^n$ is $t^n/\zeta(n) + O(t^{n-1})$. In this talk, I will discuss a generalization of this result to arbitrary polytopes with rational vertices. Moreover, I will show an analogous result for the number of ways to choose a primitive collection of $k < n$ points in tP where P is a polytope with rational vertices. Time permitting, I will also discuss how primitive points are distributed in $\mathbb{Z}^n$ as well as their connection to the Jordan totient functions.

Ansgar Freyer (FU Berlin)

The covering radius of Minkowski sums

The Minkowski sum of two convex bodies K and L is defined as $\{x + y : x \in K,\ y \in L\}$. We investigate how the covering radius of $K + L$ relates to the covering radii of K and L. This is motivated by questions from discrete geometry, as well as by the current developments around the Lonely Runner Conjecture. We will present sharp upper bounds on $\mu(K + L)$ in the planar case. Afterwards, we discuss higher dimensional analogs, which leads us in the terrain of Voronoi decompositions and, more generally, inclusion minimal convex bodies that cover the space. It was shown by Xue and Zong that such bodies do not need to be translative tiles. We will demonstrate that the minimal covering bodies are polytopes with at least $2d$ many facets, where d is the dimension. This is joint work with Giulia Codenotti and Katarina Krivokuća.

Simona Fryšová (Charles University)

Additively indecomposable quadratic forms over number fields

Additively indecomposable quadratic forms over the integers have been studied for many years. They become especially interesting when the coefficients are taken to be algebraic integers from a number field. Magdaléna Tinková and Pavlo Yatsyna proved the existence of such a quadratic form in two variables over real quadratic fields. But what about fields of higher degree? In our joint work with Magdaléna Tinková, we obtained the existence of an additively indecomposable binary form in certain families of totally real fields. Furthermore, we study how an indecomposable form over a real quadratic field behaves under field extensions. In the case of biquadratic extensions, we describe the behavior of certain quadratic forms that are indecomposable over a quadratic field.

Lenny Fukshansky (Claremont McKenna College)

On algebraic well-rounded lattices

We consider Euclidean lattices that are images of free $\mathbb{Z}$-modules in number fields via Minkowski embedding, investigating their rank, determinant, properties of their automorphism groups and sets of minimal vectors. We are especially interested in situations when the resulting lattice is well-rounded. We will start with a review of known results on well-rounded ideal lattices and then discuss some more recent work on algebraic lattices generated by families of polynomials with interesting properties, especially Pisot polynomials.

Nihar Gargava (Université Paris-Saclay)

Shapes of unit lattices of totally real orders form a dense set of lattices

Given a totally real number field of degree $n > 2$, one can look at the ring of integers and consider the group of units. It is known by a classical theorem of Dirichlet that the group of units is given by a Euclidean lattice in $n-1$ dimensions. This also holds true if one considers the group of units in an order inside the ring of integers. One can then try to plot these lattices in the appropriate moduli space of Euclidean lattices in $n-1$ dimensions and ask where the points lie. It was conjectured by David-Shapira that for $n = 3$ these unit lattices generate a dense set of lattices. I will explain the problem for $n = 3$ and sketch the proof. If time permits, I will talk about the generalization of our result to $n > 3$.

This is a joint work with Nguyen-Thi Dang and Jialun Li.

Akanksha Gupta (Indian Institute of Technology Delhi)

Quadratic Pellian polynomials over number rings

It is well known that, for a non-square positive integer d, the classical Brahmagupta-Pell equation $x^2 - dy^2 = 1$ always has a non-trivial solution in integers. However, the polynomial Pell equation need not always have a solution in $R[x]$ for a non-square polynomial D in $R[x]$, where R is an integral domain of characteristic not equal to 2. In fact, it is an open question to classify polynomials D in $R[x]$ such that $P^2 - DQ^2 = 1$ has a solution in $R[x]$. If a polynomial Pell equation has a non-trivial solution in $R[x]$, we say D is Pellian over R. In this talk, we will discuss the Pellianity of quadratic polynomials over the ring of integers of number fields.

