

Titles and Abstracts

1. Man-Duen Choi, University of Toronto, Canada
Title: How I could think of tensor products of matrices
Abstract: In all years, I have mathematical dreams on completely positive linear maps, concerning tensor products of complex matrices. Suddenly, I wandered into the quantized world of fantasies and controversies. To release myself from Quantum Entanglements and the Principle of Locality, I need to seek the meaning of physics and the value of metaphysics.
Conclusion: I THINK, THEREFORE I AM a pure mathematician.
2. Cho-Ho Chu, Queen Mary, University of London
Title: The Liouville theorem and amenability.
Abstract: I will discuss briefly a recent joint work with Xin Li, in which we show the equivalence of the Liouville theorem and amenability for discrete semigroups and groupoids. Our result for groupoids proves a conjecture proposed by Kaimanovich in 2004.
3. Harold Garth Dales, Lancaster University, UK
Title: Banach function algebras, approximate identities, and BSE norms
Abstract: I shall discuss Banach function algebras on a locally compact space, and, in particular, when their maximal modular ideals have (pointwise) contractive approximate identities. I shall define the BSE norm on such an algebra and explain when it is a BSE algebra. This will include an explanation of what 'BSE' stands for. There will be a variety of examples including some uniform algebras, and the Fourier algebra, the Figa-Talamanca {Herz algebras, and certain Segal algebras based on a locally compact group.

The talk is based on two joint papers with Ali Ülger of Istanbul.
4. Guihua Gong, Jilin University, China
Title: On the classification of AH algebras with ideal property
Abstract: In this talk, I will present a classification of AH algebras with ideal property and with no dimension growth. This classification unifies and generalize the case for real rank zero AH algebras due to Dadarlat-Gong and simple AH algebras due to Elliott-Gong-Li. This is a joint work with Chunlan Jiang and Liangqing Li.
5. Chunlan Jiang, Hebei Normal University
Title: Curvature and the Second fundamental form in classifying quasi-homogeneous holomorphic curves and operators in the Cowen-Douglas class
Abstract: In this talk, we study quasi-homogeneous operators, which include the homogeneous operators, in the Cowen-Douglas class. We give two separate theorems describing canonical models (with respect to equivalence under unitary

and invertible operators, respectively) for these operators using techniques from complex geometry. This considerably extends the similarity and unitary classification of homogeneous operators in the Cowen-Douglas class obtained recently by the G. Misra and A. Korányi. Specifically, the complex geometric invariants used for our classification are the curvature and the second fundamental forms inherent in the definition of a quasi-homogeneous operator. We show that these operators are irreducible and determine when they are strongly irreducible. Applications include the equality of the topological and algebraic K-group of a quasi-homogeneous operator and an affirmative answer to a well-known question of Halmos on similarity for these operators.

6. Anthony To-Ming Lau, University of Alberta
 Title: Finite dimensional invariant subspace properties
 Abstract: Motivated by a result of Ky Fan, I will discuss characterizations of left amenability of a class of Banach algebras which are preduals of von Neumann algebras in terms of finite invariant subspace properties.
7. Hanfeng Li, Chongqing University
 Title: Sofic Mean Length
 Abstract: Given a unital ring R and a length function on R -modules, we introduce an invariant, called mean length, for modules of the group ring $R\Gamma$ for any sofic group Γ . Applications will be given for Kaplansky's direct finiteness conjecture and the correspondence between mean dimension in dynamical systems and von Neumann-Lück rank in L^2 -invariants theory. This is joint with Bingbing Liang.
8. Zhiqiang Li, Chongqing University
 Title: KK-lifting problem for C^* -algebras and order structures on K -groups
 Abstract: In this talk, we will focus on KK-lifting problem for C^* -algebras, namely, the problem to determine which KK-classes of C^* -algebras can be represented by $*$ -homomorphisms between the algebras (of course tensor products of the codomain algebras with matrices are allowed). Such a lifting problem is usually closely related to order structures on K -groups of C^* -algebras. We will exhibit several examples to illustrate this problem. This is a joint work with G. A. Elliott.
9. Huaxin Lin, University of Oregon, USA
 Title: Classification of finite simple amenable C^* -algebras
 Abstract: We present a classification theorem for a class of unital simple separable amenable \mathbb{Z} -stable C^* -algebras by the Elliott invariant. This class of simple C^* -algebras exhausts all possible values of Elliott invariant for unital stably finite simple separable amenable \mathbb{Z} -stable C^* -algebras. Moreover, it contains all unital simple separable amenable C^* -algebras which satisfy the UCT and have finite rational tracial rank.
10. Ying-Fen Lin, Queen's University Belfast, UK

Title: Positive extensions of Schur multipliers

Abstract: In my talk, I will first introduce partially defined Schur multipliers, and then show necessary and sufficient conditions for the extension of such a Schur multiplier to a fully defined positive Schur multiplier, in terms of an operator system.

