Titles and Abstracts

1. Oscar Blasco, University of Valencia, Spain

Title: Matriceal harmonic analysis for matrices with operator entries

Abstract: In this talk, we will consider matrices with entries in the space of operators $\mathcal{B}(H)$, where H is a separable Hilbert space. Recall that a (left) Schur multiplier is a matrix $A = (T_{i,j})$ where $T_{i,j} \in \mathcal{B}(H)$ such that the matrix $A * B = (T_{i,j}S_{i,j})$ defines a bounded operator on $\ell^2(H)$ for any bounded operator on $\ell^2(H)$ given by $B = (S_{i,j})$. We shall consider the classes of matrices that can be approached in the operator norm or in the multiplier norm by matrices with a finite number of diagonals. When restricted to Toeplitz matrices we shall show that they can be identified with the space of continuous functions or certain classes of measures with values in $\mathcal{B}(H)$ respectively. We shall also introduce matriceal versions with operator entries of classical spaces of holomorphic functions such as $H^\infty(\mathbb{D})$, $A(\mathbb{D})$ or $H^1(\mathbb{D})$ when dealing with upper triangular matrices. This is a joint work with Ismael Garcia-Bayona.

2. Zeqian Chen (陈泽乾), Wuhan Institute of Physics and Mathematics, CAS, China

Title: Geometric and topological phases of quantum systems

Abstract: This paper presents universal definitions of geometric and topological phases for any quantum system. The geometric phases are defined for observables relying on the geometry of the observable space, while the topological phases are associated with unitary propagators beyond the time-dependent Hamiltonians, relying neither on translation invariance nor on any gap assumption, which can be extend-ed to a noncyclic evolution. The index of the topological phases are shown to be integer-valued and independent of the time-dependent Hamiltonians.

3. Lixin Cheng (程立新), Xiamen University, China

Title: On inequivalent measures of noncompactness of Banach spaces

Abstract: Let X be a Banach space, and $\mathfrak{B}(X)$ be the collection of all nonempty bounded subsets of X. A function $\mu : \mathfrak{B}(X) \to \mathbb{R}^+$ is said to be a regular measure of noncompactness on X provided it satisfies the following six properties:

(P1) (Noncompactness) $\mu(B) = 0 \Longleftrightarrow B$ is relatively compact;
(P2) (Monotonicity) $\mu(A) \leq \mu(B)$ for all $A \subset B \in \mathfrak{B}(X)$;
(P3) (Convexity invariance) $\mu(\text{co}B) = \mu(B)$, $B \in \mathfrak{B}(X)$;
(P4) (Order invariance) $\mu(A \cup B) = \mu(A) \vee \mu(B)$, $A, B \in \mathfrak{B}(X)$;
(P5) (Subadditivity) $\mu(A + B) \leq \mu(A) + \mu(B)$, $A, B \in \mathfrak{B}(X)$;
(P6) (Absolute homogeneity) $\mu(kB) = |k|\mu(B)$, $k \in \mathbb{F}$, $B \in \mathfrak{B}(X)$.

We say two (regular) measures μ and ν are equivalent if there exist positive numbers α, β so that

$$\alpha\nu(B) \leq \mu(B) \leq \beta\nu(B), \text{ for all } B \in \mathfrak{B}(X).$$

The question that "**whether every pair of (regular) measures of noncompactness is equivalent to each other**" was asked by K. Goebel in 1978. In 1992,

Banaś and Martinón [1] gave first example that the spaces $\ell_p(X)$ admit inequivalent regular measures of noncompactness for a Banach space X of infinite dimension. After stating their original motivation which comes from problems in nonlinear analysis, Mallet-Paret and Nussbaum [2] showed that there exist inequivalent regular measures on a series of classical Banach spaces. They further proposed the "Fundamental Question" that "**for what infinite dimensional Banach spaces X, do there exist inequivalent measures of noncompactness β_1 and β_2 on X?**"
In this talk, we first show a construction theorem of measures of noncompactness. Then we use this theorem to show that every infinite dimensional Banach space admits inequivalent regular measures of noncompactness.