Zilong He (Dongguan University of Technology)

ADC quadratic lattices over algebraic number fields

In this talk, we will introduce the background of ADC quadratic lattices and the relations among ADC-ness, universality, regularity, and maximality. We then present equivalent conditions for binary and ternary ADC lattices over local fields. Furthermore, we will discuss spinor exceptions and sufficient conditions for indefinite ternary ADC lattices over algebraic number fields.

Sushant Kala (IMSc Chennai)

Lower bound for the canonical height on abelian varieties

The study of points of small height is an important theme in Diophantine geometry. A key property concerning absolute lower bound on heights is the Bogomolov property, introduced by Bombieri and Zannier. In this talk, we will report on a recent work on Bogomolov property for abelian varieties over certain infinite extensions.

Oleg Karpenkov (University of Liverpool)

First steps in lattice trigonometry

In this talk we discuss a new insight on lattice geometry and its invariants. In particular we study with integer trigonometric functions introduced in 2008 in the planar case and their generalisations to the multidimensional case (2023). These trigonometric functions are closely related to geometric continued fractions of the corresponding lattice angles. Lattice trigonometry provides a comprehensive description of singularities of toric surfaces of arbitrary fixed value of Euler characteristic.

Mingyu Kim (Pusan National University)

Regular ternary sums of generalized m-gonal numbers

Let $P_m(x) = ((m-2)x^2 - (m-4)x)/2$ for $m \geq 3$. A polynomial of the form

$$f(x,y,z) = aP_m(x) + bP_m(y) + cP_m(z) \quad (a,b,c \in \mathbb{N})$$

is called a ternary sum of generalized m-gonal numbers (or an m-gonal form). In this talk, we provide an explicit upper bound on m such that a regular ternary m-gonal form exists. We also briefly compare two notions of regularity for m-gonal forms.

Jakub Krásenský (Czech Technical University in Prague)

Kitaoka's Conjecture on universal ternary forms

It is well known that in $\mathbb{Q}(\sqrt{5})$, every totally positive integer is a sum of three integral squares; i.e., the form $x^2+y^2+z^2$ is universal. In the '90s, Kitaoka conjectured that there are only finitely many totally real fields admiting a universal ternary quadratic form. This has inspired much of the recent research regarding quadratic forms over number fields, but only partial results are known: Most importantly, Chan–Kim–Raghavan solved the case of quadratic fields in 1996, and Kala–Yatsyna showed the finiteness of such number fields for any fixed degree in 2023. In this talk, I present a recently discovered unexpected connection of Kitaoka's Conjecture to sums of squares that enabled to prove explicit Kitaoka's Conjecture for fields of odd discriminant (Kala–Kramer–Krásenský), fields of degree 4 (Kramer–Krásenský) and real cyclotomic fields (Krásenský, in preparation).

Katarina Krivokuca (FU Berlin)

Upper bounds on covering minima of convex bodies

In 1977, Kannan and Lovász introduce covering minima as a sequence of functional on convex bodies, depending on a lattice, which interpolates between the inverse of the lattice width and the covering radius. They prove the first polynomial bound on the Flatness constant by giving upper bounds on covering minima, which depend on successive minima. However, these bounds rarely give a good approximation of the actual value of the covering minima.

In this talk, we will give two new upper bounds on covering minima for general convex bodies, depending on covering minima of certain linear projections and intersections. We show one bound to be sharp for direct sums of convex bodies, generalizing previous results on the covering radius and lattice width.

Radan Kučera (Masaryk University)

Explicit units in number fields

Dirichlet's unit theorem describes the structure of the group of units of the ring of integers of any number field. In sharp contrast, there are relatively few families of number fields for which explicit units generating a subgroup of finite index are known.