11. Jean Ludwig, Universite de Lorraine, France

Title: The C^* -algebra of a nilpotent Lie group

Abstract: For any nilpotent Lie group we provide a description of the image of its C^* -algebra through its operator-valued Fourier transform and we show that this C^* -algebra has the norm controlled dual limits property. This is joint work with Ingrid Beltita, Daniel Beltita and Hedi Regeiba.

12. Tao Ma, Wuhan University

Title: Vector Valued q -Variation for Differential Operators and Semigroups

Abstract: We establish β -valued variational inequalities for differential operators, ergodic averages and symmetric diffusion semigroups under the condition that Banach space β has martingale cotype property. These results generalize, on the one hand Pisier and Xu's result on the variational inequalities for β -valued martingales, on the other hand many classical variational inequalities in harmonic analysis and ergodic theory. Moreover, we show that Rademacher cotype q is necessary for the β -valued q -variational inequalities. As applications of the variational inequalities, we deduce the jump estimates and obtain quantitative information on the rate of convergence. It turns out the rate of convergence depends on the geometric property of the Banach space under consideration, which considerably improves Cowling and Leinert's result where it is shown that the convergence always holds for all Banach spaces.

13. Tao Mei, Wayne State University, USA

Title: Completely boundedness of the heat semigroups on von Neumann algebras of Hyperbolic groups

Abstract: This talk is based on a joint work with M. de la Salle. Let $F_n, 1 \leq n \leq \infty$ be the group of n free generators. Let λ_g be the left regular representations of $g \in G$. One may consider the analogue of the classical Poisson (heat) semigroups on free group von Neumann algebra $\mathcal{L}(F_n)$,

$$S_t^r : \lambda_g \rightarrow e^{-t|g|^r} \lambda_g,$$

with $|g|$ the reduced word length of g .

It is due to U. Haagerup S_t^r 's with $0 < r \leq 1$ are semigroups of complete contractions on $\mathcal{L}(F_n)$. O. Narutaka shows further that S_t^r 's, again with $0 < r \leq 1$, are semigroups of completely bounded maps on von Neumann algebras of Hyperbolic groups.

What we can say for other value of r , in particular for $r = 2$? and why we care?

14. Chi-Keung Ng, Naikai University, China

Title: The Gelfand Transform for Commutative Unital Banach Rings

Abstract: Using the affine analytic space A^1_S for a commutative unital ring S (as introduced by Berkovich), we extend the Gelfand transform and obtain a functor from the category of commutative unital Banach rings to that of “continuous bundles of complete valuation fields”. This functor induces an equivalence from the category of commutative unital real C^* -algebras to the category of “quasitrivial” continuous bundles of complete valuation field extensions of \mathbb{R} , which extends the Gelfand theory for commutative unital complex C^* -algebras.

As an application, if S is a commutative unital Banach algebra over a complete valuation field k , we obtain a complete valuation field K extending k and an easily described topology on $C(S, K) \times K$ such that the “universal Hausdorff image” of this topological space is canonically homeomorphic to A^1_S .

Furthermore, we show that if G is a discrete torsion-free abelian group, there always exists a complete valuation field K extending k such that the group of homomorphisms from G to the unit sphere of K separates points of G .

15. Narutaka Ozawa, University of Tokyo, Japan

Title: The Furstenberg boundary and C^* -simplicity

Abstract: A (discrete) group G is said to be C^* -simple if the reduced group C^* -algebra of it is simple. I will first explain Kalantar and Kennedy's characterization of C^* -simplicity for a group G in terms of its action on the maximal Furstenberg boundary. Then I will talk about my result with Breuillard, Kalantar, and Kennedy about examples and stable properties of C^* -simple groups.

