Operator Algebra and Harmonic Analysis 2017 (as of Dec. 8 2017)

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<tr><td>3:50-4:30</td><td>Mahya Ghandehari</td><td>Mehdi S. Monfared</td><td>Xiang Fang</td></tr>
<tr><td>4:35-5:15</td><td>Chih-Neng Liu</td><td>Ming-Yi Lee</td><td>Ebrahim Samei</td></tr>
<tr><td>5:20-6:00</td><td></td><td>Hun Hee Lee</td><td>Yin-Fen Lin</td></tr>
<tr><td>6:00-</td><td colspan="2">Supper</td><td>Banquet</td><td colspan="2">Supper</td></tr>
<tr><td>7:30</td><td>ST Yau: My past experience in Math</td><td></td><td></td><td colspan="2"></td></tr>
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1. Venue: Tsinghua Sanya International Mathematics Forum (TSIMF), Sanya, Hainan Providence, China.
2. Registration is done upon your arrival at TSIMF.
3. Opening is before the first talk on Dec. 18. Closing is on Dec. 22, after the last talk.
4. Group Photo will be taken on Tuesday, right after the last talk in the morning session and before lunch.
5. Banquet holds on Dec. 20 at TSIMF.
6. Participants can join an activity during the Free Discussion.
7. Visit the Conference homepage at http://www.tsimf.cn/meeting/show?id=36 for details.

Operator Algebra and Harmonic Analysis 2017
算子代数与调和分析研讨会 2017

Tsinghua Sanya International Mathematics Forum (TSIMF)
Sanya, Hainan, China
December 18 to 22, 2017.

as of December 7, 2017

Monday, December 18, 2017

(Chair: Zhong-Jin Ruan 阮忠进)

8:10 – 8:20 Opening
Shiu-Yuen Cheng 郑绍远 (Yau Mathematical Sciences Center, Tsinghua University, China)
Anthony To-Ming Lau 刘道明 (University of Alberta, Canada)

8:20 – 9:00 Anthony To-Ming Lau 刘道明 (University of Alberta, Canada)
The Rajchman algebra of a locally compact group.

09:05 – 09:45 Bachir Bekka (Université de Rennes 1, France)
Harmonic cocycles and von Neumann algebras.

tea/coffee/snacks

10:00 – 10:40 Lajos Molnár (University of Szeged and Budapest University of Technology and Economics, Hungry)
Jordan isomorphisms as preservers.

10:45 – 11:25 Chin-Cheng Lin 林钦诚 (National Central University, Taiwan)
$\mathcal{A}_{p,\mathbb{E}}$ *weights, maximal operators, and Hardy spaces associated with a family of general sets.*

11:30 – 12:10 Chi-Wai Leung 梁子威 (The Chinese University of Hong Kong, Hong Kong)
Grassmannians over Banach Spaces.

Lunch

(Chair: Anthony To-Ming Lau 刘道明)

14:00 – 14:40 Keith Taylor (Dalhousie University, Canada)
Constructing projections in $L^1(G)$.

14:45 – 15:25 Chun-Yen Shen 沈俊俨 (National Taiwan University, Taiwan)
A two weight $T1$ *and* Tb *theorem for the Hilbert transform.*

tea/coffee/snacks

15:50 – 16:30 Mahya Ghandehari (University of Delaware, USA)
Construction of higher dimensional frames using square-integrable representations.

16:35 – 17:15 Chih-Neng Liu 刘治能 (National Sun Yat-Sen University, Taiwan)
Generalized n-circular projections on JB-triples and Hilbert* $C_0(\Omega)$*-modules.*

supper

(`Master Lectures 大师论坛`)

19:30 – 21:00 Shing-Tung Yao 丘成桐 (Director of Yau Mathematical Sciences Center of Tsinghua University and Professor of Harvard University)
My past experience in mathematics.

Tuesday, December 19, 2017

(Chair: Keith Taylor)

8:20 – 9:00 Michael Cowling (University of New South Wales, Australia)
Structure of connected groups and applications to harmonic analysis.

