哈爾濱工業大學数学研究院
Institute for Advanced Study in Mathematics of HIT

CHINA-JAPAN-KOREA CONFERENCE ON FUNCTIONAL ANALYSIS

Conference Handbook

Harbin · China

August 11–17 2024

About

The China-Japan-Korea Conference on Functional Analysis is an annual conference organized by the functional analysts from the countries alternately. The first conference will be held in Harbin, 11-17 August 2024 (with 11 August and 17 August as arrival and departure days).

The conference is organized by the Institute for Advanced Study in Mathematics of HIT .

Venue

Sun Island Garden Hotel, No.869, Binghua Road, Harbin 150000
太阳岛花园酒店 黑龙江省哈尔滨市道里区冰花路 869 号, 150000

Steering Committee

Xiaoman Chen	Fudan University
Lixin Cheng	Xiamen University
Benoît Collins	Kyoto University
Kunyu Guo	Fudan University
Takahiro Hasebe	Hokkaido University
Jaeseong Heo	Hanyang University
Masaki Izumi	Kyoto University
Ja A Jeong	Seoul National University
Un Cig Ji	Chungbuk National University
Chunlan Jiang	Hebei Normal University
Yasuyuki Kawahigashi *(Deputy Chair)*	University of Tokyo
Hun Hee Lee *(Deputy Chair)*	Seoul National University
Zhengwei Liu *(Secretary-General)*	Tsinghua University
Narutaka Ozawa	Kyoto University
Yoshimichi Ueda	Nagoya University
Quanhua Xu *(Chair)*	Harbin Institute of Technology

Organizing Committee

Guixiang Hong	Harbin Institute of Technology
Jinghao Huang	Harbin Institute of Technology
Xudong Lai	Harbin Institute of Technology
Jiange Li	Harbin Institute of Technology
Ke Li	Harbin Institute of Technology
Simeng Wang	Harbin Institute of Technology
Xiao Xiong	Harbin Institute of Technology
Quanhua Xu	Harbin Institute of Technology
Yujia Zhai	Harbin Institute of Technology

Contacts

Yang Zhou (zhouyang0722@hit.edu.cn)
Mo Yan (yanmo@hit.edu.cn)

Links

Conference website: `https://cjk.hit.edu.cn/`
Institute for Advanced Study in Mathematics of HIT: `http://im.hit.edu.cn/en/`

Practical Information

Reception

- August 11 (Sunday): Lobby of the *VIP Building* (贵宾楼), 13:00-22:00
- August 12-16 (Monday-Friday): Lecture Hall A

Lecture halls

- Lecture Hall A: *Banquet Hall* (宴会厅), located on the ground floor of the *Catering Builing* (餐饮楼)
- Lecture Hall B: *Room Songhua River* (松花江厅), located on the ground floor of the *Conference Center* (会议中心)
- Lecture Hall C: *Room Mudan River* (牡丹江厅), located on the ground floor of the *Conference Center* (会议中心)

Please follow the signs in the buildings.

Map


★ 冰雪大世界
Harbin Ice and Snow World
北门
North Gate
(Pedestrian only 仅行人)
停车场C 14个
停车场A 52个
26个
停车场B 16个
停车场D 42个（70可停）
地下停车场
雪乡街
Conference Center
• Lecture Halls B & C
会议楼
别墅C
别墅B
别墅A
VIP Building
• Conference Reception (August 11)
• Check-in
员工停车场
贵宾楼
Corridor
50-60个 (2nd floor)
10个
餐饮楼
双行车道
13个
停车场F
13个
双行车道
双行车道
8个
停车场E 6个
Catering Building
• Conference Reception
(since August 12)
• Lecture Hall A
• Buffet Restaurant
南门
ENTRANCE
South Gate
Binghua Road

Schedule

August 12 (Monday)		
Lecture Hall A		
8:30-9:00	**Welcome Remarks**	
9:00-9:45	**Yasuyuki Kawahigashi** *University of Tokyo*	Subfactors, tensor categories and tensor networks
9:50-10:35	**Yong Jiao** *Central South University*	The sharp matrix-weighted Doob inequalities
11:00-11:45	**Sang-Gyun Youn** *Seoul National University*	A Khintchine inequality for central Fourier series on non-Kac compact quantum groups
14:00-14:45	**Jianchao Wu** *Fudan University*	Classifiable C^*-algebras and almost elementary dynamical systems
14:50-15:35	**Dilian Yang** *University of Windsor*	Higher rank Baumslag-Solitar semigroups and their C^*-algebras
	Lecture Hall A	**Lecture Hall B**
16:00-16:30	**Qingnan An** *Northeast Normal University* Classification of C^*-algebras real rank zero and stable rank one	**Hun Hee Lee** *Seoul National University* New tensor products of C^*-algebras and characterization of type I C^*-algebras as rigidly symmetric C^*-algebras
16:35-17:05	**Zhichao Liu** *Dalian University of Technology* Distance between unitary orbits and classification of $*$-homomorphisms	**Li Gao** *Wuhan University* Deviation inequalities in quantum information via complex interpolation
17:10-17:40	**Yuanhang Zhang** *Jilin University* Stability relations for Hilbert space operators and a problem of Kaplansky	**Minyi Huang** *Zhejiang Sci-Tech University* Geometric phase in quantum systems

August 13 (Tuesday)		
Lecture Hall A		
9:00-9:45	**Éric Ricard** *University of Caen Normandy*	Almost uniform convergences in von Neumann algebras
9:50-10:35	**Kui Ji** *Hebei Normal University*	On the flag structure for a class of Cowen-Douglas operators
11:00-11:45	**Kan Kitamura** *RIKEN*	Actions of tensor categories on Kirchberg algebras
14:00-14:45	**Xin Ma** *University of Toronto*	Boundary actions and pure infiniteness of crossed product C^*-algebras.
	Lecture Hall A	**Lecture Hall B**
14:55-15:25	**Zhen Wang** *Hangzhou Normal University* p-nuclearity of L^p-operator crossed products	**Xiaofeng Wang** *Guangzhou University* Hankel operators on Fock-type space
16:00-16:30	**Un Cig Ji** *Chungbuk National University* Anticipating Quantum Stochastic Integrals	**Guozheng Cheng** *Dalian University of Technology* A converse to Littlewood's theorem on random analytic functions
16:35-17:05	**Penghui Wang** *Shandong University* Optimal control of quantum stochastic systems in fermion fields: Pontryagin maximal principle	**Yongjiang Duan** *Jinan University* Balayage for the weighed Bergman spaces
17:10-17:40	**Yuan Li** *Shaanxi Normal University* Reversible channels and isometric properties of quantum channels	**Yongning Li** *Chongqing Technology and Business University* The eigenvalues, numerical ranges and invariant subspaces of the Bergman-Toeplitz operators over the bidisk

