Geometric Capacity Analysis
Analyse géométrique de capacité
(Org: **Liguang Liu** (Renmin University of China) and/et **Jie Xiao** (Memorial))

RYAN GIBARA, Concordia University
Accessible parts of the boundary for domains in metric measure spaces

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.

GUIXIANG HONG, Wuhan University
Pointwise convergence of noncommutative Fourier series

This paper is devoted to the study of convergence of Fourier series for nonabelian groups and quantum groups. It is well-known that a number of approximation properties of groups can be interpreted as some summation methods and mean convergence of associated noncommutative Fourier series. Based on this framework, this work studies the refined counterpart of pointwise convergence of these Fourier series. We establish a general criterion of maximal inequalities for approximative identities of noncommutative Fourier multipliers. As a result we prove that for any countable discrete amenable group, there exists a sequence of finitely supported positive definite functions tending to 1 pointwise, so that the associated Fourier multipliers on noncommutative L_p-spaces satisfy the pointwise convergence for all $1 < p < \infty$. In a similar fashion, we also obtain results for a large subclass of groups (as well as discrete quantum groups) with the Haagerup property and weak amenability. We also consider the analogues of Fejer means and Bochner-Riesz means in the noncommutative setting. Our results in particular apply to the almost everywhere convergence of Fourier series of Lp-functions on non-abelian compact groups. On the other hand, we obtain as a byproduct the dimension free bounds of noncommutative Hardy-Littlewood maximal inequalities associated with convex bodies. As an ingredient, our proof also provides a refined version of Junge-Le Merdy-Xu's square function estimates $H_p(\mathcal{M}) \simeq L_p(\mathcal{M})$ when $p \to 1$.

RITVA HURRI-SYRJÄNE, University of Helsinki, Finland
On the fractional capacity

The goal of my talk is to address some questions related to the fractional capacity. In particular, I will discuss the characterization of the fractional Hardy inequalities in unbounded John domains. My talk is based on joint work with Antti Vähäkangas.

ROBERT JERRARD, University of Toronto

DAMIR KINZEBULATOV, Université Laval
Heat kernel of fractional Laplacian with Hardy drift via desingularizing weights

We establish sharp two-sided bounds on the heat kernel of the fractional Laplacian, perturbed by a drift having critical-order singularity, using the method of desingularizing weights.

This is joint work with Yu.A.Semenov and K.Szczypkowski.

LIGUANG LIU, Renmin University of China
Restricting Riesz potentials

We will talk about some recent progess on the restricting Riesz-Hardy/Morrey/Besov potentials and their applications to obtaining the regularity of dual solutions to certain fractional PDEs. These results are jointed work with Professor Jie Xiao.

ROBERT MCCANN, University of Toronto
Isodiametry and geometric variance bounds

Among probability measures on $\mathbf{R}^n$ which take their values in a set of unit diameter, we show the variance around the mean is maximized precisely by those measures which assign mass $1/(n+1)$ to each vertex of a (unit-diameter) regular simplex (i.e. an equilateral triangle in two dimensions and regular tetrahedron in three). This provides sharp generalizations of variance bounds by Popoviciu (1935) and Bhatia-Davis (2000) from $n = 1$ to higher dimensions.

Based on `https://arxiv.org/abs/1907.13593` and work in progress with Tongseok Lim.

NGUYEN CONG PHUC, Louisiana State University
Characterizations of predual spaces to a class of Sobolev multiplier type spaces

We characterize preduals and Köthe duals to a class of Sobolev multiplier type spaces. Our results fit well with the modern theory of function spaces of harmonic analysis and are also applicable to nonlinear partial differential equations. We make use of several tools from nonlinear potential theory, weighted norm inequalities, and the theory of Banach function spaces to obtain our results. This talk is based on joint work with Keng Hao Ooi.

