前　言

为提高我国泛函分析空间理论的研究水平，增强国内同行学者之间的学术交流与合作，促进相关学科之间的交叉与发展，全国空间理论联络组决定在哈尔滨工业大数学研究院召开 2023 年泛函分析空间理论研讨会，交流泛函分析空间理论领域的最新研究成果和前沿进展。

日程安排

2023 年 6 月 23 日下午

14:00-20:00　会议报到　珈蓝酒店(哈尔滨工业大学店)
黑龙江省哈尔滨市南岗区文君街 36 号

20:00-21:30　空间联络组会议　数学研究院会议室

2023 年 6 月 24 日上午 明德楼 B 区 201-1

08:50-09:00　会议开幕　许全华教授致辞

主持人：程立新（厦门大学）

09:00-09:45　熊　枭（哈尔滨工业大学）

09:45-10:30　赖旭东（哈尔滨工业大学）

10:30-10:50　休　息

主持人：焦　勇（中南大学）

10:50-11:35　吴　恋（中南大学）

11:35-12:20　罗思捷（中南大学）

12:20-14:30　午　休

2023 年 6 月 24 日下午 明德楼 B 区 201-1

主持人：薛小平（哈尔滨工业大学）

14:30-15:15　姚兴兴（武汉工程大学）

15:15-16:00　郭　鑫（中南财经政法大学）

16:00-16:20　休　息

日程安排

主持人：郭铁信（中南大学）

16:20-17:05　商绍强（哈尔滨工程大学）

17:05-17:50　尹际富（河南师范大学）

18:00-20:00　自由讨论

2023 年 6 月 25 日上午 明德楼 B 区 201-1

主持人：宋　文（哈尔滨师范大学）

09:00-09:45　周　宇（上海工程技术大学）

09:45-10:30　韩亚洲（太原理工大学）

10:30-10:50　休　息

主持人：王茂发（武汉大学）

10:50-11:35　周德俭（中南大学）

11:35-12:20　胡前锋（河北工业大学）

12:20-12:30　会议闭幕 许全华教授致闭幕词

2023 年 6 月 25 日下午

自由讨论

报告摘要

非交换框架下的拟微分算子理论

熊　枭
哈尔滨工业大学

摘要：拟微分算子理论为连接调和分析与偏微分方程的桥梁，是研究微分几何与偏微分方程的重要工具。最近 McDonald-Sukochev-Zanin 利用 C*代数的方法重新定义了拟微分算子，这使得人们可以在一些抽象的非交换框架下发展拟微分算子理论。本次报告中，我将简要介绍非交换框架下拟微分算子理论的进展，并给出拟微分算子在 Connes 的非交换几何框架中计算量子化积分、即 Dixmier 迹公式方面的应用。

A noncommutative local smoothing estimate

赖旭东
哈尔滨工业大学

Abstract. We introduce a noncommutative local smoothing estimate which is closely related to noncommutative Bochner-Riesz means and Fourier restriction problem. This is a joint work with G. Hong and L. Wang.

报 告 摘 要

The sharp weighted maximal inequalities for noncommutative martingales and applications

吴 恋

中南大学

Abstract. We establish weighted maximal L_p-inequalities in the context of operator-valued martingales on semifinite von Neumann algebras. The main emphasis is put on the optimal dependence of the L_p constants on the characteristic of the weight involved. As applications, we establish weighted estimates for the noncommutative version of Hardy-Littlewood maximal operator and weighted bounds for noncommutative maximal truncations of a wide class of singular integrals.

报 告 摘 要

Functional Inequalities in the CAR algebra and their applications

罗思捷

中南大学

Abstract. Due to wide applications to computer science, functional inequalities on the hypercube have been one of the essential parts in the Boolean analysis area for decades. Recently, Ivanisvili et al. applied the heat semigroup approach to establish a dimensional free Pisier inequality for vector-valued functions on hypercubes and thus settled a longstanding open problem. Since then, studying functional inequalities on hypercubes dazzles the nonlinear theory of Banach spaces. This talk will focus on fruitful lines of research on functional inequalities in the noncommutative framework. Firstly, we recall the necessary materials on the noncommutative hypercube--CAR algebra. Secondly, functional inequalities in the CAR algebra, such as the Talagrand L1-Lp inequality and the Eldan-Gross inequality, will be mentioned. Finally, if time permits, we will conclude this talk with an application to the superconcentration phenomenon. The talk is based on recent work with Yong Jiao and Dejian Zhou.

报 告 摘 要

Commutants of composition operators on a Hilbert space of Dirichlet series

姚兴兴

武汉工程大学

Abstract. The aim of this talk is to study the commutants of composition operators on the Hilbert space of Dirichlet series with square summable coefficients. Especially, for any linear symbol with non-zero characteristic, we characterize when its composition operator has a minimal commutant.

Difference of composition operators on holomorphic function space

郭 鑫

中南财经政法大学

Abstract. Motivated by the conjecture of Shapiro-Sundberg raised in 1990, study on difference of composition operators has been a topic of growing interest. We introduce some progress about the difference of composition operators on holomorphic function spaces.