References

[1] J. Banaś, A. Martinón, Measures of noncompactness in Banach sequence spaces Mathematica Slovaca, Vol. 42 (4) (1992), 497-503.

[2] J. Mallet-Paret, R.D. Nussbaum, Inequivalent measures of noncompactness. Ann. Mat. Pura Appl. (4) 190 (3) (2011), 453-488.

4. Qingjin Cheng (程庆进), Xiamen University, China

Title: Sphere equivalence and its applications

Abstract: Two unit spheres of infinite-dimensional Banach spaces are said to be sphere equivalent if there exists a uniform homeomorphism between them. In this talk, we will introduce some sphere equivalence results in literature and some related problems. In particular, we are interested in its applications involving Kasparov-Yus Property (H) and non-coarse embeddings of Banach expanders.

5. Yunbai Dong (董云柏), Wuhan Textile University, China

Title: An optimal linear approximation for a class of nonlinear operators between uniform algebras

Abstract: Assume that A, B are uniform algebras on compact Hausdorff spaces X and Y, respectively. Let $T : A \to B$ be a map (nonlinear in general) satisfying $T(A^{-1}) = B^{-1}$ and $T1 = 1$. We show that if there exist constants $\alpha, \beta \geq 1$ such that $\beta^{-1}\|f \cdot g^{-1}\| \leq \|Tf \cdot (Tg)^{-1}\| \leq \alpha\|f \cdot g^{-1}\|$ for all $f \in A$ and $g \in A^{-1}$, then the Šilov boundaries $\partial A, \partial B$ of A, B are homeomorphic. In fact, there exists a homeomorphism $\tau : \partial B \to \partial A$ such that $(\alpha\beta)^{-1}|f(\tau(y))| \leq |(Tf)(y)| \leq \alpha\beta|f(\tau(y))|$ for all $f \in A$ and for all $y \in \partial B$. Moreover, we give an example which shows that the constant $\alpha\beta$ in the above inequality is the best possible, even when T is a bijection.

6. Nikita Evseev, Sobolev Institute of Mathematics, Russia

Title: Decomposable operators on different L_p-direct integrals

Abstract: Let (T, μ) be a measurable space, and $\mathcal{W} = \{W_t\}_{t\in T}$ be a family of Banach spaces. Consider such functions f, that $f(t) \in W_t$ for any $t \in T$. Define a "norm"

$$\|f\|_{L_p(T,\mathcal{W})} = \left(\int_T \|f(t)\|^p_{W_t}\, d\mu\right)^{\frac{1}{p}}.$$

It turns out that under some assumptions the set of functions with finite norm constitute a Banach space which is called L_p-direct integral (of spaces $\{W_t\}_{t\in T}$) and denoted as $\left(\int_T^{\oplus} W_t\, d\mu\right)_{L_p}$. The direct integral plays a role in group representation theory, it is the infinite-dimensional analogue of the decomposition of a finite-dimensional vector space on which a group acts as a direct sum of irreducible representations. Besides Direct integrals can be used to provide an analogue of the decomposition of a vector space as a direct sum of eigenspaces for operators with continuous spectra. (see [1, 2]).

We explore linear operators on those spaces. As a certain class we are studying decomposable operators. A decomposable operator can be represented as

$$M_F[f](s,t) = P(s,t)[f(t)],$$

where $P(s,t) : W_t \to V_s$ is an operator-valued function and $F \subset S \times T$. Thus we have operator

$$M_F : \left(\int_T^{\oplus} W_t\, d\mu\right)_{L_p} \to \left(\int_F^{\oplus} V_s\, d\lambda\right)_{L_q}.$$

The first natural question to ask is whether this operator bounded.

Theorem 1. *Let measure λ be absolutely continuous with respect to product $\mu \times \nu$. Then the operator M_F, $p \geq q$, is bounded if and only if*

$$\|P(s,t)\| \cdot J^{\frac{1}{q}}(s,t) \in L_{\kappa,q}(F),$$

where $J(s,t) = \frac{d\lambda}{d\mu\times\nu}$ — RadonC-Nikodym derivative.