August 14 (Wednesday)		
Lecture Hall A		
9:00-9:45	**Masaki Izumi** *Kyoto University*	Quasi-product compact group actions on C^*-algebras
9:50-10:35	**Hyun Jae Yoo** *Hankyong National University*	Group automorphisms for strongly quasi invariant states and conditional expectations
11:00-11:45	**Kai Wang** *Fudan University*	Recent progress in rigidity of determinantal point processes
Free Afternoon		

August 15 (Thursday)		
Lecture Hall A		
9:00-9:45	**Hanfeng Li** *State University of New York at Buffalo*	Combinatorics, local entropy theory, and local theory of Banach spaces
9:50-10:35	**Yusuke Isono** *Kyoto University*	Weak Dixmier property for dense subalgebras and application to type III factors
11:00-11:45	**Lian Wu** *Central South University*	Noncommutative weak L^∞
	Lecture Hall B	**Lecture Hall C**
14:00-14:30	**Qin Wang** *East China Normal University* Ideal structure of uniform Roe algebras	**Marat Pliev** *Southern Mathematical Institute of the Russian Academy of Sciences* Orthogonally additive operators in analysis and geometry
14:35-15:05	**Liang Guo** *Shanghai Institute of Mathematics and Interdisciplinary Sciences* A Bott periodicity theorem for ℓ^p-spaces and the coarse Novikov conjecture at infinity	**Lei Li** *Nankai University* Jordan structure in Banach spaces
15:10-15:40	**Ignacio Vergara** *Universidad de Santiago de Chile* The Dixmier problem and approximation properties	**Anna Tomskova** *Inha University in Tashkent* The homotopy type of the linear group of Lebesgue-Bochner and Besov spaces

16:00-16:30	**Hongyin Zhao** *University of New South Wales* Diagonality modulo symmetric spaces in semifinite von Neumann algebras	**Zipeng Wang** *Chongqing University* Harmonic analysis of Mandelbrot cascades
16:35-17:05	**Fulin Yang** *Harbin Institute of Technology* Schatten properties of Calderón-Zygmund singular integral commutator on stratified Lie groups	**Jin Li** *Shanghai University* Minkowski valuations and related topics
17:10-17:40	**Gan Yao** *Harbin Institute of Technology* Proper cocycles, measure equivalence and L_p-Fourier multipliers	**Luoyi Shi** *Tiangong University* Real operators and approximation

August 16 (Friday)		
Lecture Hall A		
9:00-9:45	**Seung-Hyeok Kye** *Seoul National University*	Choi matrices: variants and infinite dimensional analogues
9:50-10:35	**Takuya Takeishi** *Kyoto Institute of Technology*	Groupoid homology and K-theory for algebraic actions from number theory
11:00-11:45	**Hang Wang** *East China Normal University*	Dirac operators, higher index theory and applications
	Lecture Hall A	**Lecture Hall B**
14:00-14:30	**Junsheng Fang** *Hebei Normal University* Sums of projections in semifinite factors	**Xingxing Yao** *Wuhan Institute of Technology* Königs maps and commutants of composition operators on the Hardy-Hilbert space of Dirichlet series
14:35-15:05	**Weijuan Shi** *Shaanxi Normal University* Uhlhorn's Theorem in semifinite factors	**Xiaoyan Zhang** *SouthWest Petroleum University* Dynamics of weighted backward shifts on the little Lipschitz space

15:10-15:40	**Baiying Ren** *East China Normal University* Equivariant Index Theorem on R^n in the Context of Continuous Fields of C^*-algebras	**Heon Lee** *Seoul National University* First-order differential calculi and Laplacians on q-deformations of compact semisimple Lie groups induced by linear functionals
15:45-16:15	**Chen Zhang** *East China Normal University* The maximal coarse Baum-Connes conjecture for spaces that admit an A-by-FCE coarse fibration structure	**Hugues Moyart** *Laboratoire de Mathématiques Nicolas Oresme* K-closedness results in noncommutative L_p spaces and applications to noncommutative martingales
Lecture Hall A		
16:35-17:20	**Fedor Sukochev** *University of New South Wales*	Isometric structure in noncommutative symmetric spaces

Abstracts

August 12 (Monday)

Subfactors, tensor categories and tensor networks

Yasuyuki Kawahigashi 9:00-9:45 Lecture Hall A

University of Tokyo

I present recent studies of tensor categories based on subfactor theory. In particular, I will use a bi-unitary connection, a finite family of complex numbers which are entries of a large unitary matrix in two ways. This notion naturally appears in subfactor theory, realizes an object in a tensor category, and has close recent relations to two-dimensional topological order in condensed matter physics. I start with some basic explanations and present recent progress.

The sharp matrix-weighted Doob inequalities

Yong Jiao 9:50-10:35 Lecture Hall A

Central South University

The purpose of this talk is to introduce the martingale A_p condition formatrix weights and establish matrix-weighted Doob maximal inequalities for vectorvalued(more precisely, C^d-valued, where d denotes the dimension) martingales. Theproof mainly relies on the idea of principal sets and new sparse dominations. Ourapproach is powerful enough to obtain the optimal dependence of the constant on thecharacteristic of the weight involved. Furthermore, it appears that this method has awide range of applications beyond matrix-weighted Doob inequalities. This is a joint work with Wei Chen, Lian Wu and Xingyan Quan.

