Convex Geometry in Florence

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Conference booklet

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Da un secolo, oltre.

Abstracts

Ambrus, Gergely (University of Szeged and Rényi Institute, Hungary)

Title: *Cube sections, Eulerian numbers and the Laplace–Pólya integral*

Abstract: Volumes of central hyperplane sections of the d-dimensional cube Q_d have been studied for over a century: it is known that minimal sections are parallel to a facet, while K. Ball proved in 1986 that the sections of maximal volume are normal to the main diagonal of a 2-dimensional face. Many of the related results were achieved by using analytic methods: the volumes in question can be expressed by the so-called Laplace–Pólya integrals. These are also in connection with Eulerian numbers of the first kind, and hence provide a connection between geometric estimates and combinatorial inequalities. In our joint work with Barnabás Gárgyán (University of Szeged), we establish new bounds for the Laplace–Pólya integrals by entirely combinatorial means, which then imply new results in both fields. In particular, we prove the existence of full-dimensional, non-diagonal critical central sections of the cube in every dimension at least 4, and generalize asymptotic bounds on Eulerian numbers obtained by Lesieur and Nicolas in 1992.

Bozzai, Rainie (University of Washington & of Szeged, USA & Hungary)

Title: *Vector balancing and kernel density estimation*

Abstract: In machine learning, *coresets* provide a method for capturing essential aspects of datasets while reducing the computational complexity of algorithms run on those datasets. We use the vector balancing problem from convex geometry to provide improved bounds on the sizes of coresets for the problem of kernel density estimation, a form of nonparametric estimation of probability distributions. Through a novel analytic approach to this problem using *chaining*, we are able to give improved bounds for many important kernels such as the Gaussian and Laplacian kernels, and we also give new bounds that explicitly depend on the geometry of the dataset.

Brauner, Leo (Technical University of Wien, Austria)

Title: *Mixed spherical liftings and Lefschetz operators on scalar valuations*

Abstract: Given a convex body in some subspace $E \subseteq \mathbb{R}^n$, its area measures can be expressed as spherical liftings of its surface area measure relative to E. We introduce a mixed version of the spherical liftings, extending this formula of Goodey and Weil to mixed area measures. Then, we apply our result to connect two main objects in valuation theory. The Lefschetz operators allow us to move between valuations of different degrees of homogeneity. A homogeneous valuation in turn can be represented by its Klain–Schneider function, a continuous function on some compact flag manifold. We describe the action of the Lefschetz operators on the Klain–Schneider function by a Radon type transform.

This is joint work with Georg C. Hofstätter and Oscar Ortega-Moreno.

Eller, Katharina (Technical University of Berlin, Germany)

Title: *On subspace concentration for centered convex bodies*

Abstract: We study subspace concentration of dual curvature measures of convex bodies K satisfying $\gamma(-K) \subseteq K$ for some $\gamma \in (0, 1]$. We present upper bounds on the subspace concentration depending on γ, which, in particular, retrieve the known results in the symmetric setting.

Falah, Tomer (Technion – Israel Institute of Technology, Israel)

Title: *The Minkowski problem for general log-concave functions*

Abstract: The classical Minkowski problem is a well-known problem which asks to find a convex body with a given surface area measure. Recently much progress was made on studying surface area measures and the Minkowski problem for log-concave functions. As was observed by Colesanti–Fragalà and Rotem, a general log-concave function has two surface area measures, one on $\mathbb{R}^n$ and one on the sphere that accounts for "boundary effects".

When the log-concave function is essentially continuous this second measure vanishes, and in this case the Minkowksi problem was solved by Cordero-Erausquin and Klartag. In this talk

we will discuss the solution of the Minkowski problem for general log-concave functions with no regularity assumptions.

Based on joint work with Liran Rotem.

Fodor, Ferenc (University of Szeged, Hungary)

Title: *Stability of inequalities concerning the mean width*

Abstract: The regular simplex maximizes the mean width among convex bodies whose John ellipsoid is the unit ball (Barthe, 1998). If the body is origin symmetric, then the maximizer is the cube (Schechtman, Schmuckenschläger, 1995). Similar statements hold in the case when the Löwner ellipsoid of the body is the unit ball. We prove stability forms of these inequalities in the origin symmetric case using a measure transportation argument. Joint work with K. J. Böröczky (University of Budapest) and D. Hug (University of Karlsruhe).

