

## SCHEDULE, TITLE & ABSTRACT

### Tentative Schedule

**December 19, 2018**

Registration

**December 20, 2018**

Chair: Zhou, Jiazuo

9:00 - 9:10 Openning Remark;

Chair: Zong, Chuanming

9:10 - 9:40 Xiao, Jie

Title: Another look at Stein-Weiss  $H$  ( $p > 1$ )-inequality

9:45 - 10:15 Zheng, Bentuo

Title: Commutators in the Spaces of Bounded Linear Operators on Classical Banach Spaces

10:20 - 10:50 Group Photo, Tea break

Chair: Ye, Deping

10:50 - 11:20 Ge, Jianquan

Title: Recent progress on DDVV-type inequalities

11:25 - 11:55 Wang, Zuoqin

Title: Spectral geometry of toric manifolds

12:00 - 14:00 Lunch break

Chair: Zheng, Bentuo

14:10 - 14:40 Li, Aijun

Grassmannian Loomis-Whitney inequality and its dual inequality

14:45 - 15:15 Zhang, Ning

Title: Generalizations of Grunbaums inequality

15:20 - 15:50 Li, Ben

Title: The Löwner function for a log-concave function

15:50 - 16:20 Tea break

Chair: Xiao, Jie

16:20 - 16:50 Ma, Dan

Title: Moment matrix and  $SL(n)$  equivariant valuations on polytopes

16:55 - 17:25 Lin, Youjiang

Title: Affine Orlicz Polya-Szego principles and the cases of equality

17:30 - 18:00 Hu, Jiaqi

Title: A new geometric functional and its associated affine isoperimetric inequalities

18:10 - 19:50 Banquet

**December 21, 2018**

Chair: Feng, Huitao

8:20 - 8:50 Huang, Yong

Title: Geometric flows to Minkowski problems

8:55 - 9:25 Wu, Senlin

Title: Covering and illumination of convex bodies

9:30 - 10:00 Xi, Dongmeng

Title: On the Orlicz Minkowski problem

10:00 - 10:20 Tea break

Chair: Xiong, Ge

10:20 - 10:50 Yuan, Liping

Title: On some properties of convex bodies

10:55 - 11:25 Wang, Hejun

Title: Uniqueness and continuity of the solution to the  $L_p$  dual Minkowski problem

11:30 - 12:00 Zeng, Chunna

Title:  $SL(n)$  covariant vector valuations on polytopes

12:10 - 14:00 Lunch break

Chair: Suh, Y-J.

14:10 - 14:40 Mo, Xiaohuan

Title: Finsler warped product metrics

14:45 - 15:15 Kim, Gyu Jong

Title: Hypersurfaces in the complex quadric with normal Jacobi operator of Codazzi type

15:20 - 15:50 Pyo, Juncheol

Title: Solitons for the mean curvature flow and inverse mean curvature flow

15:50 - 16:10 Tea break

Chair: Liu, Huili

16:10 - 16:40 Woo, Changhwa

Title: Extremal hypersurface constrained elasticae in Lorentzian space forms

16:45 - 17:15 Lee, Hyunjin

Title: Generalized parallelism for the shape operator of a real hypersurface in the complex quadric