A Khintchine inequality for central Fourier series on non-Kac compact quantum groups

Sang-Gyun Youn 11:00-11:45 Lecture Hall A

Seoul National University

The comparison between L_p norm and L_2 norm has a long history in harmonic analysis. There has been extensive research employing probabilistic methods involving independent random variables or lacunary Fourier series using Sidon sets and $\Lambda(p)$ sets. A dissatisfactory conclusion is that it is hard to expect equivalence between the L_p norm and the L_2 norm of characters for many of the most natural compact Lie groups G. Our motivation was to study this problem within a broader category of compact quantum groups. The main result of this study is the establishment of the

equivalence between the L_p norm and the L_2 norm for all linear combinations of characters on the twisted Drinfeld-Jimbo compact quantum groups G_q.

Classifiable C^*-algebras and almost elementary dynamical systems

Jianchao Wu 14:00-14:45 Lecture Hall A

Fudan University

A recurring motivation for the study of operator algebras (in particular, C^*-algebras and von Neumann algebras) is their close ties with (topological or measure-theoretical) dynamical systems. In the measure-theoretic setting, Connes' landmark work on the classification of amenable simple separable von Neumann algebras helped bring about the classification of amenable ergodic systems (up to orbit equivalence). The topological setting is more delicate: the Elliott program to classify well-behaved amenable simple separable C^*-algebras using an invariant of K-theoretic nature reached success only fairly recently, and its interactions with amenable topological dynamical systems (say, group actions on compact metric spaces, or more generally, topological groupoids) has been under active research. A focal point in the C^*-algebraic setting is the strikingly multifaceted idea of regularity for C^*-algebras, and connections are being revealed between these regularity concepts and purely dynamical notions such as the small boundary property. I will discuss a few ways to transfer and connect regularity concepts to the dynamical setting, focusing on the notion of almost elementariness for discrete group actions and étale groupoids. This is mainly based on collaborations with Xin Ma.

Higher rank Baumslag-Solitar semigroups and their C^*-algebras

Dilian Yang 14:50-15:35 Lecture Hall A

University of Windsor

We propose a notion of higher rank Baumslag-Solitar semigroups and study their C^*-algebras. In this talk, we focus on two special classes: one is related to products of odometers, and the other is related to Furstenberg's $\times p, \times q$ conjecture. For the former class, we characterize the factoriality of the associated von Neumann algebras and further determine their types; for the latter, we provide their canonical Cartan subalgebras.

Parallel Session I

Title: Classification of C^*-algebras real rank zero and stable rank one

Qingnan An 16:00-16:30 Lecture Hall A

Northeast Normal University

We will talk about the Elliott conjecture of real rank zero setting which would briefly involve Total K-theory, Universal Multi-Coefficient Theorem, Bockstein Operations and a new invariant called Total

Cuntz semigroup. By considering the the classification of extensions of C^*-algebras, we exhibit two unital, separable, nuclear C^*-algebras of stable rank one and real rank zero with the same ordered scaled total K-theory satisfying UCT, but they are not isomorphic with each other, which forms a counterexample to Elliott Classification Conjecture for real rank zero setting. We point out that such a result reveals the necessity of the orders from the Total K-theory of ideals. Moreover, we will also show that the Coefficient maps from the Total K-theory of ideals are also indispensable, while the Bockstein Operations are automatic. This serry of works are jointed with Zhichao Liu.

Distance between unitary orbits and classification of $*$-homomorphisms

Zhichao Liu 16:35-17:05 Lecture Hall A

Dalian University of Technology

One of the most fundamental questions in operator algebra is: when are two operators unitarily equivalent? The present talk addresses the related problem of computing the distance between unitary orbits of positive elements in terms of spectral information. Then we link the normal elements with classification of $*$-homomorphisms from commutative algebras to simple C^*-algebras of real rank zero and strict comparison. We will show that the these $*$-homomorphisms can be classified in terms of the Cuntz semigroup.

Stability relations for Hilbert space operators and a problem of Kaplansky

Yuanhang Zhang 17:10-17:40 Lecture Hall A

Jilin University

In his monograph on Infinite Abelian Groups, Kaplansky raised three “test questions” concerning their structure and multiplicity. As noted by Azoff, these questions make sense for any category admitting a direct sum operation. Here, we are interested in the operator theoretic version of Kaplansky’s second question which asks: if A and B are operators on an infinite-dimensional, separable Hilbert space and $A \oplus A$ is equivalent to $B \oplus B$ in some (precise) sense, is A equivalent to B? We examine this question under a strengthening of the hypothesis, where a “primitive” square root $J_2(A)$ of $A \oplus A$ is assumed to be equivalent to the corresponding square root $J_2(B)$ of $B \oplus B$. When “equivalence” refers to similarity of operators and A is a compact operator, we deduce from this stronger hypothesis that A and B are similar. Also, we provide a large family of examples of unitary operators U which are unitarily equivalent to $J_n(U)$, a “primitive” n^{th}-root of $U \oplus U \oplus \cdots \oplus U$. This is a joint work with Laurent Marcoux, Heydar Radjavi and Sascha Troscheit.

Parallel Session II

New tensor products of C^*-algebras and characterization of type I C^*-algebras as rigidly symmetric C^*-algebras

Hun Hee Lee 16:00-16:30 Lecture Hall B

Seoul National University

We introduce new C^*-algebra tensor products motivated by exotic group C^*-algebras. For certain discrete groups G_1 and G_2, our C^*-algebraic construction produces $2^{\aleph_0}$ distinct C^*-completions of $C_r^*(G_1)\odot C_r^*(G_2)$. Moreover, our construction settles a question of Leptin and Poguntke from 1979 concerning a characterization of type I C^*-algebras. Recall that a Banach $*$-algebra A is symmetric if the spectrum $\sigma(a^*a) \subseteq [0,\infty)$ for every $a \in A$ rigidly symmetric if the Banach space projective tensor product $A\otimes_\gamma B$ is symmetric for every C^*-algebra B. A theorem of Kugler asserts that every type I C^*-algebra is rigidly symmetric. We show, through our new constructions, the converse of Kugler's theorem. This is based on joint work with E. Samei and M. Wiersma.

Deviation inequalities in quantum information via complex interpolation

Li Gao 16:35-17:05 Lecture Hall B

Wuhan University

Many error analysis in quantum information processing can be formulated as deviation inequalities of random matrices. In this talk, I will talk about how complex interpolations of various L_p spaces can be an effective tool in establishing error estimates in quantum information tasks such as quantum soft covering and quantum decoupling. This talk is based on joint works with Hao-Chung Cheng, Yu-Chen Shen, Frédéric Dupuis and Mario Berta.