Surprisingly the methods of proof the above theorem are very close to that for composition operator (see [3]). The developed technique have been used to study bounded operators in mixed norm Lebesgue spaces [4, 5].

References

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[2] M. de Jeu, J. Rozendaal, Disintegration of positive isometric group representations on L^p-spaces. Positivity **21**(2), 673–710 (2017).

[3] S. Vodop'yanov and A. Ukhlov, Set functions and their applications in the theory of Lebesgue and Sobolev spaces. I., Sib. Adv. Math. **14**(4), 78–125 (2004).

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7. Uwe Franz, University of Franche-Comté, France

Title: Invariant states on the Brown algebra

Abstract: Denote by $C(U_n^{\mathrm{dual}})$ the universal C*-algebra generated by the coefficients of a $n \times n$ unitary $U = (u_{jk})_{1\leq j,k\leq n}$. Voiculescu showed that this algebra can be equipped with the structure of a dual group and Cébron and Ulrich studied its properties from a quantum probabilistic viewpoint. In particular, they defined convolution products associated to the five universal notions of independence (tensor, free, monotone, boolean, and anti-monotone) for states on $C(U_n^{\mathrm{dual}})$. Cébron and Ulrich showed

that there exists so-called *tensor and free Haar traces*, i.e. tracial states that are invariant under tensor or free convolution with other tracial states. In my talk I will introduce a family of automorphism groups on $C(U_n^{\mathrm{dual}})$ and I will show that for each of these automorphism groups there exists a tensor and a free Haar KMS-state, i.e. a state satisfying a KMS property that is invariant under tensor or free convolution with any other state satisfying the same KMS property. This leads to a new family of reduced versions of the Brown algebra.

This talk is based on joint work with Guillaume Cébron and Michaël Ulrich.

8. Yongqiang Fu (付永强), Harbin Institute of Technology, China

Title: Young measures in variable exponent spaces and applications to elliptic and parabolic systems with variable growth

Abstract: In this talk, we give some conclusions of Young measures in variable exponent spaces. By means of Young measures and the theory of variable exponent Sobolev spaces, we obtain the existence of solutions for quasilinear elliptic and parabolic systems in divergence form with variable growth.

9. Qi Guo (国起), Suzhou University of Science and Technology, China

Title: Monotone translation-projection covariant Minkowski valuations

Abstract: In this talk, we give first a brief introduction to the achievements on Minkowski valuations compatible with the transformation group $\mathrm{GL}(n), \mathrm{O}(n), \mathrm{SO}(n)$ etc. Then, we discuss the MInkowski valuations compatible with the translation transformation group, in particular, we show that, under some conditions, monotone translation-projection covariant Minkowski valuations are exactly orthogonal projects, which gives a characteristic of the orthogonal projects as valuations on Euclidean spaces. This is a joint work with Yun Xu.

10. Tiexin Guo (郭铁信), Central South University, China

Title: Two fixed point theorems in complete random normed modules

Abstract: We prove two fixed point theorems in complete random normed modules,which are random respectively the generalizations of classical Banach contraction mapping principle Browder-Kirk's fixed piont theorem.Then we gives their applications to backward stochastic equations and random fixed point theorems of random non-expansive mappings.

11. Fei He (贺飞), Inner Mongolia University, China

Title: Unified views on several fixed point theorems

Abstract: In this talk, we give unified methods of several fixed point theorems.

1. In b-metric space, we establish a fixed point result for cyclic φ-contractions, which unifies and generalizes several fixed point theorems for nonlinear contractions.

2. In metric space, we establish a fixed point result of Geraghty-Ćirić type, which unifies classical fixed point theorems of Ćirić type and Geraghty type.

3. We introduce the concept of fuzzy b-metric spaces, which is the generalization of fuzzy metric spaces and b-metric spaces. In such spaces, we establish several fixed point theorems for nonlinear contractions.