Grundbacher, Florian (Technical University of München, Germany)

Title: *A new definition of the geometric mean of convex bodies fulfilling all naturally desired properties*

Abstract: Motivated through the log-Brunn–Minkowski conjecture, various attempts have been made to define the geometric mean of convex bodies. Many of these constructions are fairly complex and/or fail to satisfy some natural properties one would expect of such a mean. We remedy this by providing a new, technically simple definition of the geometric mean that fulfills all properties considered in recent literature.

To obtain the proposed geometric mean, we first study the closely related p-means of convex bodies, with the usual definition extended to series ranging over all p in the extended reals. We analyze general relations between them and show inequalities that quantify how well they approximate each other. As a byproduct, we also obtain results on the Banach–Mazur distance between convex bodies and their p-means.

Grünfelder, Balázs (University of Szeged, Hungary)

Title: *On the variance of generalized random polygons*

Abstract: We prove asymptotic lower and upper bounds on the variance of the area of generalized random polygons in various probability models in and around a smooth convex disc. The common element in these models is that the generalized random polygons are formed by the intersection of all translates of a suitable fixed convex disc containing a sample of i.i.d. random points. Upper bounds on variances lead to strong laws of large numbers, lower bounds may be used to prove central limit theorems. The talk is based on joint works with F. Fodor (University of Szeged) and V. Vígh (University of Szeged).

Hofstätter, Georg (Technical University of Wien, Austria)

Title: *Convex valuations from Whitney to Nash*

Abstract: We ask the following Whitney-type question for valuations, formulated in terms of mixed volumes: suppose that a mixed volume (considered as functional in k open spots) is given in every linear subspace of a fixed dimension; can this family be represented as restrictions of a linear combination of mixed volumes (with k open spots) in the total space? Clearly, compatibility on pairwise intersections is a necessary condition. In this talk, we will show that, together with a regularity condition, this is also sufficient when all mixed volumes are smooth.

This is joint work with D. Faifman.

Kipp, Christian (Technical University of Berlin, Germany)

Title: *Small perturbations of polytopes*

Abstract: We study the question how a convex body can be deformed "infinitesimally" such that the resulting shape is still convex. Using an abstract approach motivated by certain first-order optimality conditions, we recover a notion of weak derivatives of convex-body-valued functions due to G. Pflug and H. Weisshaupt. We characterize the set of realizable perturbations in the case where the perturbed body is a polytope. As an application, we discuss a necessary condition for polytopal maximizers of the isotropic constant.

Knoerr, Jonas (Technical University of Wien, Austria)

Title: *Unitarily invariant valuations on convex functions*

Abstract: I will present a characterization of all continuous, dually epi-translation invariant valuations on the space of finite-valued convex functions that are invariant under the unitary group. Similar to the Hadwiger Theorem for convex functions established by Colesanti, Ludwig, and Mussnig, any such valuation admits a (singular) integral representation with respect to certain families of Monge–Ampère-type operators. While there is only one family of such operators in the Euclidean setting, separating these different families and the associated valuations becomes a major challenge in the Hermitian case, and our proof relies heavily on the geometric properties of these operators.

We will in particular discuss a geometric construction of these operators and the associated valuations and how their properties are used in the proof of the characterization result.

Kolesnikov, Alexander (Moscow HSE University, Russia)

Title: *TBA*

Abstract: TBA

Kotrbatý, Jan (Charles University, Czech Republic)

Title: *Geometric inequalities for smooth convex bodies*

Abstract: In his seminal work "On simple polytopes", P. McMullen proved an array of inequalities between mixed volumes of strongly isomorphic simple polytopes that in particular broadly generalize the Alexandrov–Fenchel inequality and non-negativity of the mixed volume. Unlike these two special cases, the general inequalities do not extend to all convex bodies, as observed recently by R. van Handel.