Geometric phase in quantum systems

Minyi Huang 17:10-17:40 Lecture Hall B

Zhejiang Sci-Tech University

Geometric phase, which is an interesting phenomenon in quantum systems, has attracted wide attention due to its potential applications in quantum information and computation. In 1984, it was first discovered that the phase of a quantum state can be decomposed as the sum of a dynamical and a geometric one. Later this phenomenon was discussed from different aspects. Recently, the concept of observable geometric phase was introduced for para-Hermitian operators. In this talk, we will talk about some related problems and the geometric phase in non-Hermitian quantum systems.

August 13 (Tuesday)

Almost uniform convergences in von Neumann algebras

Éric Ricard 9:00-9:45 Lecture Hall A

University of Caen Normandy

We review and improve some results around almost uniform convergences in von Neumann algebras. This is based on joint works with Léonard Cadilhac (IMJ, Paris) and Guixiang Hong (HIT, Harbin).

On the flag structure for a class of Cowen-Douglas operators

Kui Ji 9:50-10:35 Lecture Hall A

Hebei Normal University

The explicit description of irreducible homogeneous operators in the Cowen-Douglas class and the localization of Hilbert modules naturally leads to the definition of a smaller class possessing a flag structure. These operators are shown to be irreducible. It is also shown that the flag structure is rigid, that is, the unitary equivalence class of the operator and the flag structure determine each other. A complete set of unitary invariants, which are somewhat more tractable than those of an arbitrary operator in the Cowen-Douglas class can be obtained. In this talk, we introduce a subclass of Cowen-Douglas operators which possesses a "strong" flag structure, and for which the curvature and the second fundamental form of the associated line bundle is a complete set of unitary invariants. We prove that this new class of operators is norm dense in the Cowen-Douglas class up to similarity. We obtain a classification modulo conjugation by an invertible operator for a large class of operators possessing a strong flag structure. Along the way, it is shown that the number of the similarity invariants found recently can be reduced from $\frac{n(n-1)}{2}+1$ to n. Moreover, we obtain a complete characterization of weakly homogeneous operators with large index and flag structure.

Actions of tensor categories on Kirchberg algebras

Kan Kitamura 11:00-11:45 Lecture Hall A

RIKEN

In subfactor theory, it was discovered that operator algebras often admit symmetries beyond mere groups, sometimes referred to as quantum symmetries. Such quantum symmetries on factors have been well studied and understood by many operator algebraists. On the other hand, many things are yet to be seen in the C^*-algebraic case, and only sparse examples of quantum symmetries on C^*-algebras are available, compared to the rich variations of simple C^*-algebras in the classification list. In this talk, we will present a systematic way to produce quantum symmetries on Kirchberg algebras. We also discuss the realizability of modules over fusion rings as K-groups of Kirchberg

algebras with quantum symmetries. As a particular case, every countable unitary tensor category admits an action on the Cuntz algebra O_2.

Boundary actions and pure infiniteness of crossed product C^*-algebras

Xin Ma 14:00-14:45 Lecture Hall A

University of Toronto

In this talk, I will demonstrate new examples of strongly purely infinite C^*-algebras with origins in geometric topology. These new examples consist of crossed products of topological boundary actions induced from certain isometric proper actions on proper CAT(0) metric spaces, such as actions of right-angled Artin/Coxeter groups on particular CAT(0) complexes and actions of some generalized Baumslag-Solitar (GBS) groups on their Bass-Serre trees. This is joint work with Daxun Wang and Wenyuan Yang.

Parallel Session I

p-nuclearity of L^p-operator crossed products

Zhen Wang 14:55-15:25 Lecture Hall A

Hangzhou Normal University

The aim of this talk is to study a problem raised by N. C. Phillips concerning the L^p operator crossed products. Let $(X, \mathcal{B}, \mu)$ be a measure space and A be a closed subalgebra of $\mathcal{B}(L^p(X, \mu))$, where $p \in [1, \infty)\backslash\{2\}$. Let (G, A, α) be an L^p-operator algebra dynamical system, where G is a countable discrete amenable group. We prove that the full L^p-operator crossed product $F^p(G, A, \alpha)$ is p-nuclear if and only if A is p-nuclear provided the action α of G on A is p-completely isometric. As applications, we prove that L^p-Cuntz algebras and rotation L^p-operator algebras are both p-nuclear. Our results solve the p-nuclearity problem for L^p-Cuntz algebras raised by N. C. Phillips.

Anticipating Quantum Stochastic Integrals

Un Cig Ji 16:00-16:30 Lecture Hall A

Chungbuk National University

In this talk, based on the quantum white noise theory, we introduce new types of anticipating quantum stochastic integrals by combining the Hitsuda-Skorokhod quantum stochastic integrals and the interactions between the integrands and the integrators. For our purpose, we formulate several types of quantum (stochastic) gradients as continuous linear operators acting on the spaces of white noise operators, which are related to the quantum white noise derivatives and reflecting the interactions with the external noises, and then we introduce anticipating quantum stochastic integrals.

Optimal control of quantum stochastic systems in fermion fields: Pontryagin maximal principle

Penghui Wang 16:35-17:05 Lecture Hall A

Shandong University

In this talk, I will introduce some recent development on the optimal control of quantum stochastic systems. Such a quantum stochastic system is an noncommutative analogue of stochastic differential equations, and the well-definedness of L^p solution is based on the BG inequality obtained by Pisier and Xu. By using dynamic programming principle, the optimal control problem was studied when the drift term has no control. An in this talk, we will introduced the Pontryagin maximal principle of such a controlled quantum stochastic system with control in the drift term. The talk is based on the joint work with S.Wang.

Reversible channels and isometric properties of quantum channels

Yuan Li 17:10-17:40 Lecture Hall A

Shaanxi Normal University

We investigate the equivalence of the isometric channels and reversible channels. Moreover, we study several equivalent characterizations of reversible channels, from views of adjoint channels, complementary channels and Choi representations of channels, respectively. Also, the isometric channels have extension properties from the Banach space of all trace-class operators to all Schatten p-class operators.