12. Guixiang Hong (洪桂祥), Wuhan University, China

Title: Vector-valued Littlewood-Paley theory and variational inequalities

Abstract: In this talk, I shall present some of my recent works on vector-valued inequalities. We first develop a vector-valued Littlewood-Paley theory in harmonic analysis based on the work by Martinez-Torrea-Xu. Using this theory, we are able to characterize the martingale cotype properties of Banach space via vector-valued variational inequalities associated with semigroups which solved one problem left in the work by Hong-Ma. Also, we give a characterization of geometric properties of Banach space in terms of variational estimates of vector-valued Hilbert transform. Finally, a dimension free UMD lattice-valued variational inequalities has also been found. This talk is based on joint works with Danqing He, Tao Ma, Wei Liu

13. Yi Huang (黄益), Nanjing Normal University, China

Title: Operator Theory on Tent Spaces

Abstract: In this talk we shall give a summary on Operator Theory on Tent Spaces recently established by Auscher and collaborators. Some harmonic and functional analysis techniques for solving boundary value elliptic and parabolic problems will be discussed. In particular, we present a Calderón-Zygmund type machinery concerning the extrapolation theory for the singular integral operators on tent spaces. For maximal regularity operators on tent space, we give some optimal results by exploiting the structure of convolution integral operators and by using the off-diagonal decay estimates of the underlying semigroup or resolvent family. In the end we apply the previous harmonic and functional analysis techniques to estimate on tent spaces certain evolutionary integral operators arisen from the study of boundary value elliptic problems and first order non-autonomous systems.

14. Yong Jiao (焦勇), Central South University, China

Title: Noncommutative good-λ inequalities

Abstract: We propose a novel approach in noncommutative probability, which can be regarded as an analogue of good-λ inequalities from the classical case due to Burkholder and Gundy (Acta Math **124**: 249-304, 1970). This resolves a longstanding open problem in noncommutative realm. Using this technique, we present new proofs of noncommutative Burkholder-Gundy inequalities, Stein's inequality, Doob's inequality and L^p-bounds for martingale transforms; all the constants obtained are of optimal orders. The approach also allows us to investigate the noncommutative analogues of decoupling techniques and, in particular, to obtain new estimates for noncommutative martingales with tangent difference sequences and sums of tangent positive operators. These in turn yield an enhanced version of Doob's maximal inequality for adapted sequences and a sharp estimate for a certain class of Schur

multipliers. We expect the method to be useful in other settings as well. This is a joint work with A. Osekowski and L. Wu.

15. Lei Li (李磊), Nankai University, China

Title: Separable universal Banach lattices

Abstract: I will talk about the construction of separable universal injective and projective lattices for the class of all separable Banach lattices. This is the joint work with Denny H. Leung, Timur Oikhberg and Mary A. Tursi.

16. Haiying Li (李海英), Henan Normal University, China

Title: Convexities of some integral means for analytic functions

Abstract: In this talk, we first prove that the Gaussian integral means of $f : \mathbb{C} \longmapsto \mathbb{C}$ (with respect to the area measure $e^{-\alpha|z|^2} dA(z)$) is a convex function of r from $(0, \infty)$ when $\alpha \leq 0$. We then obtain that the weighted integral means $A_{\alpha,\beta}(f, r)$ and $L_{\alpha,\beta}(f, r)$ of the mixed area and the mixed length of $f(r\mathbb{D})$ and $\partial f(r\mathbb{D})$, respectively, also have the property of convexity in the case of $\alpha \leq 0$. Moreover, we show with examples that the range $\alpha \leq 0$ is the best possible. Finally, we investigate a kind of logarithmic convexity of area integral means for some different analytic functions.