In a joint work with Andreas Bernig and Thomas Wannerer, we prove the mixed versions of hard Lefschetz theorem and Hodge–Riemann relations for the Alesker algebra of smooth valuations on convex bodies. As a consequence, we obtain an analytic counterpart of McMullen's result, namely analogous inequalities for convex bodies with smooth boundary and positive curvature.

Langharst, Dylan (Institute of Mathematics Jussieu, France)

Title: *Functional volume product along the Fokker–Planck heat flow*

Abstract: The now-classical Santaló inequality for an integrable, nonnegative function f on $\mathbb{R}^n$ states $M(f) := \left(\int_{\mathbb{R}^n} f\right) \inf_z \left(\int_{\mathbb{R}^n} (\tau_z f)^\circ\right) \leq M(e^{-|x|^2})$, where $\tau_z f(x) = f(x-z)$ and f° is the polar of a function. We approximate polarity by defining the L^p Laplace transform of a function f, $p \in (0,1)$ as,

$$\mathcal{L}_p(f)(x) = \left(\int_{\mathbb{R}^n} f(y)^{\frac{1}{p}} e^{x\cdot y}\,\mathrm{d}y\right)^{\frac{p}{p-1}}.$$

Under mild regularity assumptions on f, such as log-concavity or continuity, $\lim_{p\to 0^+} \mathcal{L}_p(f)(x/p) = f^\circ(x)$.

In this work, which is joint with Cordero-Erausquin and Fradelizi, we define the L^p volume product of a nonnegative function f as

$$M_p(f) := \left(\int_{\mathbb{R}^n} f\right) \inf_z \left(\int_{\mathbb{R}^n} \mathcal{L}_p(\tau_z f)(x/p)\,\mathrm{d}x\right)^{1-p}.$$

Our main theorem is that $M_p(f_t)$ is increasing along the Fokker-Planck heat-semi group. This extends a recent result by Nakamura–Tsuji, who obtained the same monotonicity when f is even and integrable. An immediate corollary is $M_p(f) \leq M_p(e^{-|x|^2})$. Sending $p \to 0^+$, we also obtain that $M(f_t)$ is increasing in t. Perhaps even more interesting is the analysis for the infimum: the infimum may be zero if p is not sufficiently close to 0. We characterize exactly when this occurs by studying the Laplace transform of log-concave functions, using and elaborating on some ideas by Klartag. If the infimum is not zero, then it is obtained at a unique point, which we call the pth Laplace–Santaló point of f.

Ludwig, Monika (Technical University of Wien, Austria)

Title: *Unimodular Valuations beyond Ehrhart*

Abstract: A complete classification of unimodular, polynomial-valued valuations is established on lattice polygons. The proof uses invariant polynomials of a specific finite group and an extension to formal power series-valued valuations. In addition, a classification of polynomial-valued, translation invariant, and Minkowski additive functions is obtained.

Joint work with Ansgar Freyer and Martin Rubey.

Marín Sola, Francisco (University of Murcia, Spain)

Title: *Entropy, isotropic constant and Mahler's conjecture*

Abstract: In 2018, Bo'az Klartag proved using projective transformations that, given a convex body with minimal volume product, its isotropic constant is related to its volume product. As a consequence, he obtained that a strong version of the slicing conjecture implies Mahler's conjecture.

In this talk, we will discuss how to adapt his ideas to the realm of log-concave functions. Specifically, we will show that achieving an analogous result needs the consideration of a pertinent version of the isotropic constant, notably one incorporating the entropy, in conjunction with some other transformations. If time allows, we will also compare various strong forms of the functional slicing conjecture.

This talk is based on a joint work with Matthieu Fradelizi.

Milman, Emanuel (Technion – Israel Institute of Technology, Israel)

Title: *Uniqueness results for the cone-volume measure*

Abstract: Let V_K denote the cone-volume measure of a convex body K (containing the origin) in $\mathbb{R}^n$. It was shown by Brendle–Choi–Daskalopoulos that if V_K is a multiple of the Lebesgue measure, then K is necessarily a centered Euclidean ball, thereby resolving a long standing conjecture of Firey. More generally, the log-Minkowski problem, conjectured by Boroczky–Lutwak–Yang–Zhang, predicts that if K, L are (smooth, positively curved) origin-symmetric convex bodies with $V_K = V_L$, then necessarily $K = L$.