09:05 – 09:45 Zhong-Jin Ruan 阮忠进 (University of Illinois at Urbana Champaign, USA)
Approximation properties for group C-algebras.*

TEA/COFFEE/SNACKS

10:00 – 10:40 Nico Spronk (University of Waterloo, Canada)
Traces on group C-algebras.*

10:45 – 11:25 Søren Knudby (Münster University, Germany)
The Fourier and Rajchman algebras of a locally compact group.

11:30 – 12:10 Ali Ulger (University of Koc, Turkey)
On Some Theorems of Reiter/Varopoulos/Saeki/Helson, and Sets of Synthesis.

Group Photo taken at the entrance of the conference building

Lunch

(Chair: Man-Duen Choi 蔡文端)

14:00 – 14:40 Volker Runde (University Alberta, Canada)
Wittstock moduli of elementary operators and their application to generalized notions of amenability.

14:45 – 15:25 Marcel de Jeu (Leiden University, the Netherlands)
Banach lattice algebra representations in harmonic analysis.

TEA/COFFEE/SNACKS

15:50 – 16:30 Mehdi S. Monfared (University of Windsor, Canada)
Almost periodic functionals and finite-dimensional representations.

16:35 – 17:15 Ming-Yi Lee 李明亿 (National Central University, Taiwan)
Carleson measure characterization of weighted BMO associated with a family of general sets.

17:20 – 18:00 Hun Hee Lee (Seoul National University, Korea)
Twisted group algebra, Fourier (-Stieltjes) space and amenability.

supper

Wednesday, December 20, 2017

(Chair: Chi-Keung Ng 吴志强)

8:20 – 9:00 Huaxin Lin 林华新 (University of Oregon, USA)
Classification of Simple Amenable C-algebras of Low Real Rank.*

09:05 – 09:45 Shuang Zhang 张爽 (University of Cincinnati, USA)
Some recent results around multiplier algebras.

TEA/COFFEE/SNACKS

10:00 – 10:40 Ngai-Ching Wong 黄毅青 (National Sun Yat-sen University, Taiwan)
The geometry of convex combinations of positive elements determines a noncommutative L^p space.

10:45 – 11:25 Denny H. Leung 梁浩瀚 (National University of Singapore, Singapore)
Maximal ideals in Banach algebras of bounded linear operators.

11:30 – 12:10 Hao-Wei Huang 黄皓玮 (National Sun Yat-sen University, Taiwan)
Harmonic analysis in bi-free probability theory.

Lunch

(Chair: Ngai-Ching Wong 黄毅青)

14:00 – 14:40 Yong Zhang 张勇 (University of Manitoba, Canada)
Attractive points, fixed points and amenability properties of semigroups.

14:45 – 15:25 Ya-Shu Wang 王雅书 (Nation Chung Hsing University, Taiwan)
Orthogonally multiplicative maps between Figá-Talamanca-Herz algebras.

TEA/COFFEE/SNACKS

15:50 – 16:30 Xiang Fang 方向 (National Central University, Taiwan)
Carleson measures on the Dirichlet space revisited.

16:35 – 17:15 Ebrahim Samei (University of Saskatchewan, Canada)
Twisted Orlicz algebras and complete isomorphism to operator algebras.

17:20 – 18:00 Yin-Fen Lin 林英芬 (Queen's University Belfast, UK)
A Fourier inversion theorem and prime ideals for nilpotent Lie groups.

Banquet (18:00)

Thursday, December 21, 2017

(Chair: Michael Cowling)

8:20 – 9:00 Man-Duen Choi 蔡文端 (University of Toronto, Canada)
The harmonic analysis of two by two matrices.

09:05 – 09:45 Lixin Cheng 程立新 (Xiamen University, China)
On linear isometry, isometry and perturbed isometry of Banach spaces.