17. Youjiang Lin (蔺友江), Chongqing Technology and Business University, China

Title: Affine Orlicz Pólya-Szegö principle for log-concave functions

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

18. Rui Liu (刘锐), Nankai University, China

Title: Bases, frames, and dilations of operator-valued measures on Banach spaces

Abstract: This talk is on the intersection topics between functional analysis and applied harmonic analysis: We introduce the concept of (Schauder) frames for Banach and operator spaces, show the connection with the bounded approximation property and complemented embedding, and give the duality theorems for frames and associated basis in reflexive Banach spaces. A general dilation theory of operator-valued measures and frames for Banach spaces is motivated by the observation that there is a connection between the analysis of dual pairs of frames (both the discrete and the continuous theory) and the dilation theory of operator-valued measures on Banach spaces. As a continuation of our recent work, we show that every operator-valued system of imprimitivity with a projective isometric group representation has dilation to a spectral system of imprimitivity acting on a larger Banach space, and also prove that every operator-valued measure with bounded p-variation can be dilated to a projection-valued measure with the same variation property on a larger Banach space.

19. Chunyan Liu (刘春燕), Shanghai University of Engineering Science, China

Title: Convexity and smoothness and continuity of generalized metric projections in Banach spaces

Abstract: Let $\mathcal{P}$ be the family of all proximinal subsets of a Banach space X. Let $P : (X, \mathcal{P}) \to 2^X$ be the mapping defined as $P(x, A) = P_A(x) = \{a \in A : \|x - a\| = d(x, A)\}$ for any $(x, A) \in (X, \mathcal{P})$, where P_A is the metric projection on X and $P : (X, \mathcal{P}) \to 2^X$ is clearly a generalization of the metric projection. The mapping P is said to be (resp. weakly) upper semi-continuous at $(x, A) \in (X, \mathcal{P})$ in the Hausdorff sense if, for any (resp. weakly) open set $W \supset P_A(x)$, any $\{x_n\}_{n=1}^{\infty} \subset X$ with $x_n \to x$ and any sequence $\{A_n\}_{n=1}^{\infty} \subset \mathcal{P}$ with $A_n \xrightarrow{H} A$, there exists a $N \in \mathbb{N}$ such that $P_{A_n}(x_n) \subset W$ for any $n > N$.

In this talk, the relations among convexity, smoothness and continuity of generalized metric projection $P : (X, \mathcal{P}) \to P_A(x)$ are discussed. We prove that (1) if X is a nearly strongly convex (resp. nearly very convex) space, then the mapping $P : (X, \mathcal{P}) \to 2^X, P(x, A) = P_A(x)$ is (resp. weakly) upper semi-continuous in the Hausdorff sense at any element of $(X, \mathcal{P})$; (2) if X has the property S (resp. property WS), then the mapping $P : (X^*, \mathcal{P}^*) \to 2^{X^*}, P(x^*, A^*) = P_{A^*}(x^*)$ is (resp. weakly) upper semi-continuous at any element of $(X^*, \mathcal{P}^*)$, where $\mathcal{P}^*$ stands for the family of all proximinal subsets of the dual space X^*. Our results are generalizations of some known results of the continuity of metric projection in non-reflexive spaces.

20. Sijie Luo (罗思捷), Xiamen University, China

Title: A localized setting of Artstein-Avidan-Milman's theorem for fully order preserving mappings

Abstract: In this talk, we give a localization and generalization of the following Artstein-Avidan-Milman theorem: for a fully order preserving mapping $\varphi : \mathrm{Conv}(\mathbb{R}^n) \to \mathrm{Conv}(\mathbb{R}^n)$, there exist a linear isomorphism $E : \mathbb{R}^n \to \mathbb{R}^n$, $u_0, v_0 \in \mathbb{R}^n$ and $\alpha > 0, \beta \in \mathbb{R}$ so that

$$(\varphi f)(x) = \alpha f(Ex + u_0) + \langle v_0, x \rangle + \beta, \quad x \in \mathbb{R}^n, \ f \in \mathrm{Conv}(\mathbb{R}^n),$$

where $\mathrm{Conv}(\mathbb{R}^n)$ stands for the set of all l.s.c. convex functions defined on $\mathbb{R}^n$.