Using a local version of the Brunn–Minkowski inequality and centro-affine differential geometry, we obtain a new proof of Firey's conjecture (which generalizes to a multitude of additional non-linearities), and confirm the log-Minkowski conjecture whenever K enjoys very liberal curvature pinching estimates.

Based on joint works with Mohammad N. Ivaki.

Mouamine, Mohamed Abdeldjalil (Technical University of Wien, Austria)

Title: *Vector-valued valuations on convex functions*

Abstract: Following the work of A. Colesanti, M. Ludwig, and F. Mussnig on continuous scalar-valued valutions on the space of convex super-coercive functions, which is given by

$$\mathrm{Conv}_{\mathrm{sc}} = \left\{ u : \mathbb{R}^n \to (-\infty, +\infty] \,:\, u \not\equiv +\infty,\ \lim_{|x|\to+\infty} \frac{u(x)}{|x|} = +\infty,\ u \text{ is l.s.c. and convex} \right\},$$

we define a family of continuous $\mathbb{R}^n$-valued, translation invariant and rotation equivalent valuations using the conjugate Monge–Ampère measure. In this talk, we will present existence theorems for such valutions according to their degree of homogeneity and a characterization of smooth valuations. The proof is based on Klain's approach.

Based on joint work with F. Mussnig.

Mussnig, Fabian (Technical University of Wien, Austria)

Title: *A Hausdorff-type metric for convex functions and an extremal property of rotation epi-means*

Abstract: We introduce a functional analog of the Hausdorff metric for coercive convex functions and show equivalence with epi-convergence. In contrast to the Hausdorff metric, we cannot use a global function that plays the role of the unit ball, but we have to resort to using local functional unit balls. For the subclass of super-coercive convex functions, our construction coincides with a

metric that was previously introduced together with Ben Li. We then use our results to establish an extremal property of rotation epi-means which were previously introduced together with Andrea Colesanti and Monika Ludwig for the characterization of functional intrinsic volumes in a Hadwiger-type result. Thereby, we generalize a result of Schneider.

Joint work in progress with Steven Hoehner.

Nagy, Kinga (University of Szeged, Hungary)

Title: *Random spherical disc-polygons and a spherical spindle-convex duality*

Abstract: In this contribution, we consider uniform random disc-polygons on the sphere, and discuss their asymptotic properties. We introduce a notion of spherical spindle-convexity, and state some results regarding the expected number of vertices of random disc-polygons in this setting, as well as the expectation of its area and perimeter.

We also define a notion of duality in spherical spindle-convexity, which provides a natural way to construct circumscribed disc-polygons about an arbitrary spindle-convex disc. Using the properties of the duality, we also examine the asymptotic behaviour of the random circumscribed disc-polygons.

Joint work with Viktor Vígh (University of Szeged, Hungary).

Naldi, Simone (University of Limoges, France)

Title: *A Johnson-type theorem for spheres supporting the vertices of a tetrahedron*

Abstract: A reformulation of the three circles theorem of Johnson [1] with distance coordinates to the vertices of a triangle is explicitly represented in a polynomial system and solved by symbolic computation. A similar polynomial system in distance coordinates to the vertices of a tetrahedron T is introduced to represent the configurations of four balls of radius R^*, which intersect in one point, each ball containing three vertices of T but not the fourth one. This problem is related to that of computing the largest value r for which the set of vertices of T is an r-body [2]. For triangular pyramids P in $\mathbb{R}^3$ we completely describe the set of geometric configurations with the required four balls of radius R^*. The solutions obtained by symbolic computation show that triangular pyramids are split into two different classes: in the first one R^* is unique, in the second one three values R^* there exist.