17:20 - 17:50 Zou, Du

Title: The  $L_p$  Minkowski problem for capacity

18:00 Dinner

### **December 22, 2018**

Chair: Leng, Gangsong

8:30 - 9:00 Li, Jin

Title: The Laplace transform and valuations

9:05 - 9:35 Fang, Niufa

Title: Petty projection body of log-concave functions

9:40 - 10:10 Wang, Tuo

Title: TBA

10:10 - 10:30 Tea break

Chair: Wu, Senlin

10:30 - 11:00 Zhu, Baocheng

Title: On the polar Orlicz-Minkowski problems

11:05 - 11:35 Xu, Wenxue

Title TBA

11:40 - 12:10 Ye, Deping

Title: The general dual Orlicz-Minkowski problem for discrete measure

12:10 Closing remark

12:10 Lunch

13:00 Free afternoon

### **December 23, Departure**

## Title & Abstract

- Speaker: Dr. Niufa Fang
  - **Title:** Petty projection body of log-concave functions
  - **Author(s):** Niufa Fang (Nankai University, China)
  - **Abstract:** In this talk, we will present a new connection between convex geometry and analysis. For any given log-concave function, we define a new log-concave function, that is, the functional Petty projection body. The functional Petty projection body inherits almost all properties of the classical Petty projection body, such as, Petty projection inequality, Loomis-Whitney inequality, affine invariant,  $SL(n)$  contravariant valuation and etc.. This is a joint work with Prof. Jiazuo Zhou.
  
- Speaker: Prof. Jianquan Ge
  - **Title:** Recent progress on DDVV-type inequalities
  - **Author(s):** Jianquan Ge (Beijing Normal University, China)
  - **Abstract:** Recently we generalize the known DDVV-type inequalities for real (skew-) symmetric and complex (skew-)Hermitian matrices into arbitrary real, complex and quaternionic matrices. Inspired by the Erdős-Mordell inequality, we establish DDVV-type inequalities for matrices in the subspaces spanned by a Clifford system or a Clifford algebra. We also generalize the Bottcher-Wenzel inequality to quaternionic matrices. In this talk, we will briefly introduce the background, the new progress above, and some open questions.
  
- Speaker: Dr. Jiaqi Hu
  - **Title:** A new geometric functional and its associated affine isoperimetric inequalities
  - **Author(s):** Jiaqi Hu (Fudan University, China)
  - **Abstract:** In this talk, we will speak on our new introduced affine invariant geometric functional for convex polytopes. Some new sharp affine isoperimetric inequalities are established for this new functional, which are extensions of Lutwak-Yang-Zhang's results on their celebrated cone-volume functional (E. Lutwak, D. Yang, G. Zhang, Trans. Amer. Math. Soc. 353 (2001) 1767-1779).
  
- Speaker: Prof. Yong Huang
  - **Title:** Geometric flows to Minkowski problems
  - **Author(s):** Yong Huang (Hunan University, China)
  - **Abstract:** In this talk, we recall how to solve Minkowski problems by using geometric flows, such as Gauss curvature flow. In particular, a recent joint work, the regularity of  $L_p$  dual Minkowski problem with Chuanqiang Chen, Yiming Zhao will be particularly discussed.
  
- Speaker: Dr. Hyunjin Lee
  - **Title:** Generalized parallelism for the shape operator of a real hypersurface in the complex quadric
  - **Author(s):** Hyunjin Lee and Young Jin Suh (Kyungpook National University, Korea)

- **Abstract:** In this talk, we will consider the complex quadric  $Q^m = SO_{m+2}/SO_mSO_2$  as a kind of Hermitian symmetric space with rank 2 of compact type, which is a complex hypersurface in complex projective space  $\mathbb{C}P^m$ . And it can be regarded as a kind of real Grassmann manifold of compact type with rank 2. Accordingly, the complex quadric admits both a complex conjugation structure  $A$  and a Kähler structure  $J$ , with anti-commutes with each other. By using these structures of the ambient space we give some characterizations for a real hypersurface  $M$  in  $Q^m$  with respect to the generalized parallelism for the shape operator of  $M$ , which named  $\eta$ -parallelism and cyclic parallelism, respectively.

□ Speaker: Prof. Aijun Li

- **Title:** Grassmannian Loomis-Whitney inequality and its dual inequality
- **Author(s):** Aijun Li (Henan Polytechnic University, China)
- **Abstract:** Based on reverse isoperimetric inequalities on Grassmann manifolds, the Grassman Loomis-Whitney inequality and its dual inequality are established, which provide a lower bound of the volume of a convex body in terms of its lower dimensional sections.