Parallel Session II

Hankel operators on Fock-type space

Xiaofeng Wang 14:55-15:25 Lecture Hall B

Guangzhou University

In this talk, we consider Hankel operators, with locally integrable symbols, densely defined on a family of Fock-type spaces whose weights are C3-logarithmic growth functions with mild smoothness conditions. We characterize the boundedness, compactness and Schatten class membership of Hankel operators. Besides, we give characterizations of the Schatten class membership of Toeplitz operators with positive measure symbols for the small exponent $0 < p < 1$.

A converse to Littlewood's theorem on random analytic functions

Guozheng Cheng 16:00-16:30 Lecture Hall B

Dalian University of Technology

We reformulate the Littlewood theorem on random analytic functions in the Hardy spaces as a problem of determining the random symbol spaces, and we show that, under a general randomization scheme, the symbol space is always a subspace of $H^2(\mathbb{D})$. We then characterize completely when the symbol space is precisely $H^2(\mathbb{D})$. This result extends Littlewood's theorem and can also be considered a converse of the theorem, since previous literature has solely focused on the sufficiency part of the results.

Balayage for the weighed Bergman spaces

Yongjiang Duan 16:35-17:05 Lecture Hall B

Jinan University

Given a finite complex Borel measure μ on the unit disk, the Balayage of μ is a notion that is in some sense dual to the Poisson transform, which is very important in the theory of Hardy space. As the counterpart of the Poisson transform, the Berezin transform also play an important role in the theory of Bergman spaces, and one can also define the Bergman space version of the balayage. In this talk, we study the properties of the Balayage for the weighed Bergman spaces induced by doubling radial weights, and also give some description of its relationship with the Berezin transform.

The eigenvalues, numerical ranges and invariant subspaces of the Bergman-Toeplitz operators over the bidisk

Yongning Li 17:10-17:40 Lecture Hall B

Chongqing Technology and Business University

In this talk, we consider several questions about the eigenvalues, the numerical range and the invariant subspaces of the Toeplitz operator on the Bergman space over the bidisk and we obtain the corresponding results. This talk is based on the joint work of Yin Zhao and Xuanhao Ding.

August 14 (Wednesday)

Quasi-product compact group actions on C^*-algebras

Masaki Izumi 9:00-9:45 Lecture Hall A

Kyoto University

The notion of qausi-product actions of a compact group on a C^*-algebra was introduced by Bratteli et al. in their attempt to seek an equivariant analogue of Glimm's characterization of non-type I C^*-algebras. We show that a faithful minimal action of a second countable compact group on a separable C^*-algebra is quasi-product whenever its fixed point algebra is simple. This was previously known only for compact abelian groups and for profinite groups. Our proof relies on a subfactor technique applied to finite index inclusions of simple C^*-algebras in the purely infinite case, and also uses ergodic actions of compact groups in the general case. As an application, we show that if moreover the fixed point algebra is a Kirchberg algebra, such an action is always isometrically shift-absorbing, and hence is classifiable by the equivariant KK-theory due to a recent result of Gabe-Szabó.

Group automorphisms for strongly quasi invariant states and conditional expectations

Hyun Jae Yoo 9:50-10:35 Lecture Hall A

Hankyong National University

In this talk we discuss the strongly quasi invariant states for group automorphisms acting on a C^*- or von Neumann algebra. When the group is compact, introducing a unitary representation on the von Neumann albegra of GNS representation we define a Umegaki conditional expectation onto the invariant subalgebra for the group automorphism. When G is a union of increasing compact groups of automorophisms, we construct a sequence of conditional expectations and thereby construct (decreasing) martingales. As an example, we discuss the group of finite permutations on the set of nonnegative integers acting on a C^*-algebra of infinite tensor product. This is based on the joint work with Ameur Dhahri and Chul Ki Ko.

Recent progress in rigidity of determinantal point processes

Kai Wang 11:00-11:45 Lecture Hall A

Fudan University

In this talk, we will survey some recent progress in the rigidity of determinantal point processes. This is joint work with Prof. Yanqi Qiu and Zhaofeng Lin.

August 15 (Thursday)

Combinatorics, local entropy theory, and local theory of Banach spaces

Hanfeng Li 9:00-9:45 Lecture Hall A

State University of New York at Buffalo

In 1995 Glasner and Weiss showed that if a homeomorphism on a compact metrizable space X has zero entropy, then so does the induced homeomorphism on the space of Borel probability measures on X. I will discuss a strengthening of the Glasner-Weiss result, in the framework of local entropy theory, based on a new combinatorial lemma. I will also present an application of the combinatorial lemma to the local theory of Banach spaces. This is joint work with Kairan Liu.

Weak Dixmier property for dense subalgebras and application to type III factors

Yusuke Isono 9:50-10:35 Lecture Hall A

Kyoto University

Let $A \subset M$ be an inclusion of von Neumann algebras with an operator valued weight $E\colon M \to A$. We show that every positive element $x \in M$ with $E(x) < \infty$ satisfies the weak Dixmier property for the inclusion $A \subset M$. This generalizes Marrakchi's result for conditional expactaions and has several applications to type III factors in the framework of Popa's deformation/rigidity theory. For example, we generalize Ozawa's relative solidity theorem and construct some new examples of prime type III factors.

Noncommutative weak L^∞

Lian Wu 11:00-11:45 Lecture Hall A

Central South University

Bennett, DeVore and Sharpley (Ann of Math. 113: 601-611, 1981) introduced the weak analogue of the space L^∞ and studied its relationship to the space of functions of bounded mean oscillation. The purpose of this paper is to continue this line of research in the context of functions on $\mathbb{R}^d$ with values in a semifinite von Neumann algebra. As a by-product, this allows for the comparison of the BMO norms of an operator-valued function and its decreasing rearrangement. The argument rests on a new distributional estimate for noncommutative martingales invoking Cuculescu projections, which is of independent interest. The applications include related $BMO \to wL^\infty$ inequalities for square functions and conditional square functions, as well as corresponding versions of Stein and dual Doob estimates, which are new even for classical martingales.