[1] R. A. Johnson, *A circle theorem*, Amer. Math. Monthly 23(5):161–162, 1916

[2] M. Longinetti, P. Manselli, and A. Venturi, *On the complements of union of open balls of fixed radius in the Euclidean space*, Matematiche (Catania) 78(1):3–22, 2023

Ortega-Moreno, Oscar (Technical University of Wien, Austria)

Title: *Moment inequalities for Gaussian vectors*

Abstract: The Gaussian product inequality is a long-standing conjecture relating the moments of an arbitrary centred normal random vector to the moments of a standard one. In connection to this problem we present some new extensions of moment inequalities for Gaussian vectors.

Papvári, Dániel István (University of Szeged, Hungary)

Title: *A central limit theorem for random disc-polygons*

Abstract: We study the following probability model. Let K be a convex disc with C^2_+ boundary that is contained in a circle of radius r. Let $X_1, \dots, X_n$ be i.i.d. uniform random points from K. The intersection K_n^r of all radius r circular discs that contain $X_1, \dots, X_n$ is called a (uniform) random r-disc-polygon. Under these assumptions $K_n^r \subset K$. We prove a quantitative central limit theorem for the area of K_n^r. We combine different tools such as Stein's method from probability theory, geometric estimates for floating bodies and the asymptotic lower bound for the variance of the area proved by Fodor, Grünfelder, Vígh (2022).

This is a joint work with F. Fodor (University of Szeged).

Protasov, Vladimir (University of L'Aquila, Italy)

Title: *Invariant norms and antinorms on cones with applications to dynamical systems*

Abstract: Invariant norms are widely used in the study of linear dynamical systems and of spectral properties of sets of matrices. For a given set of $d \times d$ matrices $\mathcal{A} = \{A_1, \dots, A_m\}$, a norm $f(x)$ in

$\mathbb{R}^d$ is called invariant with the coefficient $\lambda \geq 0$ if $\max_{i=1,\dots,m} f(A_i x) = \lambda f(x)$ for all $x \in \mathbb{R}^d$. By Barabanov's theorem [1], an invariant norm exists for every irreducible family of matrices. It may not be unique but the coefficient λ for all invariant norms is the same and is equal to the *joint spectral radius*, *i.e.*, the exponent of fastest growth of the solution x_k of the difference equation $x_{k+1} = A(k)x_k$ as $k \to \infty$, where $A(k) \in \mathcal{A}$ for all k. The invariant norm f gives a very refined information on the asymptotic behaviour of x_k. The geometrical properties and the construction of those norms has been studied in the literature. It is known that for most of matrix families, the invariant unit ball is either a polyhedron or an ellipse polyhedron (a convex hull of concentric two-dimensional ellipses) [2].

If the matrices $A(k)$ are taken randomly from the set $\mathcal{A}$, then the joint spectral radius is replaced by the *Lyapunov exponent* [3] and the invariance property reads as $\left[\prod_{i=1,\dots,m} f(A_i x)\right]^{1/m} = \lambda f(x)$. In this case the invariant norm may not exist but if the matrices share a common invariant cone, then there exists a "concave norm" (*antinorm*) on a cone [4].

The main facts of convex analysis can be generalized to antinorms on a cone, although some of them look differently [5]. For example, the duality relation for antinorms is discontinuous and there are infinitely many self-dual antinorms. Moreover, there are infinitely many autopolar polyhedra in the positive orthant [6]. Their classification for $d \geq 3$ is an open problem.

[1] N. E. Barabanov, *Lyapunov indicator for discrete inclusions*, I–III, Automat. Remote Control 49(2–3, 5), 1988

[2] V. Yu. Protasov, *The Barabanov norm is generically unique, simple, and easily computed*, SIAM J. Control Optim. 60(4):2246–2267, 2022

[3] H. Furstenberg and H. Kesten, *Products of random matrices*, Ann. Math. Statist. 31:457–469, 1960

[4] V. Yu. Protasov, *Antinorms on cones: duality and applications*, Linear and Multilin. Alg. 70(22):7387–7413, 2022

