Florian Besau,

Title: Spherical Floating Bodies and Floating Area Measures

Abstract: Given a convex body in Euclidean space, a convex floating body is obtained by cutting off caps that violate a fixed volume bound. This is a classic affine construction that can be traced back to Dupin in the 19th century and has been studied extensively in the past century. Blaschke used the floating body to introduce the now classical notion of affine surface area for smooth convex bodies in dimension two and three. Blaschke's observation, that the volume derivative of the floating body converges to the affine surface area as the volume of the cut-offs goes to zero, was extended for smooth convex bodies to all dimensions by Leichtweiss and finally to all convex bodies by Schuett & Werner.

Recently, together with Werner, we gave a natural analog for the convex floating body of spherical convex bodies, i.e., convex closed subsets of the n-dimensional unit sphere. The (spherical) volume derivative of this spherical floating body converges to a new spherical surface area measure, the spherical floating area.

It was observed by Barany & Larman that the volume difference of the (Euclidean) floating body for polytopes is of a higher order in the volume of the cut-offs. Their results were strengthened by Schuett, who established that for polytopes the total number of complete flags, a combinatoric invariant, is the first factor in the asymptotic expansion. In current work together with Schuett and Werner, we observe that the same behavior holds true for the spherical floating body of spherical polytopes.

In this talk I am going to present a brief outline of the many relations between the Euclidean and spherical floating body and address some remaining open questions. (Based on joint work in part with Werner and Schuett & Werner).

Niufa Fang

Title: The functional Lp Minkowski inequality

Abstract: The Lp Minkowski inequality, an extension of the Lp isoperimetric inequality, is a basic inequality in the Lp-Brunn-Minkowski theory. It is well known that the Lp isoperimetric inequality is equivalent to the Lp Sobolev inequality. Does there exist a Sobolev style inequality that implies the Lp Minkowski inequality? In this talk, we will construct a Sobolev style inequality that is equivalent to the Lp Minkowski inequality. This work is joined with W. Xu, J. Zhou and B. Zhu.

Dmitry Faifman

Title: Crofton formulas in symplectic, contact and Riemannian geometries

Abstract. The classical Crofton formula of Euclidean geometry -computing the length of a plane curve by counting its intersections with straight lines - lies in the foundation of modern integral geometry. More recently, several incarnations of Crofton formulas were established in various geometries, such as hermitian and pseudo-Euclidean spaces. In the talk, I will present the Crofton integral in three different settings - a hypersurface in Euclidean space, the linear symplectic space, and the contact sphere. The three turn out to be linked through the integral geometry of the Heisenberg algebra.

Thomas Hack

Title: Spherical centroid bodies

Abstract: Going back to C. Dupin and W. Blaschke, the notion of Euclidean centroid bodies, along with their associated isoperimetric inequalities, forms a classical part of the theory of convex bodies. In this talk, we give a new definition of centroid bodies in spherical space, explore their basic properties, and discuss isoperimetric problems associated with them. (joint work with F. Besau, P. Pivovarov, and F. E. Schuster)

Julian Haddad,

Title: Sharp affine Sobolev type inequalities and the Busemann-Petty centroid inequality

Abstract: We show that the Lp Busemann-Petty centroid inequality for convex sets provides an elementary proof of many affine-invariant functional inequalities in a unified approach. The inequalities are Sharp and the extremal functions are characterized in several cases.

Martin Henk

Title: “Remarks on the log-Minkowski problem”

Abstract: We will briefly survey what is known and unknown about the log-Minkowski problem. In particular, we are going to address the question of uniqueness/non-uniqueness in view of the subspace concentration condition. (Based on joint works with Karoly Böröczky Jr., Hannes Pollehn and Romanos Malikiosis)

Shaoxiong Hou

Title: A mixed volume from the anisotropic logarithmic potential

Abstract: In this talk, we investigate a mixed volume from the anisotropic potential with natural logarithm as a better complement to the end point case of the most recently developed mixed volumes from the anisotropic Riesz-potential. An optimal polynomial log-inequality is not only discovered but also applicable to produce a polynomial dual for the conjectured fundamental log-Minkowiki inequality in convex geometry analysis, which generalizes the dual log-Minkowski inequality for mixed volume of two star bodies.