This talk is devoted to abelian extensions of $\mathbb{Q}$, that is, finite Galois extensions with abelian Galois group. For such fields, W. Sinnott introduced the group of circular (or cyclotomic) units, whose generators are given by explicit formulas and whose index in the full unit group is finite.

However, in most abelian extensions of $\mathbb{Q}$ the full unit group contains non-circular units, and explicit constructions of such units are generally unknown. We shall describe an infinite family of abelian extensions of $\mathbb{Q}$ in which an explicit non-circular unit can nevertheless be constructed.

This is a joint work with Cornelius Greither.

Seok Hyeong Lee (Seoul National University)

Counting sublattices of quadratic lattices up to isometry

We introduce a Dirichlet series that counts full-rank sublattices of a fixed quadratic lattice up to proper isometry, thereby refining the usual sublattice-counting problem by keeping track of isometry classes. For integral binary lattices, we obtain explicit formulas in the cases of squarefree discriminant and square discriminant. We also discuss analytic properties of these Dirichlet series and their consequences for the proportion of one-lattice classes. This talk is based on joint work with Daejun Kim and Seungjai Lee.

Cong Ling (Imperial College London)

Quadratic forms: From the Gougu Theorem to post-quantum cryptography

With the global standardization of cryptographic protocols resistant to quantum attacks, the focus of lattice-based cryptography is shifting toward the equivalence of quadratic forms—a subject of central importance in modern number theory. This talk begins with the Gougu Theorem ($a^2+b^2=c^2$), known in the West as the Pythagorean Theorem and recognized as the first theorem proven in ancient China. As the simplest expression of a quadratic form, it serves as our starting point for a survey of the history of lattices and quadratic forms from the era of Gauss to the present day. We will then demonstrate how quadratic forms underpin the second generation of lattice-based cryptography. Finally, we will present a quantum polynomial-time attack on a digital signature scheme based on indefinite quadratic forms, highlighting the evolving challenges in the post-quantum landscape. This talk is based on a joint work with Markus Kirschmer and Ali Sadreddin: `https://eprint.iacr.org/2026/890`.

Nico Lorenz (Ruhr-Universität Bochum)

Cliques in representation graphs of quadratic forms

Let q be a nondegenerate quadratic form on an A-module V and let $a \in A$. We consider the Cayley graph on V with generating set $V_a = \{x \in A \setminus \{0\} \mid q(x) = a\}$, i.e. the graph with vertices V in which two different vectors $x, y \in V$ are adjacent if and only if $q(x-y) = a$. This graph is called the *representation graph of q with respect to a*. A first example of such graphs is the unit distance graph on the Euclidean plane. The determination of its *chromatic number*, i.e. the minimal number k which is needed to assign one of k colors to each vertex such that adjacent vertices are not of the same color, is known as the *Hadwiger-Nelson* problem.

In this talk, we will handle the related problem of computing the *clique number*, i.e. the maximal size of a set $C \subseteq V_a$ such that each two different vertices $x, y \in C$ are adjacent. We will show how this combinatorial problem for representation graphs can be stated in terms of quadratic forms. This characterization will be used to compute the clique number of representation graphs for quadratic forms over finite local rings and to prove a local-global principle to determine the clique number of the representation graph of a quadratic form over a number field. This is a joint work with M.C. Zimmermann.

Guillermo Mantilla-Soler (Universidad Nacional de Colombia, Aalto University)

Zeta functions of number fields and the classification of integral quadratic forms

The Dedekind zeta function encodes profound arithmetic information about a number field, yet non-isomorphic fields can be arithmetically equivalent. A natural question is how this shared analytic data governs underlying geometric structures, such as the integral trace form. In this talk, we investigate the relation between the zeta functions of number fields and the classification of their associated integral quadratic forms. While arithmetic equivalence does not force these forms to be isometric in full generality, we will establish that for tamely ramified, non-totally real number fields, arithmetic equivalence does indeed guarantee isometric integral trace forms.