[5] N. Guglielmi and M. Zennaro, *An antinorm theory for sets of matrices: bounds and approximations to the lower spectral radius*, Linear Alg. Appl., 607:89–117, 2020

[6] M. Makarov, *Antinorms and self-polar polyhedra*, Sib. Math. J. 64(5):1200–1212, 2023

Runge, Mia (Technical University of München, Germany)

Title: *General properties of (r, D, R)-Blaschke–Santaló diagrams in arbitrary Minkowski spaces*

Abstract: We study Blaschke–Santaló diagrams for the inradius, circumradius and diameter in general Minkowski spaces. Independent of the gauge, they can be described by at most five parts of boundaries. We analyse which bodies fill these bounds and for which gauges they become redundant. Furthermore, we give a complete description of the union over all these diagrams with respect to planar symmetric gauges (solving an open problem stated by Brandenberg and Gonzáles Merino in a recent paper) by providing a new inequality that tightens Bohnenblust's bound. This union is equal to the union over all diagrams with respect to intersections of triangles with their origin reflection.

Joint work with René Brandenberg and Bernardo Gonzáles Merino.

Sagmeister, Ádám (Rényi Institute, Hungary)

Title: *Some inequalities on reduced convex bodies in the hyperbolic space*

Abstract: The concept of reducedness was defined by Heil in 1978 in hope of tackling volume minimizing problems concerning the minimal width of the body. A convex body is called reduced, if for any different convex body that is contained within, the minimal width is strictly smaller. At first, the definition suggests that reduced bodies are some kind of dual of bodies of constant width, but in fact it is a broader family. A classical result of Pál from 1921 states that the regular triangle minimizes the area if the minimal width is fixed. Lassak conjectured that the area among reduced bodies of a fixed minimal width is maximized by the circle and the quarter of a disk, and he proved that all reduced polygons have a smaller area. Similar investigations have been made on the sphere, but the concept of reducedness in the hyperbolic space is very recent as the formerly known hyperbolic width functions did not make a good fit for this purpose. After introducing a new concept of hyperbolic width by Lassak, we will discuss some unexpected facts on hyperbolic reduced bodies including Pál's problem, we will see how hyperbolic reduced polytopes can differ from Euclidean or spherical ones, and we will answer two of Lassak's recent

questions. This talk is partially based on joint works with Károly Jr. Böröczky, András Csépai and Ansgar Freyer.

Saroglou, Christos (University of Ioannina, Greece)

Title: *Some results on the L_p-Brunn–Minkowski inequality for intrinsic volumes and the L_p-Christosffel–Minkowski problem*

Abstract: Our goal is to show how to improve some results related to the title of this talk, due to Bianchini, Colesanti, Pagnini and Roncoroni. Namely, we prove the log-Brunn–Minkowski inequality for intrinsic volumes (in fact the L_p-Brunn–Minkowski inequality for negative p) in a C^2 neighborhood of the Euclidean ball. On the other hand, we show that the L_p-Brunn–Minkowski inequality for intrinsic volumes does not hold globally for any $p < 1$. Related, we prove a global uniqueness result for the L_p-Christoffel–Minkowski when the function in the right hand side is sufficiently close to the constant 1. Joint work with Konstantinos Patsalos.

Schejter, Alon (Technion – Israel Institute of Technology, Israel)

Title: *Complex illumination problem*

Abstract: The classical *illumination number* of a convex body $K \subset \mathbb{R}^n$ is the minimal number of light sources that can illuminate the boundary of K. The *weighted illumination number* is the infimal total mass of an illuminating weighted set of directions. The famous *Hadwiger's Conjecture* states that among all convex bodies in $\mathbb{R}^n$ the cube has the largest Illumination number, both classical and weighted. In this talk we will discuss a Hadwiger-type conjecture for complex convex bodies K in $\mathbb{C}^n$. Here the role of the cube will be played by the polydisc, the product of 2-dimensional disks. First we will directly compute the classic and weighted illumination numbers of the polydisc, relating the problem to a covering problem for the torus. Then we will sketch a proof of the complex Hadwiger conjecture for complex zonotopes and complex zonoids.

Based on joint work with Liran Rotem and Boaz Slomka.