□ Speaker: Prof. Ben Li

- **Title:** The Löwner function for a log-concave function.
- **Author(s):** Ben Li (Tel Aviv University, Israel)
- **Abstract:** In this talk we introduce the notion of Löwner (ellipsoid) function  $L(f)$  for log concave function  $f$ . It is a dual notion to the John ellipsoid function which is introduced recently. The duality will be established and if time permitting, some recent progress on affine invariant function mapping will be elaborated.

□ Speaker: Dr. Jin Li

- **Title:** The Laplace transform and valuations.
- **Author(s):** Jin Li (Vienna University of Technology, Austria)
- **Abstract:** Following the idea of F. Kleins Erlangen program, we can say that the theory of valuations is the study of the invariance of valuations (finitely additive measures) under geometric transformations. Systematically starting from the Hadwiger theorem, many valuations were studied with respect to different type of geometric transformations, e.g., translation, rotation, unitary, spin group and affine transformations. Although the earliest studied valuations (volumes and Dehns invariant) are functionals from polytopes to real numbers, many interesting valuations are functionals on other domains and having different ranges. For example, valuations on convex bodies, star bodies and function spaces; and valuations taking values in tensors, convex bodies and measures. In this talk, I will talk about valuations as transformations between functions and show that the Laplace transform is the essentially unique valuation fulfilling a type of affine invariance which maps the Lebesgue space to continuous functions. This talk is based on the joint work with Dan Ma.

□ Speaker: Prof. Youjiang Lin

- **Title:** Affine Orlicz Polya-Szego principles and the cases of equality.

- **Author(s):** Youjiang Lin (Chongqing Technology and Business University, China)
  - **Abstract:** The conjecture about Orlicz Polya-Szego principle given in [Y. Lin, JFA,2017] is established. The cases of equality are analyzed in affine Orlicz Polya-Szego principles with respect to Steiner symmetrization and Schwarz spherical symmetrization.
- Speaker: Dr. Gyu Jong Kim
- **Title:** Hypersurfaces in the complex quadric with normal Jacobi operator of Codazzi type
  - **Author(s):** Imsoon Jeong (Pai Chai University, Korea), Gyu Jong Kim (Woosuk University, Korea), and Young Jin Suh (Kyungpook National University, Korea)
  - **Abstract:** We introduce the notion of normal Jacobi operator of Codazzi type for real hypersurfaces in the complex quadric. The normal Jacobi operator of Codazzi type implies that the unit normal vector field  $N$  becomes  $\mathfrak{A}$ -principal or  $\mathfrak{A}$ -isotropic. Then we give a complete classification of Hopf real hypersurfaces in the complex quadric with normal Jacobi operator of Codazzi type.
- Speaker: Prof. Dan Ma
- **Title:** Moment matrix and  $SL(n)$  equivariant valuations on polytopes
  - **Author(s):** Dan Ma (Shanghai Normal University, China)
  - **Abstract:** All  $SL(n)$  equivariant symmetric matrix valued valuations on convex polytopes in  $R^n$  are completely classified without any continuity assumptions. The unique ones turn out to be the moment matrices corresponding to the classical Legendre ellipsoid and the isotropic position.
- Speaker: Prof. Xiaohuan Mo
- **Title:** Finsler warped product metrics
  - **Author(s):** Xiaohuan Mo (Peking University, China)
  - **Abstract:** In this lecture we discuss the warped structures of Finsler metrics. We obtain the differential equation that characterizes the Finsler warped product metrics with vanishing Douglas curvature. By solving this equation, we obtain all Finsler warped product Douglas metrics. Some new Douglas Finsler metrics of this type are produced by using known spherically symmetric Douglas metrics. We also refine and improve Chen-Shen-Zhao equations characterizing Finsler warped product metrics of scalar ag curvature. In particular, we find equations that characterize Finsler warped product metrics of constant ag curvature. Finally we improve Chen-Shen-Zhao result on characterizing Einstein Finsler warped product metrics. As its application we construct explicitly many new warped product Douglas metrics of constant Ricci curvature by using known locally projectively at spherically symmetric metrics of constant flag curvature.
- Speaker: Prof. Juncheol Pyo
- **Title:** Solitons for the mean curvature flow and inverse mean curvature flow
  - **Author(s):** Juncheol Pyo (Pusan National University, Korea)

