ABSTRACTS FOR THE SHORT TALKS

1. Tuesday

Johannes Hosle, UCLA

We discuss inequalities between measures of convex bodies implied by comparison of their projections and sections. Recently, Giannopoulos and Koldobsky proved that if K, L are convex bodies in $\mathbb{R}^n$ with $|K|\theta^\perp| \leq |L \cap \theta^\perp|$ for all $\theta \in S^{n-1}$, then $|K| \leq |L|$. Firstly, we study the reverse question: in particular, we show that if K, L are origin-symmetric convex bodies in John's position with $|K \cap \theta^\perp| \leq |L|\theta^\perp|$ for all $\theta \in S^{n-1}$, then $|K| \leq \sqrt{n}|L|$. Secondly, we discuss extensions of the result of Giannopoulos and Koldobsky to log-concave measures.

Kasia Wyczesany, Cambridge University

Title: High-dimensional tennis balls.

Abstract: In this talk I will explain what a high-dimensional tennis ball is, how one can construct it and give a motivation why such an object might be of interest by connecting it to V. Milman's question: Let $C > 1$ and $E > 0$ be constants and let k be an integer. Is it true that for sufficiently large N, every normed space X that is C-equivalent to l_2^N has a k-dimensional subspace that is $(1+E)$-complemented and $(1+E)$-equivalent to l_2^k?

Michael Roysdon, Kent State University

Title: Sectional Rogers-Shephard inequalities.

Abstract: In recent years, the question of whether or not the volume functional in the Brunn-Minkowski inequality may be replaced by a more general measure has been considered by many. Examples of extensions of the Brunn-Minkowski inequality are famed Borell-Brascamp-Lieb and Prékopa-Leindler inequalities, which yield Brunn-Minkowski-type inequalities in the class of so-called s-concave measures. A similar question was posed by Gardner and Zvavitch, which asks among which measures and convex bodies can one hope to expect a dimensional form of the Brunn-Minkowski inequality; partial answers were given by Colesanti, Gardner, Livshyts, Marisiglietti, Nayar, Ritoré, Yepes-Nicholás, and Zvavitch.

In this talk we address a similar situation with another famous inequality in Convex Geometry, the Rogers-Shephard inequality. We ask the following question: given a measure μ on $\mathbb{R}^n$, does there exists a constant $C > 0$ such that, for any m-dimensional subspace $H \subset \mathbb{R}^n$ and any convex body $K \subset \mathbb{R}^n$, the following sectional Rogers-Shephard type inequality holds:

$$\mu((K-K)\cap H) \leq C \sup_{y\in\mathbb{R}^n} \mu(K\cap(H+y))?$$

We show that this inequality is affirmative in the class of measures with radially decreasing densities with the constant $C(n,m) = \binom{n+m}{n}$.

Jing Hao, Georgia Tech

Title: Geometric inequality via information theory

Abstract: Using ideas from information theory, we establish lower bounds on the volume and the surface area using slices along different directions. In the first part of the talk, we derive volume bounds for convex bodies using Brascamp-Lieb inequality combined with entropy inequality for log-concave random variables. In the second part, we investigate a new definition called the L1-Fisher information and show that certain superadditivity properties of the L1-Fisher information lead to lower bounds for the surface areas of polyconvex sets in terms of its slices.

Ryan Gibara, University of Toronto

Title: Accessible parts of the boundary for domains in metric measure spaces

Abstract: In the setting of Q–Ahlfors regular PI–spaces, we prove that if a domain Ω has uniformly large boundary when measured with respect to the s–dimensional Hausdorff content, then its visible boundary has large t–dimensional Hausdorff content for every $0 < t < s \leq Q?1$. The visible boundary is the set of points that can be reached by a John curve from a fixed point $z_0 \in \Omega$. This generalizes recent results by Koskela-Nandi-Nicolau (in $\mathbb{R}^2$) and Azzam (in $\mathbb{R}^n$). In particular, our approach shows that the phenomenon is independent of the linear structure of the space. This is joint work with Riikka Korte.

2. Thursday

Shay Sadovsky, Tel-Aviv University

Title: Introducing "anti-blocking" convex bodies and their applications.

Abstract: Anti-blocking convex bodies, also known as convex corners, are a special class for which some geometric inequalities hold true, i.e. Mahler's conjecture, in the form of Saint-Raymond's inequality. In this talk we will introduce this class of bodies and their unique properties, and from them we will deduce new inequalities for volume and mixed volume. Based on a joint work with Shiri Artstein-Avidan and Raman Sanyal.

Uri Grupel, University of Innsbruk

Title: Intersections with random geodesics in high dimensions

Abstract: Given a large subset of the sphere $A \subseteq S^{n-1}$ does the ratio of lengths between a random geodesic Γ and the intersection $\Gamma \cap A$ represent the size of A or does it tend to a zero-one law (as the dimension grows)? We will show that for any large set A we have a distribution that is not concentrated around neither zero nor one.

In contrast to the case of the sphere, for any convex body in high dimensions, we can find a subset, of half the volume, such that the ratio of lengths between the intersection of the random geodesic with the convex body and the intersection of the subset with the random geodesic will be close to zero-one law.

The analysis of the two cases has different flavors. For the sphere we analyze the singular values of the Radon transform, in order to bound the variance of the length of the random intersection. For convex bodies, we use concentration of measure phenomena.

The results on the sphere can be generalized to the discrete torus or to intersection on the sphere with higher dimensional subspaces.

Kateryna Tatarko, University of Alberta

Title: A Steiner formula in the L_p Brunn-Minkowski theory.

Abstract: The classical Steiner formula is one of the central parts of the Brunn-Minkowski theory. It expresses the volume of the parallel body $K + tB_2^n$ of a convex body K with Euclidean ball B_2^n as a polynomial in the parameter t, where the intrinsic volumes arise as the coefficients of this polynomial.

The L_p Brunn-Minkowski theory is an extension of the classical Brunn-Minkowski theory which rapidly evolved over the past years. It centers around the study of affine invariants associated with convex bodies. One of the main objects in the L_p Brunn-Minkowski theory is the L_p *affine surface area*.

In this talk, we present an analogue of the classical Steiner formula for the L_p affine surface area for any real parameter p. This new Steiner type formula includes the classical Steiner formula and the Steiner formula from the dual L_p Brunn-Minkowski theory as special cases. We introduce the coefficients in our new Steiner type formula which we call the L_p Steiner coefficients.

Luis Carlos Garcia Lirola, Kent State University

The goal of this paper is to study geometric and extremal properties of the unit ball Lipschitz-free Banach space associated with a finite metric space M. In particular we discuss the extreme properties of its volume product. We show that if the volume product of M is maximal among all the metric spaces with the same number of points, then all triangle inequalities in M are strict and the ball is simplicial.

We also focus on the metric spaces minimizing the volume product, and in the Mahler's conjecture for this class of convex bodies. This is part of a joint work with M. Alexander, M. Fradelizi and A. Zvavitch.

Oscar Zatarain-Vera, Kent State University

Title: A vector-contraction inequality for Rademacher complexities using p-stable variables.

Abstract: Andreas Maurer in the paper ?A vector-contraction inequality for Rademacher complexities? extended the contraction inequality for Rademacher averages to Lipschitz functions with vector-valued domains; He did it replacing the Rademacher variables in the bounding expression by arbitrary idd symmetric and sub-gaussian variables. We will see how to extend this work when we replace sub-gaussian variables by p-stable variables.