TEA/COFFEE/SNACKS

10:00 – 10:40 Mehrdad Kalantar (University of Houston, USA)
Stationary C^*-dynamical systems.

10:45 – 11:25 Rui Liu 刘锐 (Nankai University, China)
Approximation properties, frames, and dilations of operator-valued measures.

Lunch

Free Discussion

supper

Friday, December 22, 2017

(`Chair: Chi-Wai Leung` 梁子威)

8:20 – 9:00 Huai-Xin Cao 曹怀信 (Shaanxi Normal University, China)
Some remarks on Bell non-locality and EPR steering of bipartite states.

09:05 – 09:45 Chi-Keung Ng 吴志强 (Nankai University, China)
Metric preserving bijection between thin positive bells of non-commutative L^p*-spaces.*

Closing Remarks

Departure

Titles and Abstracts

1. Bachir Bekka, IRMAR, UMR-CNRS 6625 Université de Rennes 1, Campus Beaulieu, F-35042 Rennes Cedex, France

   Title: Harmonic cocycles and von Neumann algebras

   Abstract: Important classes of locally compact groups (such as groups with Kazhdan's property and groups with the Haagerup property) are characterized by their actions by affine isometries on Hilbert spaces. Such an action is described by a space of 1-cohomology with coefficients in a unitary group representation. Using harmonic cocycles, the space of (reduced) 1-cohomology can be turned into a Hilbert module over the von Neumann algebra given by the commutant of the representation. We will be interested in the associated von Neumann dimension in the case of a factor representation and its relation to a notion of irreducibility for actions by affine isometries.

2. Huai-Xin Cao, School of Mathematics and Information Science, Shaanxi Normal University, Xi'an, China

   Title: Some remarks on Bell non-locality and EPR steering of bipartite states

   Abstract: Bell nonlocality and Einstein-Podolsky-Rosen (EPR) steering are every important quantum correlations of a composite quantum system. Bell nonlocality of a bipartite state is a quantum correlation demonstrated by some local quantum measurements, while EPR steering is another form of quantum correlations, observed by Schrodinger in the context of famous EPR paradox. In this paper, we give some remarks on Bell nonlocality and EPR steering of bipartite states, including mathematical definitions and characterizations of these two quantum correlations, the convexity and closedness of the set of all Bell local states and the set of all EPR unsteerable states. We also derive a EPR-steering criteria, with which the EPR steerability of the maximally entangled states are checked.

3. Lixin Cheng, Xiamen University, China

   Title: On linear isometry, isometry and perturbed isometry of Banach spaces

   Abstract: The study of properties of isometries and its generalizations on Banach spaces has continued for over 80 years since Mazur and Ulam's celebrated theorem in 1932: Every surjective isometry from a Banach space X to a Banach space Y is necessarily affine. A mapping $f : X \to Y$ is said to be ε-isometry (for some $\varepsilon \geq 0$) provided

   $$\Big| \|f(x) - f(y)\| - \|x - y\| \Big| \leq \varepsilon, \ \ \forall x, y \in X.$$

   We say that an ε-isometry f is standard, if $f(0) = 0$; and a 0-isometry is called an isometry. In this talk, we first give a sequence of examples showing linear isometries, isometries and perturbed isometries have extensive backgrounds in both pure mathematics and applied mathematics. Then we present a brief survey on this topic. Finally, we conclude this talk by some open questions in this research area.

4. Man-Duen Choi, University of Toronto, Canada

   Title: The harmonic analysis of two by two matrices

Abstract: The down-to-earth structure of two by two complex matrices may provide the best illustration of the NON-COMMUTATIVE geometry.

5. Michael Cowling, University of New South Wales, Australia

   Title: Structure of connected groups and applications to harmonic analysis

   Abstract: We develop the structure theory of connected locally groups, and use this to extend some results from connected Lie groups to connected locally compact groups. We give sharp constants for the Hausdorff-Young inequality and provide information about the Fourier and Fourier–Stieltjes algebras.