- **Abstract:** Self-similar solutions and translating solitons are not only special solutions of mean curvature flow (MCF) but a key role in the study of singularities of MCF. They have received a lot of attention. We introduce some new examples of self-similar solutions and translating solitons for the mean curvature flow (MCF) and give rigidity results of some of them. We also investigate self-similar solutions and translating solitons to the inverse mean curvature flow (IMCF) in Euclidean space.

□ Speaker: Mr. Hejun Wang

- **Title:** Uniqueness and continuity of the solution to the  $L_p$  dual Minkowski problem
- **Author(s):** Hejun Wang (Southwest University, China)
- **Abstract:** In this talk, we will briefly review the development of the Minkowski problem in integral geometry and convex geometric analysis. Recently, Lutwak-Yang-Zhang(Adv. Math.,2018) posed the  $L_p$  dual Minkowski problem, also called the  $(p, q)$  Minkowski problem, which unifies the  $L_p$  Minkowski problem, the dual Minkowski problem and the  $L_p$  Aleksandrov problem. The part results for the existence and uniqueness of the solution to the  $L_p$  dual Minkowski problem have been obtained. We will further discuss uniqueness and continuity of the solution to the dual Minkowski problem. This is a joint work with Prof. Jiazuo Zhou.

□ Speaker: Prof. Zuoqin Wang

- **Title:** Spectral geometry of toric manifolds
- **Author(s):** Zuoqin Wang (University of Science and Technology of China, China)
- **Abstract:** Delzant polytopes are very special convex polytopes, but they play a very important role in differential geometry: they are in one-to-one correspondence with toric manifolds (which are symplectic manifolds with maximal toric symmetry), and most geometric information of toric manifolds can be obtained from the polytope data. In this talk I will explain how the polytope structure can be used to study the eigenvalues of Laplace-type operators on toric manifolds.

□ Speaker: Prof. Changhwa Woo

- **Title:** Extremal Hypersurface constrained elasticae in Lorentzian space forms
- **Author(s):** Changhwa Woo (Woosuk University, Korea), Óscar J. Garay (University of the Basque Country UPV/EHU, Spain)
- **Abstract:** We study geodesics in hypersurfaces of a Lorentzian space, which are critical curves of the bending energy functional, for variations constrained to lie on the hypersurface. We characterize critical geodesics showing that they live fully immersed in a totally geodesic and that they must be of three different types. Finally, we consider the classification of surfaces in the Minkowski 3-space foliated by critical geodesics.

□ Speaker: Prof. Senlin Wu

- **Title:** Covering and illumination of convex bodies
- **Author(s):** Senlin Wu (North University of China, China)

- **Abstract:** Hadwiger's covering conjecture is a long-standing open problem in Discrete and Convex geometry asserting that each  $n$ -dimensional convex body which is not affinely equivalent to the  $n$ -cube can be covered by  $2^n - 1$  of its smaller homothetic copies. We present several of our recent results in this direction.

□ Speaker: Dr. Dongmeng Xi

- **Title:** On the Orlicz Minkowski problem
- **Author(s):** Dongmeng Xi (Shanghai University, China)
- **Abstract:** The Orlicz Minkowski problem was proposed by Haberl, Lutwak, Yang & Zhang in 2010, and they dealt with the even measures. We demonstrate the existence part of the discrete Orlicz Minkowski problem, which is a non-trivial extension of the discrete  $L_p$  Minkowski problem for  $0 < p < 1$ .