Sen Hu

Title: On Feynman Geometry

Abstract: In this talk we explain a notion of Feynman geometry on which quantum field theories could be properly defined.

A strong Feynman geometry is a geometry when the vector space of A_∞ structures is finite dimensional. A weak Feynman geometry is a geometry when the vector space of A_∞ structures is infinite dimensional while the relevant operators are of trace-class. We construct families of Feynman geometries with "continuum" as their limit.

Qingzhong Huang

Title: On the Loomis-Whitney inequality for isotropic measures

Abstract. The classical Loomis-Whitney inequality compares the volume of a convex body in R^n with the product of volumes of its coordinate projections. It was observed by K. Ball that this inequality also holds for its projections along a sequence of directions satisfying John's condition. In this talk, we will present several extensions of K. Ball's result for isotropic measures.

Philipp Kniefacz

Title: Affine vs. Euclidean Sobolev inequalities

Abstract: In this talk we present a family of sharp Sobolev-type inequalities obtained from averages of the length of i-dimensional projections of the gradient of a function. This family has both the classical Sobolev inequality (for i = n) and the affine Sobolev-Zhang inequality (for i = 1) as special cases as well as a recently obtained Sobolev inequality of Haberl and Schuster (for i = n-1). Moreover, we identify the strongest member in our family of analytic inequalities, which turns out to be the only affine invariant one among them.

Ben Li,

Title: Loewner function of log concave functions

Abstract: We introduce the notion of Loewner ellipsoid function for log concave function. The duality of this notion to the John ellipsoid function which is introduced by D. Alonso-Gutierrez et al will also be discussed. This is based on joint work with C. Schuett and E. Werner.

Jin Li,

Title: Function-valued valuations

Abstract: Function-valued valuations are valuations which taking values in some function spaces. Many fundamental operators and basic operators in geometric analysis are function-valued valuations, while their characterizations as function-valued valuations are still open. In this talk, I will warm up with some examples of function-valued valuations and then focus on some classification results on $\SLn$ compatible $C(\R^n)$-valued valuations, which can be understood as natural extensions of L_p Minkowski valuations. Such valuations include the Laplace transform and general projection functions which are extensions of L_p projection functions.

Youjiang Lin

Title: Affine Orlicz Polya-Szego principle for log-concave functions

Abstract: The affine Lp Polya-Szego principle significantly strengthens the classical Polya-Szego principle. It is an open problem whether there exists an affine Orlicz Polya-Szego principle which includes the affine Lp Polya-Szego principle as special case. In this paper, an affine Orlicz Polya-Szego principle for log-concave functions is established by using functional Steiner symmetrizations.

Alexander Litvak

Title: Circular law for sparse random regular digraphs

Abstract: Fix a constant $C\geq 1$ and let $d=d(n)$ satisfy $d\leq \ln^{C} n$ for every large integer n. Denote by A_n the adjacency matrix of a uniform random directed d-regular graph on n vertices.

We show that, as long as $d\to\infty$ with n, the empirical spectral distribution of the appropriately rescaled matrix $\A$ converges weakly in probability to the circular law. This result, together with an earlier work of Cook, completely settles the problem of weak convergence of the empirical distribution in directed d-regular setting with the degree tending to infinity. As a crucial element of our proof,

we develop a technique of bounding intermediate singular values of A_n based on studying random normals to rowspaces. This is a joint work with A. Lytova, K. Tikhomirov, N. Tomczak-Jaegermann, and P. Youssef.

Jiakun Liu

Title: A boundary problem for Monge-Ampere equations.

Abstract: In this talk, we will present a recent result on the global $C^{2,\alpha}$ and $W^{2,p}$ regularity for the Monge-Ampere equation subject to a natural boundary condition arising in optimal transportation, which also has wide range of applications, such as in convex geometry, reflector design, meteorology and fluid mechanics. This is a joint work with Shibing Chen and Xu-Jia Wang.