报 告 摘 要

Gateaux differentiablity of convex function in Banach spaces and application

商绍强

哈尔滨工程大学

Abstract. In this report, we study Gateaux differentiablity of convex function in Banach spaces. We prove that if X is a Gateaux differentiability space and convex function f is continuous on X, then, for any separable closed subspace E of X, there exists a sequence $\{f_n\}_{n=1}^{\infty}$ of continuous convex function such that (1) $f_n \le f_{n+1} \le f$ for all integers $n \ge 1$; (2) f_n is Gateaux differentiable at all points of a dense open subset of X; (3) $f_n \to f$ on E. Moreover, we also prove that if X^* is a smooth space and f is a ω^*-lower semicontinuous convex function on X^*. Then there exist two convex function sequences $\{f_n\}_{n=1}^{\infty}$ and $\{g_n\}_{n=1}^{\infty}$ such that (1) $f_n \le f_{n+1} \le f$ and $f \le g_{n+1} \le g$ for all integers $n \ge 1$; (2) f_n and g_n are ω^*-lower semicontinuous and Gateaux differentiable on X^*; (3) for every $x^* \in X^*$, there exists a neighborhood V of x^* such that $f_n \to f$ and $g_n \to f$ uniformly on V. Finally, we introduce the application of differentiability of convex function in ball-covering property.

报 告 摘 要

Localization of Figiel's theorem and extension of perturbed isometries

尹际富

河南师范大学

Abstract. In this talk, we will be concerned about isometric embeddings and perturbed isometries between unit spheres. On the one hand, some attempts will be made to generalize Figiel's theorem to the local unit sphere case. On the other hand, we will also consider the quasi-Figiel problem, furthermore, the results will be applied to study the perturbed version of the MUP (Cheng et al 2011). This work will generalize a series of classical results in related fields.

报告摘要

Representation of surjective isometric embeddings between Hausdorff metric spaces generated by convex subsets in Banach spaces

周 宇

上海工程技术大学

Abstract. In this talk, we mainly show the following representation theorem. Let X and Y be real finite-dimensional Banach spaces, $(cc(X),H)$ be the metric space of all nonempty compact convex subsets of X equipped with the Hausdorff metric H, and $f:(cc(X),H)\to(cc(Y),H)$ be a surjective isometric embedding with $f(A+B)=f(A)+f(B),\forall\ A,B\in cc(X)$,where $H(A,B)=\max\left\{\sup_{a\in A}\inf_{b\in B}\|a-b\|,\sup_{b\in B}\inf_{a\in A}\|b-a\|\right\},\forall\ A,B\in cc(X)$, $A+B=\{a+b:a\in A,b\in B\}$ and $f(A)+f(B)=\{u+v:u\in f(A),v\in f(B)\}$. Then, there is a surjective linear isometric embedding $\overline{f}:X\to Y$ such that $f(A)=\left\{\overline{f}(a):a\in A\right\},\forall\ A\in cc(X)$.

报告摘要

Generalized non-commutative Hardy spaces associated with subdiagonal algebras

韩亚洲

太原理工大学

Abstract. Let E be a symmetric quasi-Banach space and let j be an Orlicz function. In this talk, we will discuss a generalized noncommutative Hardy space $H^{E_j}(\mathbb{M})$ associated with a diffuse von Neumann algebra $\mathbb{M}$ with a faithful normal semi-finite trace. These spaces share many properties with noncommutative Hardy spaces $H^p(\mathbb{M})$. In particular, complex interpolation spaces and Beurling type theorem of such spaces are given under a wide range of conditions.

Azuma type inequalities for noncommutative martingales and applications

周德俭

中南大学

Abstract. In the classical setting, the Azuma inequality is one of the most important inequalities of martingale concentration inequalities, and has many significant applications. In this talk, we discuss several Azuma type inequalities for noncommutative martingales and their applications. In particular, we prove Azuma type inequality for noncommutative conditionally symmetric martingales. We will also mention questions and progress for related topic. This talk is based on the joint work with Yong Jiao and Sijie Luo.

报 告 摘 要

Banach spaces (non-commutative) operator-valued measures and their applications in quantum information

胡前锋

河北工业大学

Abstract. Recently, the development of the approximation properties of Banach spaces and the introduction of new tools such as Banach space (Lipschitz) frames and Banach space geometry inspired a new avenue of research in the dilation theory for (non-commutative) operator-valued measures (0VMs) on Banach space.In this talk, we introduce a general dilation theory for the non-commutative OVMs on projection lattices of vN-algebras and construct the minimal dilation for quantum OVMs from projection lattices of sigma-finite vN-algebras without a Type I_2 direct summand to B(X) where the Banach space X is the sequence spaces l_p (1< p< 2) or has the Schur property, which inspires us to study the dilations for (non-commutative) OVMS on Banach spaces with bounded approximation properties (BAP) or l_p, L_p and more generally, p-type or q-cotype Banach spaces. Meanwhile, positive operator-valued measures (POVMs) have an important physical significance, are called generalized measurements in quantum mechanics and are basic mathematical tools in quantum information theory, have a natural, and very valuable, subset which comes from Hilbert space frame theory. Based on those connections, we have considered the continuous frame quantum detection problem and also investigated the quantum detection problem for OVMs generated by multi-window Gabor frames.

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