ALINA STANCU, Concordia University
A connection between two generalized Minkowski problems

We consider the logarithmic Minkowski inequality which is equivalent to several problems in convex geometric analysis and is still an open problem in dimension greater than two. Among the problems equivalent to the logarithmic Minkowski inequality is the uniqueness of solutions to the logarithmic Minkowski problem. We present yet a new connection to a uniqueness of a Minkowski problem, namely if a given centro-affine Minkowski problem has unique solution (up to special linear group of transformations), then the corresponding logarithmic Minkowski inequality holds.

YUHUA SUN, Nankai University
Global positive solution to a semi-linear parabolic equation with potential on Riemannian manifold

This paper determines when the Cauchy problem

$$\begin{cases} \partial_t u = \Delta u - Vu + Wu^p & \text{in } M \times (0,\infty) \\ u(\cdot,0) = u_0(\cdot) & \text{in } M \end{cases}$$

has no global positive solution on a connected non-compact geodesically complete Riemannian manifold for a given triple (V, W, p). As the principal result of this paper, our theorem optimally extends in a unified way most of the previous results in this subject. Based on joint work with Qingsong Gu, Jie Xiao, and Fanheng Xu.

XIAOMIN TANG, Huzhou University
Schwarz lemma at the boundary on the classical domain of type IV

Let $\mathcal{R}_{\mathcal{IV}}(n)$ be the classical domain of type $\mathcal{IV}$ in $\mathbb{C}^n$ with $n \geq 2$. The purpose of this talk is twofold. The first is to investigate the boundary points of $\mathcal{R}_{\mathcal{IV}}(n)$. We give a sufficient and necessary condition such that the boundary points of $\mathcal{R}_{\mathcal{IV}}(n)$ are

smooth. The second is to establish the boundary Schwarz lemma on the classical domain of type $\mathcal{IV}$. we obtain the optimal estimates of the eigenvalues of the Fréchet derivative for holomorphic self-mappings at the smooth boundary point of $\mathcal{R}_{\mathcal{IV}}(n)$. This is a joint work with Jianfei Wang and TaiShun Liu.

IGOR E. VERBITSKY, University of Missouri

Classes of solutions to quasilinear elliptic equations with sub-natural growth terms

This talk is concerned with various classes of solutions (BMO, $W^{1,r}$, L^r, etc., along with their local counterparts) to quasilinear elliptic equations of the type $-\Delta_p u = \sigma\, u^q + \mu$ for $0 < q < p-1$ in $\mathbf{R^n}$. Here σ, μ are nonnegative functions (or measures), and Δ_p $(1 < p < \infty)$ is the p-Laplacian. We will discuss necessary and sufficient conditions for the existence of solutions, in both capacity and nonlinear potential theory terms, as well as related weighted norm inequalities. Based in part on joint work with Adisak Seesanea (Hokkaido University, Japan).

JIANFEI WANG, Huaqiao University

The high order Schwarz-Pick estimates

The purpose of this talk is twofold. The first is to establish the Schwarz-Pick estimates of partial derivatives of arbitrary order for holomorphic mappings from the unit polydisk into the bounded symmetric domains associated with the Caratheodory metric. The second part is to obtain high order Schwarz-Pick lemma of holomorphic functions from the unit ball into convex domain associated with the hyperbolic metric. This talk is joined work with Prof. Liu,yang, Li, Jincheng and Shi, Qingtian.

SHIHSHU WALTER WEI, The university of Oklahoma

Generalized Harmonic Forms on Noncompact Manifolds and Their Applications

I'll describe the background and current work on the interesting relations between generalized harmonic forms, nonlinear partial differential inequalities for differential forms on noncompact manifolds, conservation laws and geometric applications.

DEPING YE, Memorial University

XIAO ZHONG, University of Helsinki

JIAZU ZHOU, Southwest University / China

Sharp convex mixed Lorentz-Sobolev inequality

A sharp convex mixed Lorentz-Sobolev inequality, the functional version of an L_p Minkowski inequality, is obtained. The new sharp convex mixed Lorentz-Sobolev inequality generalized the sharp convex Lorentz-Sobolev inequality of Ludwig-Xiao-Zhang. This is a joint work with N. Fang, W. Xu and B. Zhu.