Romain Ménabé (Université Grenoble Alpes)

A combinatorial approach to Voronoï theory

In this talk, I will present the invariants of Euclidean lattices arising from the geometry of their Voronoï cells we defined and studied. This new point of view can be applied, inter alia, to prove, in each dimension, the finiteness of perfect forms up to equivalence.

Guilhem Mureau (Université de Bordeaux)

Explicit Jordan decompositions for ideal lattices in CM fields

Let E be a CM number field, F a totally real subfield (e.g $\mathbb{Q}$), and let $\mathfrak{a}$ be a non-zero fractional ideal of E. Endowed with the hermitian trace form $h_{E/F}(x,y) = \mathrm{Tr}_{E/F}(x\overline{y})$, the ideal $\mathfrak{a}$ defines an ideal lattice over $\mathcal{O}_F$. In this talk, we give explicit formulas for the Jordan decomposition of this ideal lattice at a prime ideal $\mathfrak{p} \subset \mathcal{O}_F$, in terms of the prime factorization of $\mathfrak{a}$ in E. Following a paper by Eres, Morales and Perlis, our approach reduces the computation to the local behavior at the prime ideals above $\mathfrak{p}$. Our results provide local invariants for the isometry relation between ideal lattices, with potential applications to the study of structured lattices arising in arithmetic and cryptography.

Byeong-Kweon Oh (Seoul National University)

Ternary quadratic forms representing all squares of integers except for 1

In this talk, We prove that there are exactly 301 (positive definite and integral) ternary quadratic forms up to isometry that represent all squares of integers other than 1, but not 1 itself. We provide a detailed discussion of classification methods for quadratic forms satisfying this property. We further consider natural generalizations of the problem and review the results known so far. This is based on joint work with Jangwon Ju, Daejun Kim, Kyoungmin Kim, and Mingyu Kim.

Om Prakash (Charles University)

Universality beyond quadratic forms

A universal quadratic form is a positive definite quadratic form with integral coefficients that represents all positive integers – a classical example being the sum of four squares $x^2 + y^2 + z^2 + w^2$. The 290-Theorem of Bhargava and Hanke characterizes positive definite quadratic forms over rational integers are universal as exactly the forms that represent $1, 2, 3, \ldots, 290$. In this talk, I will discuss universality of higher degree forms (i.e., homogeneous polynomials of degree $m > 2$), and I will prove that no statement like the 290-Theorem can hold for them. If time permits, I will conclude by discussing the analogous questions for diagonal forms. This is a joint work with Vítězslav Kala.

Ritoprovo Roy (Charles University)

Additive structure of indecomposables in semilattices

The study of indecomposable elements is motivated by their role in the arithmetic of number fields, particularly in connection with questions arising from universal quadratic forms, where they capture essential additive structure. In the work of Hejda–Kala, the structure of indecomposables in real quadratic number fields was investigated, showing in particular that the set of additive relations among them is finitely generated. In this talk, we extend this perspective to a broader setting. In joint work with my supervisor Vita Kala, we study indecomposable elements in general number fields of any degree and further generalize these results to semigroups arising from lattices. We investigate the additive structure of indecomposables and the relations they satisfy, with the aim of understanding how these elements govern the structure of the ambient semilattices.

Simon L Rydin Myerson (Chalmers University of Technology)

Local distribution of lattice points in spherical shells, and spectral projectors on the three dimensional torus

It is natural to ask what information about a function can be deduced from properties of its Fourier series. One version of this question concerns spectral projection estimates: if a function on a compact manifold without boundary has spectrum in a narrow window, how large can its L^p norms be? When the manifold is the three-dimensional torus, this can be seen as a somewhat novel kind of lattice point problem. The results we can prove are linked to local distribution of lattice points close to spheres. In particular we need upper bounds for the number of disjoint cuboids that can fit inside a spherical shell and each contain at least a given number of lattice points. Various methods and problems are discussed. This is joint work with Pierre Germain and Daniel Pezzi.