Galyna Livshyts

Title: On the dimensional Brunn-Minkowski inequality

Abstract: In the recent years, a number of conjectures have appeared, concerning the improvement of the inequalities of Brunn-Minkowski type under the additional assumptions of symmetry; this includes the B-conjecture, the Gardner-Zvavitch conjecture of 2008, the Log-Brunn-Minkowski conjecture of 2012, and some variants. The conjecture of Gardner and Zvavitch, also known as dimensional Brunn-Minkowski conjecture, states that even log-concave measures in $\R^n$ are in fact $\frac{1}{n}$-concave with respect to the addition of symmetric convex sets. In this talk we shall establish the validity of the Gardner-Zvavitch conjecture asymptotically, and prove that the standard Gaussian measure enjoys $\frac{0.37}{n}$ concavity with respect to centered convex sets. Some improvements to the case of general log-concave measures shall be discussed as well. This is a joint work with A. Kolesnikov.

Jian Lu,

Title: Existence of solutions to the prescribed centroaffine curvature problem

Abstract: The centroaffine curvature is an elementary quantity in the affine differential geometry and in the theory of convex bodies. It plays a fundamental role in the study of many geometric problems. We will study the prescribed centroaffine curvature problem in the Euclidean space. This problem is equivalent to solving a Monge-Ampere equation on the unit sphere. It corresponds to the critical case of the Blaschke-Santalo inequality. By approximation from the subcritical case, and using an obstruction condition and a blow-up analysis, we obtain sufficient conditions for the a priori estimates, and the existence of solutions up to a Lagrange multiplier. This is a joint work with Huaiyu Jian and Xu-Jia Wang.

Songjun Lv

Title: L_p John ellipsoids associated with spherical measures

Abstract: There are two parts of this talk. Firstly, we shall present a new characterization for the L_p John ellipsoid found by Lutwak, Yang, and Zhang. Secondly, I study the L_p John ellipsoids associated with general Borel measures on the unit sphere. Its characterization, associated John type inclusion, as well as Ball's volume ratio inequalities will be disclosed.

Olaf Mordhorst

Title: Duality of Floating and Illumination Bodies (joint work with E. Werner)

Abstract: In this talk we present a duality relation between floating and illumination bodies. The convex floating body was introduced independently by B\'{a}r\'{a}ny/Larman and Sch\"utt/Werner for the study of random polytopes and for the extension of affine surface area to the class of all convex bodies. Later, E. Werner introduced the illumination body which has similar properties as the floating body. The definition of these two notions suggests that the polar of a floating body should not be too far away from the illumination body of the polar of a convex body although equality cannot be achieved in general. We consider this question for the class of centrally symmetric convex bodies and we provide asymptotically sharp estimates for the distance of the polar of the floating body to

the illumination body of the polar. This distance has a connection to other important notions in convex geometry, namely, the cone measure of a convex body. Furthermore, our estimates show that ellipsoids are the only example where equality holds.

Carsten Schütt

Title: Flags and Floating Bodies

Abstract: We study floating bodies of polytopes and asymptotic formulae involving the flag number of the polytope.

Alina Stancu

Title: Transforming centro-affinely one convex curve into another

Abstract: The famous mathematician S.-T. Yau has proposed a curvature difference flow as a way to transform a curve into another. Certain results in this direction followed for convex curves a few years later. We studied a centro-affine version of this flow with several interesting consequences and potential to extend to higher dimension.

Matthew Stephen

Title: Some characterizations of origin-symmetry

Abstract: A set $S\subset\mathbb{R}^n$ is origin-symmetric if it is equal to its reflection through the origin, i.e. $-S = S$. A star body $L\subset\mathbb{R}^n$ is a compact set which is star-shaped with respect to the origin, and whose radial function $\rho_L(\xi):= \max \lbrace a>0\, :\, a\xi\in L\rbrace$ is positive and continuous on the sphere $\xi\in S^{n-1}$. A convex body is a compact and convex set with non-empty interior. I will discuss several characterizations of origin-symmetry for star/convex bodies.

Makai, Martini, and \'Odor conjectured that convex bodies are origin-symmetric if and only if the quermassintegral of every central section is maximal amongst all parallel sections. Recently, I partially confirmed this conjecture within the class of

convex polytopes. Additionally, I proved a dual version of this conjecture. That is, (smooth) star bodies are origin-symmetric if the dual quermassintegral of every central section is maximal amongst all parallel sections in a neighbourhood of the origin.