□ Speaker: Prof. Jie Xiao

- **Title:** Another look at Stein-Weiss  $H$  ( $p > 1$ )-inequality
- **Author(s):** Jie Xiao (Memorial University of Newfoundland, Canada)
- **Abstract:** Based on a joint work with Liguang Liu at Renmin University of China, this talk will address an intrinsic nature of the Stein-Weiss  $H$  ( $p > 1$ )-inequality in harmonic analysis via the geometric embedding and dual principles induced by Riesz's singular integral. Interestingly, we find a fractional Adams inequality with the sharp constant.

□ Speaker: Prof. Deping Ye

- **Title:** The general dual Orlicz-Minkowski problem for discrete measures
- **Author(s):** Deping Ye (Memorial University of Newfoundland, Canada)
- **Abstract:** The dual Minkowski problems were initiated by Huang, Lutwak, Yang and Zhang (Acta Mathematica, 2016) and were extended to the dual  $L_p$  Minkowski problems by Lutwak, Yang and Zhang (Adv. Math., 2018). These Minkowski problems bring extra ingredients to the extensively studied  $L_p$  Minkowski problems and hence received considerable attention.

In this talk, I will present our recent progress on the general dual Orlicz-Minkowski problem, a nontrivial extension of the dual  $L_p$  Minkowski problems involving two Orlicz functions  $G$  and  $\psi$ . That is, *for which nonzero finite Borel measures  $\mu$  on  $S^{n-1}$  and continuous functions  $G$  and  $\psi$ , do there exist a constant  $\tau \in \mathbb{R}$  and a convex body  $K$  such that  $\mu = \tau \tilde{C}_{G,\psi}(K, \cdot)$ ?* Here  $\tilde{C}_{G,\psi}(K, \cdot)$  is the finite signed Borel measure. In particular, solutions to the general dual Orlicz-Minkowski problem for discrete measures will be provided.

□ Speaker: Prof. Liping Yuan

- **Title:** On some properties of convex bodies
- **Author(s):** Liping Yuan (Hebei Normal University, China)
- **Abstract:** We say that a convex body  $C$  has the *Rupert property* if we can make a hole large enough in  $C$  to permit another copy of  $C$  to pass through.

Let  $\mathcal{F}$  be a family of sets in  $\mathbb{R}^d$ . A set  $M \subset \mathcal{F}$  is called  *$\mathcal{F}$ -convex* if for any pair of distinct points  $x, y \in M$ , there is a set  $F \in \mathcal{F}$  such that



$x, y \in F$  and  $F \subset M$ . A family  $\mathcal{F}$  of compact sets is called *complete* if  $\mathcal{F}$  contains all compact  $\mathcal{F}$ -convex sets. A convex body  $K$  is called *selfish*, if the family  $\mathcal{F}_K$  of all convex bodies similar to  $K$  is complete.

In this talk we'll discuss the Rupert property and selfishness of some convex bodies.

□ Speaker: Prof. Ning Zhang

- **Title:** Generalizations of Grunbaums inequality
- **Author(s):** Ning Zhang (Huazhong University of Science and Technology, China)
- **Abstract:** Consider a convex body  $K$  with its centroid at the origin. Grunbaums inequality bounds the volume of half-space section from below by  $1/e$  times the volume of  $K$ . In this talk, we will discuss several recent extensions of this inequality, including our joint work with Matthew Stephen and Sergii Myroshnychenko where we establish a “Grunbaums inequality for projections” and a “Grunbaums inequality for sections”.

□ Speaker: Prof. Chunna Zeng

- **Title:**  $SL(n)$  covariant vector valuations on polytopes
- **Author(s):** Chunna Zeng (Chongqing Normal University, China)
- **Abstract:** In this talk, we will focus on the  $SL(n)$  covariant vector valuations on polytopes. All  $SL(n)$  covariant vector valuations on convex polytopes in  $R^n$  are completely classified without any continuity assumptions. The moment vector turns out to be the only such valuation if  $n \geq 3$  while two new functions show up in dimension two. This is a joint work with D. Ma.