21. Yumei Ma (马玉梅), Dalian Nationalities University, Dalian, China

Title: The Vogt theorem in n-normed spaces

Abstract: This paper gives the representation of m-collinearity $(m = 2, n)$, generalize A.Vogt theorem in n normed spaces that a mapping which is distance equality preserving functions that is affine. In 1932, Mazur-Ulam gave a theorem: Every isometry of a real normed space onto a real normed space is a linear mapping up to a translation. In 1970, Aleksandrov posed the following problem: Examine whether the existence of a single conservative distance for some mapping f between two metric spaces implies that f is an isometry. In 1973, Vogt extended the results of Mazur-Ulam in a different direction. He replace isometries by the more general notion of equality of distance preserving maps, maps with the property $d(f(x), f(y)) = \rho(d(x, y))$ that the distance between image points depends functionally on the distance between domain

points. The function ρ is called the gauge function for f. Vogt proved that every continuous equality of distance preserving map between two real normed spaces is affine.

22. Yanbo Ren (任颜波), Henan University of Scinence and Technology, China

Title: Weighted weak type inequalities for martingale maximal operator

Abstract: In this talk, some necessary and sufficient conditions are shown in order that martingale inequalities of the form

$$\int_{\{f^*>\lambda\}} \Phi_1(\lambda w_1) w_2 d\mathbb{P} \leq C \int_{\Omega} \Phi_2(C \mid f_\infty \mid w_3) w_4 d\mathbb{P}$$

and the form

$$\Phi_1(\lambda)\mathbb{P}_u(f^* > \lambda) \leq C\mathbb{E}(\Phi_2(\frac{C \mid f_\infty \mid v}{\gamma(\lambda)})w)$$

holds a.e. for uniformly integrable martingales $f = (f_n)_{n\geq 0}$ with some constant $C > 0$, where γ is a nondecreasing and nonnegative functions defined on $[0, \infty)$,Φ_1, Φ_2 are Young functions, u, v ,w and $w_i (i = 1, 2, 3, 4)$ are weights, $f^* = \sup_{n\geq 0} \mid f_n \mid$ and $f_\infty = \lim_{n\to\infty} f_n$ a.e.

23. Zhongrui Shi (石忠锐), University of Shanghai, China

Title: Existence of solutions for Kirchhoff type problems in MusielakCOrliczC-Sobolev spaces

Abstract: In this talk, we investigate a class of Kirchhoff type problem with Neumann boundary data in Musielak-Orlicz-Sobolev spaces. Using the Musielak-Orlicz theory and Mountain pass theorem, we establish the existence of nontrivial weak solutions which generalizes the existing results.

24. Fedor Sukochev, University of New South Wales, Australia

Title: On weak* convergent sequences in duals of symmetric spaces of τ-measurable operators

Abstract: It is shown that the predual of a σ-finite von Neumann algebra has property (k) in the sense of Figiel, Johnson and Pelczynski. This solves in the affirmative an open question raised by Figiel, Johnson and Pelczynski. Our approach here is to show that the Mackey topology on a σ-finite von Neumann algebra with respect to its predual is metrizable on norm bounded subsets. This, in turn, rests on combining the classical criterion of Akemann that each weakly relatively compact subsets of the predual of a von Meumann algebra is of uniformly absolutely continuous norm (equi-integrable) with a characterization of such sets in the predual of a σ-finite von Meumann algebra, due to Raynaud and Xu.

It is shown further that a weakly sequentially complete symmetric space E of τ-measurable operators affiliated with a semifinite σ-finite von Neumann algebra has property (k). Joint work with P. Dodds and B. de Pagter.

25. Maofa Wang (王茂发), Wuhan University, China

Title: Operator theory on noncommutative domains

Abstract: The classical Sz.-Nagy-Foias theory is an important branch of functional analysis. This theory has many applications in dilation theory, operator model theory, scattering theory, and linear system theory. In recent twenty years, noncommutative multi-variable analogues of Sz.-Nagy-Foias theory have some development, and have produced many new techniques. In this talk, we develop Sz.-Nagy-Foias theory related to the truncated weighted composition operators and the multi-Toeplitz operators on noncommutative balls and polydomains.