6. Marcel de Jeu, Leiden University, the Netherlands

   Title: Banach lattice algebra representations in harmonic analysis

   Abstract: If G is a locally compact group, then natural spaces such as $\mathrm{L}^1(G)$ or $\mathrm{M}(G)$ carry more structure than just that of a Banach algebra. They are also vector lattices, so that they are, in fact, Banach lattice algebras. Therefore, if they act by convolution on, say, $\mathrm{L}^p(G)$, it is a meaningful question to ask if the corresponding map into the Banach lattice algebra $\mathrm{L_r}(\mathrm{L}^p(G))$ of regular operators on $\mathrm{L}^p(G)$ is not only an algebra homomorphism, but also a lattice homomorphism. Analogous questions can be asked in similar situations, such as the left regular representation of $\mathrm{M}(G)$.

   In this lecture, we shall give an overview of what is known in this direction, and which approaches are available. The rule of thumb, based on an underlying general principle, is that the answer is affirmative whenever the question is meaningful.

   This is joint work with Garth Dales and David Kok.

7. Xiang Fang, National Central University, Taiwan

   Title: Carleson Measures on the Dirichlet Space Revisited

   Abstract: We prove that all doubling measures on the unit disk $\mathbb{D}$ are Carleson measures for the standard Dirichlet space $\mathcal{D}$. The proof has three new ingredients. The first one is a new characterization of Carleson measures. This holds true for general reproducing kernel Hilbert spaces, and is a (slight but necessary) generalization of a characterization due to Arcozzi-Rochberg-Sawyer (Adv. Math., 1107–1180, 2008). The second one is another new equivalent condition for Carleson measures, which holds true only for the standard Dirichlet space. This type of equivalent condition seems not appear before. The third one is an application of dyadic harmonic analysis to operator theory. This includes a two-weight inequality for Bergman-type integral operators.

8. Mahya Ghandehari, University of Delaware, USA

   Title: Construction of higher dimensional frames using square-integrable representations

   Abstract: One of the main challenges of frame and wavelet theory is to construct and analyze suitable frames which provide sparse representations for natural classes of square-integrable functions on the Euclidean space $\mathbb{R}^d$. A *frame* for $L^2(\mathbb{R}^d)$ is a sequence $\{e_j\}_{j\in J}$ in $L^2(\mathbb{R}^d)$ together with constants $0 < A \leq B < \infty$ such that

$$A\|f\|_2^2 \leq \sum_{j\in J}\langle f, e_j\rangle \leq B\|f\|_2^2,$$

for all $f \in L^2(\mathbb{R}^d)$. The construction of frames in higher dimensions turns out to be a difficult task. In this talk we present an explicit frame construction based on earlier work of Bernier and Taylor in 1996, where a general framework for the construction of higher dimensional continuous wavelet transforms was outlined. We then use the geometric features of the ambient space to produce frames with small frame bound gap. This talk is based on joint work with Kris Hollingsworth, and Nathaniel Kim, Aizhan Syzdykova, and Keith F. Taylor.

9. Hao-Wei Huang, Department of Applied Mathematics, National Sun Yat-sen University, No. 70, Lienhai Rd., Kaohsiung 80424, Taiwan

   Title: Harmonic Analysis in bi-free probability theory

   Abstract: In free probability the notion of free convolution of probability distributions on $\mathbb{R}$ has played an important role since its inception by D. Voiculescu some 30 years ago. In 2013, Voiculescu generalized the notion of free independence to study left and right actions on reduced free product spaces simultaneously, known as bi-free independence. One generalization of the free convolution to the bi-free setting is the bi-free convolution of planar probability distributions. In this talk, we will explain that the bi-freely infinitely divisible laws, and only these laws, can be used to approximate the distributions of sums of identically distributed bi-free pairs of commuting faces. We will also talk about bi-free Lévy-Khintchine representations from an infinitesimal point of view. The proofs depend on the bi-free harmonic analysis machinery that we developed for integral transforms of two variables. If time permits, some recent developments in this direction will also be discussed.