Parallel Session I

Ideal structure of uniform Roe algebras

Qin Wang 14:00-14:30 Lecture Hall B

East China Normal University

The uniform Roe algebra of a discrete metric space is a C^*-algebra that analytically encodes the coarse geometry of the underlying space. We will first focus on the class of ideals of a uniform Roe algebra in which finite propagation operators are dense, and show that these ideals can be described geometrically in terms of coarse structure and invariant open subsets of the unit space of the Skandalis-Tu-Yu groupoid. We show that if the metric space has Yu's property A, then all ideals are geometric. We introduce a notion of ghostly ideal and partial property A to investigate the ideal structure of the uniform Roe algebra for a general metric space beyond the scope of Yu's property A. This talk is based on an early joint work with Xiaoman Chen and a recent work with Jiawen Zhang.

A Bott periodicity theorem for ℓ^p-spaces and the coarse Novikov conjecture at infinity

Liang Guo 14:35-15:05 Lecture Hall B

Shanghai Institute of Mathematics and Interdisciplinary Sciences

The Bott periodicity theorem is a key theorem in K-theory, with extensive applications in noncommutative geometry, especially in the Baum-Connes conjecture. In this talk, I will introduce a Bott periodicity theorem for ℓ^p spaces and use it to prove the coarse Novikov conjecture for a large class of spaces, including box spaces of hyperbolic groups and warped cones over actions of hyperbolic groups. This is joint work with Zheng Luo, Qin Wang, and Yazhou Zhang.

The Dixmier problem and approximation properties

Ignacio Vergara 15:10-15:40 Lecture Hall B

Universidad de Santiago de Chile

Every amenable group is unitarisable, meaning that every uniformly bounded representation on a Hilbert space is similar to a unitary representation. The Dixmier problem asks whether the converse is also true: Is every unitarisable group amenable? I will discuss a partial result in this direction, involving family of approximation properties inspired by the AP of Haagerup and Kraus.

Diagonality modulo symmetric spaces in semifinite von Neumann algebras

Hongyin Zhao 16:00-16:30 Lecture Hall B

University of New South Wales

Suppose $\mathcal{M}$ is a semifinite von Neumann algebras and $\mathcal{J}$ is a normed ideal in $\mathcal{M}$. Let $(\alpha(j))_{j=1}^n \in \mathcal{M}^n$ be an n-tuple of commuting self-adjoint operators. Under what conditions on $\mathcal{J}$ or α, we can find a commuting n-tuple of diagonal operators $(\delta(j))_{j=1}^n$ such that $\alpha(j) - \delta(j) \in \mathcal{J}$ for every $1 \leq j \leq n$ (in this case, $(\alpha(j))_{j=1}^n$ is said to be diagonal modulo $\mathcal{J}$)? Voiculescu provided a characterization of the diagonality of n-tuples in $\mathcal{M}$ modulo normed ideals in the case when $\mathcal{M} = B(H)$, based on his celebrated non-commutative Weyl-von Neumann theorem concerning the approximate equivalence between representations of C^*-algebras.

In this talk, we will talk about these connections and our work on characterization of the diagonality of n-tuples in $\mathcal{M}$ modulo non-commutative symmetric spaces. This allows us to present an analogue of Kuroda-Bercovici-Voiculescu's theorem for n-tuple affiliated with a semifinite von Neumann algebra. It states that, if E is a symmetric function space on $(0, \infty)$ satisfying $E \cap L_\infty \not\subset L_{n,1}$, where $L_{n,1}$ is the Lorentz function space with the fundamental function $\varphi(t) = t^{1/n}$, then every commuting self-adjoint n-tuple $(\alpha(j))_{j=1}^n \in$ affiliated with $\mathcal{M}$ is diagonal modulo $(E \cap L_\infty)(\mathcal{M})$, where $(E \cap L_\infty)(\mathcal{M})$ is the non-commutative symmetric space corresponding to $E \cap L_\infty$ associated with $\mathcal{M}$.

Schatten properties of Calderón-Zygmund singular integral commutator on stratified Lie groups

Fulin Yang 16:35-17:05 Lecture Hall B

Harbin Institute of Technology

We provide full characterisation of the Schatten properties of $[M_b, T]$, the commutator of Calderón-Zygmund singular integral T with symbol $b(M_b f(x) := b(x)f(x))$ on stratified Lie groups G. We show that, when p is larger than the homogeneous dimension Q of G, the Schatten S^p norm of the commutator is equivalent to the Besov semi-norm $B_p^{Q/p}$ of the function b; but when p Q, the commutator belongs to S^p if and only if b is a constant. For the endpoint case at the critical index $p = Q$, we further show that the Schatten $S^{Q,\infty}$ norm of the commutator is equivalent to the Sobolev norm $W^{1,Q}$ of b. This is a joint work with Ji Li and Xiao Xiong.

Proper cocycles, measure equivalence and L_p-Fourier multipliers

Gan Yao 17:10-17:40 Lecture Hall B

Harbin Institute of Technology

We establish a new transference method of completely bounded L_p-Fourier multipliers for proper cocycles for pmp group actions on standard probability spaces. This generalizes the previous results by Haagerup and Jolissaint which only deals with the case $p = \infty$. In particular, this gives

a natural transference method of Fourier multipliers between groups with measure equivalence, which directly implies and notably generalizes the main result of Hong-Wang-Wang on the pointwise convergence of noncommutative Fourier series on amenable groups. As a second application, this theory also yields a transference method of L_p-Fourier multipliers from lattices in a linear Lie group to the whole group, which strengthens the previous results for Schur multipliers obtained by Haagerup and Lafforgue-de la Salle. As an example, we give a reasonable analog of Hilbert transform on $PSL_2(R)$ using the transference method. This is ongoing joint work with Simeng Wang.

Parallel Session II

Orthogonally additive operators in analysis and geometry

Marat Pliev 14:00-14:30 Lecture Hall C

Southern Mathematical Institute of the Russian Academy of Sciences

Orthogonally additive operators (OAO) naturally arise in the different areas of the modern mathematics such as: nonlinear differential and integral equations, dynamical systems and convex geometry. In this talk we discuss recent results concerning the order structure of the space of regular orthogonally additive operators between ordered function spaces, emphasing on connections of the theory of OAOs with theory of valuations in convex geometry.