26. Ruidong Wang (王瑞东), Tianjin University of Technology, China

Title: The isometry and qusi-isometry on two-dimensional normed spaces

Abstract: The isometry operator on normed spaces is widely discussed by lots of mathematicians. And there are lots of interesting open problems remain unsolved. In this lecture, I would like to talk about the isometry and qusi-isometry on two-dimensional normed spaces, and we will give the Wigner theorem on two-dimensional real normed spaces and solve the Tingley's problem on two-dimensional normed space without URTC property. Also, we will give some open problems in this lecture.

27. Senlin Wu (吴森林), Harbin University of Science and Technology, China

Title: Complete sets in normed linear spaces

Abstract: The concept of complete sets in normed linear spaces is a natural generalization of the concept of sets of constant width in Euclidean spaces. A bounded set in a normed linear space is said to be *diametrically complete*, *diametrically maximal*, or simply *complete* if it cannot be enlarged without increasing the diameter. By applying Zorn's Lemma, one can easily verify that each bounded set K in a normed linear space is contained in at least one complete set having the same diameter, called

a completion of K. After giving a short survey of complete sets and completions of sets, we present several recent results concerning normed linear spaces having the property that there exists a nontrivial segment with a unique completion.

28. Xiao Xiong (熊枭), University of Saskatchewan, Canada

Title: Quantum differentiability on quantum tori

Abstract: The core ingredients of the quantised calculus, introduced by A. Connes, are a separable Hilbert space H, a unitary self-adjoint operator F on H and a C^*-algebra $\mathcal{A}$ represented on H such that for all $a \in \mathcal{A}$ the commutator $[F, a]$ is a compact operator on H. Then the quantised differential of $a \in \mathcal{A}$ is defined to be the operator $\mathbf{d}a = i[F, a]$. We provide a full characterisation of quantum differentiability in the sense of Connes on quantum tori $\mathbb{T}^d_\theta$. We also prove a quantum integration formula which differs substantially from the commutative case.

29. Quanhua Xu (许全华), University of Franche-Comté and Harbin Institute of Technology, France

Title: Vector-valued Littlewood-Paley-Stein theory

Abstract: Let $(T_t)_{t>0}$ be a symmetric Markovian semigroup on a σ-finite measure space $(\Omega, \mathcal{F}, \mu)$ and F its fixed point space. A celebrated classical theorem of Stein asserts that for every $1 < p < \infty$

$$\|f - \mathsf{F}(f)\|_{L_p(\Omega)} \approx \left\| \left(\int_0^\infty \left| t \frac{\partial}{\partial t} T_t f \right|^2 \frac{dt}{t} \right)^{1/2} \right\|_{L_p(\Omega)}, \quad \forall\, f \in L_p(\Omega),$$

where the equivalence constants depend only on p.

In this talk, we consider the vector-valued version of Stein's inequality. Let X be a Banach space. Then $(T_t)_{t>0}$ naturally extends to a semigroup of contractions on $L_p(\Omega; X)$ for every $1 \le p \le \infty$, where $L_p(\Omega; X)$ denotes the usual L_p-space of strongly measurable functions on Ω with values in X. It is quite easy to show that the equivalence

$$\|f - \mathsf{F}(f)\|_{L_p(\Omega;X)} \approx \left\| \left(\int_0^\infty \left\| t \frac{\partial}{\partial t} T_t f \right\|_X^2 \frac{dt}{t} \right)^{1/2} \right\|_{L_p(\Omega;X)}, \quad \forall\, f \in L_p(\Omega; X)$$

holds for some $1 < p < \infty$ iff X is isomorphic to a Hilbert space. However, the validity of one of the two one-sided inequalities in the above equivalence is a much subtler problem. This is closely related to the geometrical properties of the space X, that is, to the uniform convexity and smoothness of X.

30. Xiaoping Xue (薛小平), Harbin Institute of Technology, China

Title: The quasi-gradient flow based on Lojasiewicz inequality and its applications

Abstract: In this report, we introduce two general theorems on the convergence and stability properties of the quasi-gradient system in infinite dimensional space based on the Lojasiewicz inequality. As the application, we prove its convergence towards

a phase locked state and its stability for the continuum Kuramoto model, provided a suitable initial data and a coupling strength.