16. Hung Le Pham, Victoria University of Wellington, New Zealand

Title: Characterisations of Fourier algebras on locally compact groups

Abstract: This is a joint work with Anthony To-Ming Lau. Here, I shall present some characterisations of the Fourier algebra $A(G)$ of a locally compact group G in terms of the class of F -algebras (i.e. a Banach algebra A such that its dual A^0 is a W^* -algebra whose identity is multiplicative on A). A sample of our results is that the Fourier algebras are precisely those commutative semisimple F -algebras that are Tauberian, contain a nonzero real element, and possess a dual semigroup that acts transitively on their spectrums. Our characterisations fall into three flavours, where the first one will be the basis of the other two. The first flavour also implies a simple characterisation of when the predual of a Hopf-von Neumann algebra is the Fourier algebra of a locally compact group. Our work is motivated by the beautiful work of M. A. Rieffel (1965) and of M. E. Walter (1974).

17. Zhongjin Ruan, University of Illinois, USA

Title: On Exotic Group C^* -algebras

Abstract: Let F_2 be the free group of 2-generators. Since F_2 is non-amenable, the full group C^* -algebra $C^*(F_2)$ is not equal to the reduced group C^* -algebra $C_\lambda^*(F_2)$. In fact, Brown-Guentner and Okayasu have shown that there are infinitely many different exotic group C^* -algebras A between $C^*(F_2)$ and $C_\lambda^*(F_2)$, i.e. there are infinitely many C^* -algebras A such that we have the proper quotients

$$C^*(F_2) \rightarrow A \rightarrow C_\lambda^*(F_2).$$

In this talk, we will discuss various properties of these exotic C^* -algebras.

18. Ebrahim Samei, University of Saskatchewan, Canada

Title: Reflexivity and hyperreflexivity of bounded n -cocycle spaces and application to convolution operators

Abstract: We introduced the concept of strong property \mathbb{B} with a constant for Banach algebras and, by applying certain analysis on the Fourier algebra of a unit circle, we show that all C^* -algebras and group algebras have the strong property \mathbb{B} with a constant given by $288\pi(1+\sqrt{2})$. We then use this result to find a concrete upper bound for the hyperreflexivity constant of certain spaces of bounded n -cocycles from SA into XX , where SA is a C^* -algebra or the group algebra of a group with an open subgroup of polynomial growth and XX is a Banach SA -bimodule. As another application, we show that for a locally compact amenable group G and $1 < p < \infty$, the space $CV_p(G)$ of convolution operators on $L^p(G)$ are hyperreflexive with a constant given by $288\pi(1+\sqrt{2})$. This is the generalization of a well-known result of E. Christensen for $p=2$. This is a joint work with Jafar Soltani Farsani.

19. Nico Spronk, University of Waterloo, Canada

Title: Weak amenability of Fourier algebras

Abstract: Let G be a locally compact group. Full characterisations of amenability and weak amenability for its group algebra $L^1(G)$ have been known for a long time now. These properties have also been completely determined for the Fourier algebra $A(G)$, when its natural operator space structure is considered. Even the characterisation of classical amenability (without operator space structure) for $A(G)$ has been known for some time. However, the problem of knowing when $A(G)$ is weakly amenable remains unsettled. I wish to discuss recent work, conducted with H. H. Lee, J. Ludwig and E. Samei, which settles the issue for all Lie groups. I will indicate how the problem for general groups is "almost completed".

20. Michael Y. Sun, University of Muenster, Germany

Title: Examples of residually finite groups actions with the Rokhlin property

Abstract: We examine Izumi's definition of the Rokhlin property for residually finite groups through looking at a nice class of examples on UHF algebras. Every countable residually finite group is included in this class of examples.

21. Wei Sun, East China Normal University

Title: On conjugacies of C^* -dynamical systems

Abstract: Crossed product C^* -algebras contains information on both the original base C^* -algebras and the group actions. We focus on such problems as how we can derive certain conjugacies of two actions from the information of the two crossed product C^* -algebras.

We will start with reviewing some classical cases and results, and we will show some theoretical limits of those results. In particular, we will demonstrate examples of non-conjugacies in case the two crossed products are isomorphic. Based on that, we will show how the strengthened isomorphisms (approximate K -conjugacies as for those examples) can ensure the existence of such conjugacies for the above mentioned examples.