Kateryna Tatarko

Title: An upper bound on the smallest singular value of a square random matrix

Abstract: Let $A = (a_{ij})$ be a square $n\times n$ matrix with i.i.d. zero mean and unit variance entries. In a paper by Rudelson and Vershynin it was shown that the upper bound for a smallest singular value $s_n(A)$ is of order $n^{-\frac12}$ with probability close to one under additional assumption on entries of A that $\mathbb{E}a^4_{ij} < \infty$. We remove the assumption on the fourth moment and show the upper bound assuming only $\mathbb{E}a^2_{ij} = 1.$

Denghui Wu

Title: Lp-Brunn-Minkowski inequalities for general measures and their applications

Abstract: Lp-mixed volume and Lp-surface area measure are central concepts in the rapidly developing Lp-Brunn-Minkowski theory. In this talk, we extend these concepts to Lp-mixed mu-measures and Lp-surface μ-area measures. The Lp-Brunn-Minkowski type inequalities for measures will be given in this talk. As applications, we show the existence theorem of the related Lp-Minkowski problem for measures, and give a solution to a measure-comparison problem of projection.

Dongmeng Xi

Title: Cosine transforms on Grassmannians and related inequalities

Abstract: We introduce the notions of Lp cosine transform and isotropic measure on Grassmann manifolds. The (reverse) isoperimetric type volume inequalities for the convex bodies generated by the cosine transforms are established. These results are non-trivial extensions from the sphere to the Grassmannians.

Sudan Xing, Memorial University

Title: The dual Orlicz-Minkowski problem

Abstract: Huang-Lutwak-Yang-Zhang (Acta Mathematica, 2016) proposed the dual L_q curvature measures and solved the L_q dual Minkowski problem for $0<q\leq n$.

In this talk, I will discuss the (general) dual Orlicz-Minkowski problem which has the L_q dual Minkowski problem by Huang-Lutwak-Yang-Zhang as a special case. These problems are dual to the Log-Minkowski problem. In particular, a solution to this problem will be presented. This talk is based on the joint work with Zhu and Ye (J. Geom. Anal., 2018) and with Ye (Indiana Univ. Math. J, in press).

Deane Yang

Title: The dual Minkowski problem

Abstract: Dual curvature measures, which are analogues in the dual Brunn-Minkowski theory to the curvature measures of Brunn-Minkowski theory, were recently introduced. The question of how to characterize such measures leads to dual Minkowski problems, analogous to the classical Minkowski problems. A survey of these concepts and results obtained so far will be presented.

Liping Yuan

Title: On $\cal F$-convexity and related properties

Abstract: Let $\cal F$ be a family of sets in R^d. A set $M \subset R^d$ is called $\cal F$- convex if for any pair of distinct points $x,y\in M$ there is a set $F\in \cal F$ such that $x,y\in F$ and $F\subset M$. In this talk, we'll present some properties of some$\cal F$-convex sets, including the discrete aspects.

Ning Zhang

Title: A solution to the problem of bodies with congruent sections or projections

Abstract: In this talk, we will construct two convex bodies K and L, such that their projections K|H, L|H onto every subspace H are congruent, but nevertheless, K and L do not coincide up to a translation or a reflection in the origin. This gives a negative answer to an old conjecture posed by Nakajima and Suss.

Bentuo Zheng,

Title: Banach Spaces with the Ball Covering Property

Abstract: A Banach space is said to have the Ball Covering Property (BCP) if the unit sphere can be covered by countably many open balls which do not contain the origin. Banach spaces with and without the BCP will be illustrated, sufficient conditions for Banach spaces having the BCP will be discussed and related open problems will be presented.

Baocheng Zhu

Title: The Orlicz-Petty bodies

Abstract: In this talk, we will discuss the homogeneous Orlicz geominimal surface areas and their basic properties. We also talk about the existence of Orlicz-Petty bodies and the uniform boundedness of the Orlicz-Petty bodies of a convergent sequence of convex bodies, which can be used to prove that the homogeneous geominimal surface areas are continuous. Similar results for the nonhomogeneous Orlicz geominimal surface areas will be presented as well.

Du Zou,

Title: Convex Bodies with Identical John and LYZ Ellipsoids

Abstract: Convex bodies with identical John and LYZ ellipsoids are characterized. This solves a problem from convex geometry posed by G. Zhang