Jordan structure in Banach spaces

Lei Li 14:35-15:05 Lecture Hall C

Nankai University

I will introduce my recent work on Jordan structures in Banach spaces. For example, define the Rickart JB^*-algebras and Rickart JB^*-triples, which generalization of Rickart C^*-algebra; introduce the Jordan strict topology on the multiplier algebras of JB^*-algebras.

The homotopy type of the linear group of Lebesgue-Bochner and Besov spaces

Anna Tomskova 15:10-15:40 Lecture Hall C

Inha University in Tashkent

In this article we study the homotopical properties of linear groups of some Banach spaces. Our first main result asserts that for $1 < p, q < \infty$ the linear group $GL(L_p(L_q))$ of the Lebesgue-Bochner space $L_p(L_q)$ is contractible to a point, where L_p and L_q are both considered on $[0, 1]$ equipped with the standard Lebesgue measure. We also prove that for $1 < p < \infty$ and for a reflexive symmetric sequence space E the linear group $GL(\ell_p(E))$ is contractible to a point, where ℓ_p is the space of p-summable sequences and $\ell_p(E)$ is the ℓ_p-sum of E spaces. As the consequence

of the last result we deduce the contractibility to a point of the linear group of a Besov space $B_p^{s,q}$, $1 < p, q < \infty$, $s > 0$.

Harmonic analysis of Mandelbrot cascades

Zipeng Wang 16:00-16:30 Lecture Hall C

Chongqing University

We will talk about the asymptotic decay of the Fourier coefficients of the Mandelbrot canonical cascade measure and more general cascade measures. Our method is to put the analysis of these Fourier series into the framework of vector-valued martingales, as well as to apply celebrated asymptotics of small moments of critical or super-critical braching randow walks. This talk is based on recent joint works with Xinxin Chen, Yong Han and Yanqi Qiu.

Minkowski valuations and related topics

Jin Li 16:35-17:05 Lecture Hall C

Shanghai University

Valuations are invariants that play pivotally in addressing Hilbert's third problem. One of the important classes of valuations is Minkowski valuations, which are convex-body valued valuations associated with the Minkowski addition. In this talk, I will present some classifications of Minkowski valuations and function valued valuations, encompassing important geometric operators such as the projection body, moment body, the Legendre ellipsoid, and the Laplace transform.

Real operators and approximation

Luoyi Shi 17:10-17:40 Lecture Hall C

Tiangong University

Let $\mathcal{H}$ be a separable complex Hilbert space, $\mathcal{B}(\mathcal{H})$ be the algebra of all bounded linear operators on $\mathcal{H}$. An operator $T \in \mathcal{B}(\mathcal{H})$ is called a real operator (RO) if there is a conjugation C on $\mathcal{H}$ such that $CTC = T$. We denote by $\mathcal{R}(\mathcal{H})$ the set of all ROs on $\mathcal{H}$ and $\overline{\mathcal{R}(\mathcal{H})}$ the closure of $\mathcal{R}(\mathcal{H})$. In this talk, we will discuss the structural theory of $\mathcal{R}(\mathcal{H})$ and $\overline{\mathcal{R}(\mathcal{H})}$.

August 16 (Friday)

Choi matrices: variants and infinite dimensional analogues

Seung-Hyeok Kye 9:00-9:45 Lecture Hall A

Seoul National University

For a linear map between matrix algebras, the Choi matrix assigns a matrix in the tensor product of the domain and the range, which gives rise to the correspondence between completely positive maps and positive (semi-definite) matrices. They are now playing fundamental roles in current quantum information theory, by the correspondence between Schmidt numbers of bi-partite states and k-partially entanglement breaking maps, or equivalently k-superpositive maps.

In this talk, we first consider all possible variants of Choi matrices of linear maps, and show that they are determined by non-degenerate bilinear forms on the domain space. We will do this in the setting of finite dimensional vector spaces. In case of matrix algebras, we characterize all variants of Choi matrices which retain the usual correspondences mentioned above.

For a class of linear maps on a von Neumann factor, we also associate two objects, bounded operators and trace class operators, both of which play the roles of Choi matrices. Each of them is positive if and only if the original map on the factor is completely positive. It turns out that such correspondences are possible for every normal completely bounded map if and only if the factor is of type I. As an application, we provide criteria for Schmidt numbers of normal positive functionals in terms of Choi matrices of k-positive maps, in infinite dimensional cases. We also define the notion of k-superpositive maps, which turns out to be equivalent to the property of k-partially entanglement breaking.

Groupoid homology and K-theory for algebraic actions from number theory

Takuya Takeishi 9:50-10:35 Lecture Hall A

Kyoto Institute of Technology

By the work of Bruce and Li, the topological full group (TFG) of the groupoid associated to the ring C^*-algebra for the ring of integers of a number field is known to be a complete invariant for number fields, but it is now clear how basic invariants of number fields are reflected in the TFG. For the first step to understand this TFG, we show that the extension degree over the rational field coincides with the smallest degree such that the group homology of the TFG does not vanish. We show it by the calculation of the groupoid homology. For another application of this computation, we give another proof of Li-Luck's computation of the K-theory of the ring C^*-algebras. We also compute the groupoid homology of Barlak-Omland-Stammeier groupoids and solve the conjecture for K-theory of their C^*-algebras. This is a joint work with C. Bruce and Y. Kubota.

Dirac operators, higher index theory and applications

Hang Wang 11:00-11:45 Lecture Hall A

East China Normal University

Higher index theory is a branch in noncommutative geometry generalizing the Atiyah-Singer index theorem. Dirac operators and analysis of their heat kernels play an important role in obtaining higher index formulas. This talk will be an introduction of higher index theory in the context of Dirac operator and heat kernel analysis, together with some surveys of applications in geometry, topology and representation theory.

Parallel Session I

Sums of projections in semifinite factors

Junsheng Fang 14:00-14:30 Lecture Hall A

Hebei Normal University

Which positive operators in a factor von Neumann algebra can be written as sums of projections? This question was studied by Victor Kaftal, Ping Wong Ng, and Shuang Zhang. They obtained beautiful results on the question. In this talk we report some new progress on the question and some interesting applications. This is joint work with Xinyan Cao, Shilin Wen and Zhaolin Yao.