22. Liguang Wang, Qufu Normal University

Title: On the properties of some sets of von Neumann algebras under perturbation

Abstract: Let L be a type II_1 factor with separable predual and τ a normal faithful tracial state of L . We first show that the set of subfactors of L with property Γ , the set of type II_1 subfactors of L with similarity property and the set of all McDuff subfactors of L are open and closed in the Hausdorff metric d_2 induced by the trace norm; then we show that the set of all hyperfinite von Neumann subalgebras of L is closed in d_2 . We also consider the connection of perturbation of operator algebras under d_2 with the fundamental group and the generator problem of type II_1 factors. When M is a finite von Neumann algebra with a normal faithful trace, the set of all von Neumann subalgebras with property T relative to M is closed in the Hausdorff metric d_2 .

23. Qin Wang, East China Normal University

Title: Truncation approximation and spectral invariant subalgebras in uniform Roe algebras of discrete groups

Abstract: We study band truncation approximation for operators in uniform Roe algebras of countable discrete groups, which is a non-commutative analogue of uniform convergence of the Fourier series of a continuous function on the unit circle. Under conditions of certain growth rates, we find large classes of dense subspaces of uniform Roe algebras whose elements can be approximated in operator norm by their band truncations. We apply these results to construct a nested family of spectral invariant Banach algebras on discrete groups. For a group with polynomial growth, the intersection of these Banach algebras is a spectral invariant dense subalgebra of the uniform Roe algebra. For a group with sub exponential growth, we show that the Wiener algebra of the group is a spectral invariant dense subalgebra of the uniform Roe algebra.

24. Ya-Shu Wang, Nation Chung Hsing University

Title: Holomorphic Maps between Fourier Algebras

Abstract: Let G_1, G_2 be locally compact amenable groups, and let $BA(G_1)(0; r)$ be the open ball in the Fourier algebra $A(G_1)$ centered at 0 of radius $r > 0$. Suppose

that $H : BA(G1)(0;r) \rightarrow A(G2)$ is a completely bounded, orthogonally additive and multiplicative, and conformal holomorphic map. We show that there exist a piecewise affine homeomorphism $\sigma : G2 \rightarrow G1$ and a sequence $\{\omega_n\}$ in the Fourier-Stieltjes algebra $B(G2)$ such that

$$H(f)(y) = \sum_{n \geq 1} \omega_n(y) f(\sigma(y)) \quad \forall f \in BA(G1)(0;r).$$

25. Ngai-Ching Wong, National Sun Yat-sen University

Title: Transition Probabilities Preserving Maps

Abstract: Let Φ be a bijection (not assumed affine nor continuous) from the normal state space of one quantum system, modelled on the self-adjoint part of a von Neumann algebra $M1$, to that of another one, modelled on another von Neumann algebra $M2$. As a “generalising” of Wigner’s theorem, we show that there exists a Jordan $*$ -isomorphism $\Theta : M2 \rightarrow M1$ with

$$\Phi = \Theta_*|S(M1)$$

if and only if Φ preserves a notion of “asymmetric transition probabilities”. If Φ is assumed to preserve either the Raggio or the Uhlmann transition probabilities instead, then $M1$ and $M2$ are Jordan $*$ -isomorphic.

On the other hand, in the spirit of Uhlhorn’s theorem, we show that if Φ is biorthogonality preserving, i.e. zero transition probability preserving, then $M1$ and $M2$ are Jordan $*$ -isomorphic. As an application, we show that the sets of normal states equipped with some metrics are complete Jordan invariants for the underlying von Neumann algebras.

This is a joint work with Chi-Wai Leung (CUHK) and Chi-Keung Ng (Nankai).

26. Wenming Wu, Congqing Normal University

Title: Subspace Lattices in finite Von Neumann Algebras

Abstract: The main topic of this talk is on the subspace lattices in a finite von Neumann algebra. We will introduce the definitions of reflexive subspace lattices relative to a finite von Neumann algebra and the $*$ -algebra consisting of the closed operators affiliated with the finite von Neumann algebra. It is shown that this kind reflexive subspace lattice generated by three projections in general position is homeomorphic to the sphere plus two points. We also characterize the automorphisms fixing the subspace lattices determined by three free projections with half trace.

Furthermore, we will briefly introduce some recent progress in transitivity of a small subspace lattice and show that an abelian Kadison-Singer algebra (if there exists) in matrix algebra $M_n(C)$ ($n \geq 3$) cannot be generated by a single element.