Damaris Schindler (University of Göttingen)

Quantitative weak approximation and quantitative strong approximation for certain quadratic forms

In this talk we discuss recent results on optimal quantitative weak approximation for certain projective quadrics over the rational numbers as well as quantitative results on strong approximation for quaternary quadratic forms over the integers. We will also discuss how a Brauer–Manin obstruction can affect the growth of coprime integer points of bounded height on a quaternary quadratic form. This is joint work with Zhizhong Huang and Alec Shute.

Noy Soffer Aranov (TU Graz)

Escape of mass of sequences

One way to study the distribution of nested quadratic number fields satisfying fixed arithmetic relationships is through the evolution of continued fraction expansions. In the function field setting, it was shown by de Mathan and Teullie that given a quadratic irrational Θ, the degrees of the periodic part of the continued fraction of $t^n\Theta$ are unbounded. Paulin and Shapira improved this by proving that quadratic irrationals exhibit partial escape of mass. Moreover, they conjectured that they must exhibit full escape of mass. We construct counterexamples to their conjecture in every characteristic. In this talk we shall discuss the technique of proof as well as the connection between escape of mass in continued fractions, Hecke trees, and number walls. This is part of joint works with Erez Nesharim and Uri Shapira (https://arxiv.org/abs/2503.18749 to appear in Selecta Mathematica) and with Steven Robertson (https://arxiv.org/abs/2510.19417 and https://arxiv.org/abs/2510.19449).

Magdaléna Tinková (Czech Technical University in Prague)

The Pythagoras number of fields of small degrees

The Pythagoras number of an order is the minimal number of squares needed to express all its elements that can be written as a sum of squares. If our order is a field, the situation is well understood. However, the same is not true if it is a subset of the ring of algebraic integers of a totally real number field. For them, we mostly have results for fields of small degrees, which I will present in this talk, as well as techniques used for their determination.

Robin Visser (Charles University)

Asymptotics of n-universal lattices over number fields

Given a totally real number field K with maximal order $\mathcal{O}_K$, we say that a positive definite $\mathcal{O}_K$-lattice is n-universal if it represents every positive definite $\mathcal{O}_K$-lattice of rank n. In this talk, we present an explicit asymptotic formula for the logarithm of the minimal rank of an n-universal lattice over $\mathcal{O}_K$, with explicit leading and second-order terms governed by the degree and discriminant of K, valid for all totally real fields outside a finite list of exceptional real quadratic fields. As a consequence, for any constant $C > 0$ and $n > 2$, we prove there are only finitely many totally real fields admitting an n-universal lattice of rank at most C, and that all such fields are effectively computable. This thereby establishes a strong form of the n-universal analogue of Kitaoka's conjecture for all $n > 2$. The main tools are Siegel's mass formula, a combinatorial theorem of Wright, and bounds on the orders of finite subgroups of $\mathrm{GL}_n(\mathcal{O}_K)$. Time permitting, I will also discuss the size and non-uniqueness of n-universal criterion sets. This talk is based on joint work with Dayoon Park, Pavlo Yatsyna, and Jongheun Yoon.

Ezra Waxman (Afeka College)

Lattice points in thin sectors

On the circle of radius R centered at the origin, consider a "thin" sector about the fixed line $y = \alpha x$ with edges given by the lines $y = (\alpha \pm \epsilon)x$, where $\epsilon = \epsilon_R \to 0$ as $\mathrm{R} \to \infty$. We discuss an asymptotic count for the number of integer lattice points lying in such a sector and present results concerning the variance of such lattice points across sectors.

Jongheun Yoon (Seoul National University)

Characterizing quadratic forms by subforms of small corank

In this talk, we prove that if two positive definite integral quadratic forms of rank n+1 have the same collection of subforms of rank n, then, up to scaling, the unique pair of non-equivalent forms with this property is $x^2 + xy + y^2$ and $x^2 + 3y^2$. We also present analogous results for subforms of corank 2. This talk is based on ongoing joint work with Professor Byeong-Kweon Oh.