Tatarko, Kateryna (University of Waterloo, Canada)

Title: *How often do centroids of sections coincide with centroid of a convex body?*

Abstract: In 1961, Grünbaum asked whether the centroid $c(K)$ of a convex body K is the centroid of at least $n + 1$ different $(n - 1)$-dimensional sections of k through $c(K)$. A few year later, Löwner asked to find the minimum number of hyperplane section of K passing through $c(K)$ whose centroid is the same as $c(K)$.

We give an answer to these questions for $n \geq 5$. In particular, we construct a convex body which has only one section whose centroid coincides with the centroid of the body. Joint work with S. Myroshnychenko and V. Yaskin.

Ulivelli, Jacopo (Technical University of Wien, Austria)

Title: *A local theory of valuations*

Abstract: Following the developments of the last years in the theory of valuations on families of functions, we present some new characterization results extending the works of Colesanti, Ludwig, and Mussnig, and Knoerr. In particular, we dive into the local nature of this functionals in connection with the theory of valuations on convex bodies. Based on a joint work with Jonas Knoerr.

Vígh, Viktor (University of Szeged, Hungary)

Title: *On a new model for random polytopes in a polytope*

Abstract: Uniform random polytopes are usually defined as the convex hull of random points chosen from a fixed convex body according to the uniform distribution. In this talk we study a new model for random polytopes. We fix polytopes P and L, and we choose n independent, uniform random points from P, and we define the random polytopes L_n as the intersection of all translates of L that contain the chosen points. We present some limit theorems about L_n and discuss the connections between the models.

This is a joint work with Péter Kevei.

von Dichter, Katherina (Technical University of Brandenburg, Germany)

Title: *Mean inequalities for symmetrizations of convex sets*

Abstract: The arithmetic-harmonic mean inequality can be generalized for convex sets, considering the intersection, the harmonic and the arithmetic mean, as well as the convex hull of two convex sets. We study those relations of symmetrization of convex sets, i.e., dealing with the means of some convex set C and $-C$. We determine the dilatation factors, depending on the asymmetry of C, to reverse the containments between any of those symmetrizations, and tighten the relations proven by Firey and show a stability result concerning those factors near the simplex.

Wang, Shouda (Princeton University, USA)

Title: *The support of mixed area measures*

Abstract: Mixed area measures are omnipresent in convex geometry, and it is a fundamental problem to characterize their support by the local geometry of convex bodies. Intuitively speaking, the more a convex body is smooth near a direction, the more likely this direction will lie in the support. Schneider has proposed a conjecture that makes this intuition precise via touching cones. In this talk I will present some progress towards the solution of this conjecture based on joint work with Ramon van Handel.

Werner, Elisabeth (Case Western Reserve University, USA)

Title: *Weighted floating functions and weighted functional affine surface areas*

Abstract: We introduce the new concept of weighted floating functions associated with log concave or s-concave functions. This leads to new notions of weighted functional affine surface areas. Their relation to more traditional versions of functional affine surface areas as well as to the classical affine surface areas for convex bodies is discussed. Based on joint work with C. Schütt, Ch. Thäle, and N. Turchi.

Yepes Nicolás, Jesús (University of Murcia, Spain)

Title: *On refinements of L_p Brunn–Minkowski type inequalities*

Abstract: The well-known Brunn–Minkowski inequality asserts that, for any pair of convex bodies $K, L \subset \mathbb{R}^n$, $\mathrm{vol}\big((1-\lambda)K + \lambda L\big)^{1/n}$ is a concave function in $\lambda \in [0,1]$. Although this $(1/n)$-concavity cannot be in general improved, due to a classic result by Bonnesen one may however "enhance the concavity" of the volume functional by stating that

$$\mathrm{vol}\big((1-\lambda)K + \lambda L\big) \geq (1-\lambda)\mathrm{vol}(K) + \lambda \mathrm{vol}(L)$$

for all $\lambda \in [0,1]$, provided that K and L have a common projection onto a hyperplane H (or even just projections onto H of the same volume). Furthermore, the celebrated L_p version of the Brunn–Minkowski inequality, originally proven by Firey in the 60's in the setting of convex bodies containing the origin, asserts that

$$\mathrm{vol}\big((1-\lambda)\cdot K +_p \lambda \cdot L\big)^{p/n} \geq (1-\lambda)\mathrm{vol}(K)^{p/n} + \lambda \mathrm{vol}(L)^{p/n}$$

for all $\lambda \in [0,1]$, whenever $p \geq 1$.