27. Zhizhang Xie, Texas A&M University, USA

Title: Higher signatures on Witt spaces

Abstract: The signature is a fundamental homotopy invariant for topological

manifolds. However, for spaces with singularities, this usual notion of signature ceases to exist, since, in general, spaces with singularities fail the usual Poincaré duality. A generalized Poincaré duality theorem for spaces with singularities was proven by Goresky and MacPherson using intersection homology. The classical signature was then extended to Witt spaces by Siegel using this generalized Poincaré duality. Witt spaces are a natural class of spaces with singularities. For example, all complex algebraic varieties are Witt spaces. In this talk, I will describe a combinatorial approach to higher signatures of Witt spaces, using methods of noncommutative geometry. The talk is based on joint work with Nigel Higson.

28. Quanhua Xu, Wuhan University & Université de Franche-Comté, Besançon, France
 Title: Function spaces on quantum tori
 Abstract: We will present some results about function spaces on quantum tori. The spaces in consideration include Sobolev, Besov and Triebel-Lizorkin spaces. We will discuss their embeddings and characterizations by Poisson and heat semigroups.
 The talk is based on a joint work with Xiao Xiong and Zhi Yin.

29. Shuang Zhang, University of Cincinnati, USA
 Title: Projections in C^* -algebras and the associated multiplier algebras
 Abstract: I will give a brief survey for some recent results jointly obtained with Victor Kaftal and Ping Ng around levels of abundance of projections in certain C^* -algebras and their associated multiplier algebras. In particular, I will outline how the space of extremal traces is related to the linear spans of projections in these C^* -algebras and their multiplier algebras.

30. Yong Zhang, University of Manitoba, Canada
 Title: Weak Amenability of Noncommutative Beurling Algebras
 Abstract: Let G be a locally compact group. A Beurling algebra on G is a weighted convolution algebra $L^1(G, \omega)$, where ω is a continuous weight function on G (i.e. $\omega: G \rightarrow \mathbb{R}^+$ satisfies $\omega(xy) \leq \omega(x)\omega(y)$).
 Weak amenability for commutative Beurling algebras has been extensively studied and nicely characterized. We are concerned with noncommutative Beurling algebras. It appears that the situation for noncommutative case is very different from the commutative case. I will present some recent investigation on the topic.
 We first characterize derivations from a Beurling algebra into its dual. Precisely, if $D: L^1(G, \omega) \rightarrow L^\infty(G, \frac{1}{\omega})$ is a continuous derivation, then there is $\alpha \in L^\infty(G \times G, \frac{1}{\omega \times \omega})$ such that $\alpha(xy, z) = \alpha(y, zx) + \alpha(y, xz)$ locally a.e. on G^3 and $\int \alpha(x, y) f(x) g(y) dx dy$ ($f, g \in L^1(G, \omega)$). We then establish several criteria to $G \times G$ rule out weak amenability of a Beurling algebra. As applications, we study the locally compact $\mathbf{ax+b}$ group and the locally compact Heisenberg group G_H . The function $\omega_\alpha(a, b) = (1 + |a| + |b|)^\alpha$ is a weight on $\mathbf{ax+b}$ for $\alpha > 0$ and $\omega_\alpha(u, v, w) = (1 + |u| + |v|)^\alpha$ is a weight on G_H . We show that there are continuous derivations from $L^1(G, \omega_\alpha)$ into

$L^\infty(G, \frac{1}{\omega_\alpha})$ that are not inner for $G = \mathbf{ax+b}$ or $G = G_H$. So $L^1(\mathbf{ax+b}, \omega_\alpha)$ and $L^1(G_H, \omega_\alpha)$

are not weakly amenable for all $\alpha > 0$.

For a discrete group G , we show that a continuous derivation $D: \ell^1(G, \omega) \rightarrow \ell^\infty(G, \frac{1}{\omega})$ is of the inner form (i.e. there is a function f on G such that $D(\delta_x) = \delta_x \cdot f - f \cdot \delta_x$ for all $x \in G$) if and only if $D(\delta_x)(y) = 0$ for any commuting elements $x, y \in G$. If ω

satisfies $\sup_{n \in \mathbb{N}} \frac{n}{\omega(x^n)\omega(x^{-n})} = \infty$ for all $x \in G$, then every continuous derivation

$D: \ell^1(G, \omega) \rightarrow \ell^\infty(G, \frac{1}{\omega})$ is of the inner form.

We will also consider weak amenability of Beurling algebras on subgroups and quotient groups. This is joint work with Varvara Shepelska.