31. Changsen Yang (扬长森), Henan Normal University, China

Title: Generalized von Neumann-Jordan constant for the Banaś-Frączek space

Abstract: In this talk, the exact value of the generalized von Neumann-Jordan constant $C_{NJ}^{(p)}(\mathbb{R}_\lambda^2)$ under certain conditions is investigated for the Banaś-Frączek space $\mathbb{R}_\lambda^2$.

32. Dmitriy Zanin, University of New South Wales, Australia

Title: Embeddings of operator ideals into L_p-spaces on finite von Neumann algebras

Abstract: We construct a Kruglov operator from the hyperfinite II_∞ factor to a hyperfinite II_1 factor. Kruglov operator has the most remarkable property: it maps pairwise orthogonal operators into independent ones. Besides obvious importance in (noncommutative) probability theory, it also allows to prove nice embedding result for ideals in $B(H)$. Namely, ideal admits an embedding into $L_p(\mathcal{R})$ if and only if its commutative part admits an embedding into $L_p(0,1)$.

33. Sheng Zhang (张胜), Southwest Jiaotong University, China

Title: Metric characterization of some asymptotic properties of Banach spaces

Abstract: In this talk we will discuss the metric characterization problem for some asymptotic properties of Banach spaces. In particular, we will focus on metric characterization in terms of graph preclusion of asymptotic uniform convexity and Rolewicz's property (β).

34. Wen Zhang (张文), Xiamen University, China

Title: Developments on ball covering property of Banach spaces

Abstract: In this talk, we will recall some of important results on Ball covering property of Banach spaces and introduce recent developments on this topic and some related questions will be presented.

35. Chao Zhang (张超), Harbin Institute of Technology, China

Title: Different functional spaces and its applications in PDEs

Abstract: In this talk, I review several different functional spaces and then present their applications in the regularity theory of some quasilinear elliptic and parabolic equations.

36. Bentuo Zheng (郑本拓), The University of Memphis, USA

Title: Complemented subspaces of X_p which embed into L_p

Abstract: Let T be a bounded linear operator on L_p $(2 < p < \infty)$. We show that T factors through the Rosenthal space X_p if and only if there is a change of density of L_p

so that the induced operator $\widetilde{T}$ satisfies an upper-$\ell_p \oplus \ell_2$-tree estimate. An operator which factors through X_p but fails the upper-$\ell_p \oplus \ell_2$-tree estimate is constructed. It is also shown that if T is a closed Z_p-strictly singular operator on L_p $(2 < p < \infty)$, then T factors through X_p. As a consequence, we characterize all complemented subspaces of X_p which embed into L_p.

37. Yu Zhou (周宇), Shanghai University of Engineering Science, China

Title: On representation of isometry and Hyers-Ulam stability of ε-isometry

Abstract: In this talk, we first show a representation theorem of standard surjective isometric embedding between Hausdorff metric spaces of compact convex subsets. Namely, let X (resp. Y) be a real Banach space satisfying that the set of all w^*-exposed points of $B(X^*)$ (resp. $B(Y^*)$) is w^*-dense in $S(X^*)$ (resp. $S(Y^*)$), $cc(X)$ (resp. $cc(Y)$) be the metric space of all compact convex subsets of X (resp. Y) endowed with the Hausdoff distance, and $f : cc(X) \to cc(Y)$ be a surjective standard isometric embedding. Then, (1) $f|_X$ is a surjective linear isometric embedding from X onto Y; (2) $f(A) = \{f(a) : a \in A\}$ for every $A \in cc(X)$.

We then investigate the Hyers-Ulam stability of standard ε-isometries from arbitrary Banach space X into the space $C(T)$. More precisely, let X be a real Banach space, T be a compact metrizable space, $C(T)$ be the real-valued continuous functions space, and $f : X \to C(T)$ be a standard ε-isometric embedding. Then for any $\lambda > 6$ there is an isometric embedding $h : X \to C(T)$ such that $\|f(u) - h(u)\| \leq \lambda\varepsilon$ for all $u \in X$.