In this talk, we will discuss different refinements of the above-mentioned Brunn–Minkowski inequality, as well as other related results, in the L_p setting (for $p \geq 1$), when dealing with convex bodies containing the origin with either a common projection or a common volume projection onto a hyperplane.

This is about joint work with Andrea Colesanti, Nico Lombardi and Eugenia Saorín Gómez.

Zhu, Baocheng (Shaanxi Normal University, China)

Title: *The dual Brunn–Minkowski theory for completed convex sets in a cone*

Abstract: In this talk, we will discuss the dual Brunn–Minkowski theory for unbounded closed convex sets in C, where C is a pointed closed convex cone with nonempty interior in n-dimensional Euclidean space. In particular, we introduce the q-th dual curvature measures for a class of unbounded closed convex sets, and propose the corresponding dual Minkowski problem. We will also talk about the solutions to this problem.

Schedule

	Wed, 12th		Thu, 13th		Fri, 14th	
	room 102		**room 102**		**room 102**	
08:30–09:00	registration					
09:00–09:30	welcome		Milman E.		Fodor	
09:30–10:00	Ludwig		Protasov		Ortega-Moreno	
10:00–10:30	Knoerr		Marín Sola		Vígh	
10:30–11:00	coffee break		coffee break		coffee break	
	room 101	**room 102**	**room 101**	**room 102**	**room 101**	**room 102**
11:00–11:30	Eller	Schejter	Kipp	Grundbacher	Papvári	Sagmeister
11:30–12:00	Falah	Runge	Grünfelder	Brauner	Kotrbatý	
12:00–12:30	Wang	Bozzai	Nagy	Mouamine	Hofstätter	
12:30–14:00	lunch		lunch		lunch	
	room 102		**room 102**		**room 102**	
14:00–14:30	Kolesnikov		Saroglou		Mussnig	
14:30–15:00	Langharst		Yepes Nicolás		Werner	
15:00–15:30	Ulivelli		Zhu		farewell coffee	
15:30–16:00	coffee break		coffee break			
16:00–16:30	Ambrus		von Dichter			
16:30–17:00	Tatarko		Naldi			

Get around

Points of Interest:

- Conference Venue: Dipartimento di Matematica ed Informatica (DIMAI) “U. Dini”
- Tramvia T1 stop “Morgagni–Università”
- Tramvia T1 stop “Careggi–Ospedale”
- Il Campino (pizza&beverage menu 9 euros; coffee add 1 euro)
- Caffè I Romani (sandwiches; sparingly first&second courses, salads. 10–15 euros, no large groups)
- Caffè Fiorentini (first&second courses, salads. 10–15 euros, no large groups)
- Mensa (9,90 euros for a full meal; payment only by cash; need to exhibit conference badge)
- Bar Plesso Morgagni (sandwiches, pastries, coffee)
- N.I.C. (several options here: take-away piadine, salad bar, take-away pizza, bar with first&second courses, minimarket with ready-to-eat food). Website: immobilicareggi.it/galleria-commerciale/ Should you need, inside the N.I.C. you can also find a bank and an ATM.

More food places can be found going southward along viale Morgagni (in direction of piazza Dalmazia). With respect to the printed map, this area lies South of the Tramvia T1 stop “Morgagni–Università”. E.g., “Bar Rosso 39” (first& second courses, salads. 10–15 euros, no large groups).

Other options are towards the southern end of viale Alderotti, which is the first eastward parallel to viale Morgagni. E.g., you can find a take-away kebab place (“Chicken taste”), a sushi place (“EttoSushi”), and a pizzeria (“L’angolo del gusto”).