□ Speaker: Prof. Bentuo Zheng

- **Title:** Commutators in the Spaces of Bounded Linear Operators on Classical Banach Spaces
- **Author(s):** Bentuo Zheng (University of Memphis, USA)
- **Abstract:** In this talk, we will give an introduction of commutators in Banach algebras of the form  $L(X)$  where  $L(X)$  is the space of bounded linear operators on a Banach space  $X$ . Historical results and recent developments will be presented. Intrinsic characterizations of commutators will be given and open problems will be posted.

□ Speaker: Prof. Baocheng Zhu

- **Title:** On the polar Orlicz-Minkowski problems
- **Author(s):** Baocheng Zhu (Hubei University for Nationalities, China)
- **Abstract:** We will talk about the polar Orlicz-Minkowski problems: under what conditions on a nonzero finite measure  $\mu$  and a continuous function  $\phi$  from  $(0, \infty)$  to  $(0, \infty)$  there exists a convex body  $K \in \mathcal{K}_o$  such that  $K$  is an optimizer of the following optimization problems:

$$\inf/\sup_{\|L^*\|=\omega_n} \left\{ \int_{S^{n-1}} \phi(h_L) d\mu : L \in \mathcal{K}_o \right\}.$$

The solvability of the polar Orlicz-Minkowski problems is discussed under different conditions. In particular, under certain conditions on  $\phi$ , the existence of a solution is proved for a nonzero finite measure  $\mu$  on unit sphere  $S^{n-1}$  which is not concentrated on any hemisphere of  $S^{n-1}$ .

□ Speaker: Prof. Du Zou

- **Title:** The  $L_p$  Minkowski problem for capacity
- **Author(s):** Du Zou (Wuhan University of Science and Technology, China)
- **Abstract:** Existence and uniqueness of the solution to the  $L_p$  Minkowski problem for capacity are proved when  $p > 1$ . These results are nonlinear extensions of the very recent solution to the Minkowski problem for capacity by Jerison, CNSXYZ, and AGHLV. This is the work joint with Ge Xiong.

### Colloquium Talk

15:00 - 17:30, December 19, 2018

- Speaker: Professor Jie Xiao (Memorial University of Newfoundland, Canada)
  - **Title:** Commutators in the Spaces of Bounded Linear Operators on Classical Banach Spaces
  - **Time:** 15:00 - 16:00, December 19, 2018
  - **Abstract:** Based on a joint work with Liguang Liu at Renmin University, this talk will address an intrinsic nature of the Stein-Weiss  $H^1$ -inequality in harmonic analysis via the geometric trace and duality principles induced by Riesz's singular integral. Interestingly, we find an improved Fefferman-Stein BMO-decomposition and a unique solution to the Bourgain-Brezis BMO-problem.
  
- Speaker: Professor Young Jin Suh (Kyungpook National University, Korea)
  - **Title:** Isometric Reeb flow and contact hypersurfaces in Hermitian symmetric spaces
  - **Time:** 16:30 - 17:30, December 19, 2018
  - **Abstract:** In this talk, we give a complete classification of real hypersurfaces with isometric Reeb flow in Hermitian symmetric spaces of types (A), (B), (C), (D), and (E). Moreover, we introduce the notion of contact hypersurface in a Kaehler manifold and conjecture a classification of contact real hypersurfaces in Hermitian symmetric spaces.

**Organizing committee:**

**Honorable Chair:** Delin Ren, Wuhan University of Science and Technology, China

**Chair:** Weiping Zhang, Chern Institute of Mathematics, China

Huitao Feng, Chern Institute of Mathematics, China

Gangsong Leng, Shanghai University, China

Ge Xiong, Tongji University, China

Deping Ye, Memorial University of Newfoundland, Canada

Gaoyong Zhang, New York University, USA

Jiazu Zhou, Southwest University, China

Chuanming Zong, Peking University and Tianjin University, China