Uhlhorn's Theorem in semifinite factors

Weijuan Shi 14:35-15:05 Lecture Hall A

Shaanxi Normal University

Uhlhorn's Theorem is one of the most significant generalizations of Wigner's theorem. It established the structure of transformations preserving orthogonality between the Grassmann space $P1(H)$. The aim of this talk is to study Uhlhorn's Theorem in the setting of semifinite factors.

Let M be a semifinite factor with a faithful normal semifinite tracial weight τ, and P the set of all projections in M. Denote by P_c the Grassmann space of all projections in P with trace c, where c is a positive real number. We describe the general forms of ortho-isomorphisms between two Grassmann spaces P_c in semifinite factors.

Equivariant Index Theorem on R^n in the Context of Continuous Fields of C^*-algebras

Baiying Ren 15:10-15:40 Lecture Hall A

East China Normal University

We prove an equivariant index theorem on the Euclidean space using a continuous field of C^*-algebras. This generalizes the work of Elliott, Natsume and Nest, which is a special case of the algebraic index theorem by Nest-Tsygan. The equivariant index of the Bott-Dirac operator on R^{2n} can be explicitly calculated by our formula. This is a joint work with Hang Wang and Zijing Wang.

The maximal coarse Baum-Connes conjecture for spaces that admit an A-by-FCE coarse fibration structure

Chen Zhang 15:45-16:15 Lecture Hall A

East China Normal University

The maximal coarse Baum-Connes conjecture is a geometric analogue of the Baum-Connes conjecture, which provides an algorithm for computing the higher indices of generalized elliptic operators on non-compact spaces and has many applications in topology and geometry. In this talk, I will introduce a concept of "A-by-FCE coarse fibration structures" for metric spaces and prove that the maximal coarse Baum-Connes conjecture holds for bounded geometric spaces admit an A-by-FCE coarse fibration structure. As an application, the relative expanders constructed by Arzhantseva and Tessera, as well as the box space derived from an extension of Haagerup groups by amenable groups, are shown to admit the A-by-FCE coarse fibration structure. Consequently, their maximal coarse Baum-Connes conjectures are affirmed. This is a joint work with Liang Guo and Qin Wang.

Parallel Session II

Königs maps and commutants of composition operators on the Hardy-Hilbert space of Dirichlet series

Xingxing Yao 14:00-14:30 Lecture Hall B

Wuhan Institute of Technology

Let φ be a holomorphic map which is a symbol of a bounded composition operator C_φ acting on the Hardy-Hilbert space of Dirichlet series. We find a Königs map for φ. We then deduce several applications on C_φ (e.g. on its spectrum, on its dynamical properties). In particular, we study for a large class of symbols φ if the associated composition operator has a minimal commutant. We also show how our methods shed new light to the minimal commutant property for composition operators acting on the classical Hardy-Hilbert space. This is a joint work with Prof. Bayart.

Dynamics of weighted backward shifts on the little Lipschitz space

Xiaoyan Zhang 14:35-15:05 Lecture Hall B

SouthWest Petroleum University

In this talk, we will present the dynamical behavior of weighted backward shift defined on the little Lipschitz space of a tree. In particular, we consider hypercyclic, mixing, chaotic and frequent hypercyclic properties of weighted backward shifts under the homogeneous tree.

First-order differential calculi and Laplacians on q-deformations of compact semisimple Lie groups induced by linear functionals

Heon Lee 15:10-15:40 Lecture Hall B

Seoul National University

As Laplacians are extremely important differential operators on smooth manifolds, there have been many attempts to define a correct notion of Laplacians on compact matrix quantum groups, which are regarded as a quantum generalization of compact Lie groups. In this talk, we suggest a construction in which any ad-invariant linear functional on a compact quantum group induces a bicovariant first-order differential calculus, on which the linear functional is expressed as "the square of the differential" just as classical Laplacians are. Applied to a compact Lie group, this construction yields the classical differential calculus and a classical Laplacian on it. We further apply this construction to a compact quantum group K_q arising from the q-deformation of a compact semisimple Lie group K and show that (1) all finite dimensional bicovariant first-order differential calculi on K_q can be obtained by this construction, (2) all of them converge to the classical differential calculus on K as q tends to 1, (3) linear functionals that induce these differential calculi can be chosen so that all of them converge to the same classical Laplacian on K as q tends to 1.

K-closedness results in noncommutative L_p spaces and applications to noncommutative martingales

Hugues Moyart 15:45-16:15 Lecture Hall B

Laboratoire de Mathématiques Nicolas Oresme

The abstract concept of K-closedness is a useful tool in the study of real interpolation methods. In this talk, I will present some K-closedness results in the context of noncommutative L_p spaces when filtrations are involved. As an application, we obtain new results for noncommutative martingale Hardy spaces. The approach, inspired by the work of Bourgain in the study of classical Hardy spaces, sheds light on the role of the Gundy's decomposition as the probabilistic counterpart of the well-known Calderón-Zygmund decomposition.

Isometric structure in noncommutative symmetric spaces

Fedor Sukochev 16:35-17:20 Lecture Hall A

University of New South Wales

The study of descriptions of isometries on function spaces was initiated by Banach, who obtained the general form of isometries between L_p-spaces. Representations of linear isometries between more general symmetric function spaces were later obtained by Lumer, Lamperti, Zaidenberg, Kalton and Randrianantoanina etc. In the 1950s, Kadison established a noncommutative Banach-Stone Theorem. The complete description (for the semifinite setting) of isometries on noncommutative L_p-spaces was obtained by Yeadon. For general separable noncommutative symmetric spaces, the description of surjective isometries was initiated in the 1980s. Recently, in a joint paper with Huang (JEMS, 2024), we showed that all such isometries are of elementary forms. In this talk, I will present some recent progresses in this direction in the non-separable setting. In particular, it is shown that any surjective isometry on a noncommutative symmetric space on a finite von Neumann algebra is either an L_p-isometry or generated by a unitary operator and a trace-preserving *-isomorphism. Consequently, we answer a question posed by Mitaygin in 1970.


1920
HIT