10. Mehrdad Kalantar, University of Houston, USA

    Title: Stationary C^*-dynamical systems

    Abstract: We introduce the notion of stationary actions in the context of C^*-algebras. As an application, we obtain new characterizations of C^*-simplicity, in terms of unique stationarity. By that we single out certain random walks that 'capture' C^*-simplicity, and we prove some rigidity properties for these measures. In addition, using our techniques, we prove several superrigidity results for discrete groups relative to co-amenable sub-groups. This is joint work with Yair Hartman.

11. Søren Knudby, Münster University, Germany

    Title: The Fourier and Rajchman algebras of a locally compact group

    Abstract: The Fourier algebra $A(G)$ and the Fourier-Stieltjes algebra $B(G)$ are function algebras that occur naturally in harmonic analysis of a locally compact group G. Unless G is a compact group, $A(G)$ is a proper subalgebra of $B(G)$, since functions in $A(G)$ vanish at infinity while $B(G)$ contains the constant functions. Consider the following question: Does the Fourier algebra $A(G)$ coincide with the subalgebra of $B(G)$ consisting of functions vanishing at infinity? This last algebra is sometimes called the Rajchman algebra.

The talk will cover previously known results concerning this question. It will also include a theorem giving sufficient conditions for the question to have an affirmative answer. As an application of the theorem we are able to give new examples of groups whose Fourier and Rajchman algebras coincide. In particular, we show that there exist uncountably many non-compact groups with this property.

Finally, we compare groups with completely reducible regular representation and groups whose Fourier and Rajchman algebras coincide. For unimodular groups with completely reducible regular representation, we show that the Fourier algebra may in general be strictly smaller than the Rajchman algebra.

12. Anthony To-Ming Lau, University of Alberta, Canada

    Title: The Rajchman algebra of a locally compact group

    Abstract: Let G be a locally compact group. The Rajchman algebra $B_0(G)$ is the closed idea of all functions in the Fourier Stieltjes algebra $B(G)$ consisting of all functions vanishing at infinity containing the Fourier algebra $A(G)$. In this talk, I shall report on some recent results on this algebra and open questions.

13. Hun Hee Lee, Seoul National University, Korea

    Title: Twisted group algebra, Fourier (-Stieltjes) space and amenability

    Abstract: In this talk we begin with twisted group algebras on a locally compact group with respect to a 2-cocycle. This algebra usually serves as the passage to constructing twisted (full and reduced) C^*-algebras or twisted group von Neumann algebras. As the dual of twisted full group C^*-algebra and the predual of the twisted group von Neumann algebras we can consider twisted Fourier space and Fourier-Stieltjes space. In operator algebra community twisted C^*-algebras and group von Neumann algebras main concerns and have been studied extensively, we would like to focus on the other objects, namely twisted group algebra, Fourier space and Fourier-Stieltjes space. We will explain that the results of Ruan/Losert saying that "If the Fourier-Stieltjes space and the (cb-)multiplier space of the Fourier algebra coincide, then the underlying group is amenable" still holds in twisted setting. We also explain that Pisier's characterization of amenability of group by the similarity degree being less than or equal to 2 still holds in twisted setting.

14. Ming-Yi Lee, National Central University, Taiwan

    Title: Carleson measure characterization of weighted BMO associated with a family of general sets

    Abstract: In this talk, we introduce a weighted Carleson measure $d\nu_{\mathbb{E},w}$ associated to the family $\mathbb{E}$, where $\mathbb{E} = \{E_r(x)\}_{r\in\mathcal{I},x\in X}$ is a family of open subsets of a topological space X endowed with a nonnegative Borel measure μ satisfying certain basic conditions. Using Calderón-Zygmund theory, we show that the weighted BMO associated with the family $\mathbb{E}$ can be characterized by the weighted Carleson measure $d\nu_{\mathbb{E},w}$.

15. Chi-Wai Leung, The Chinese University of Hong Kong, Hong Kong

    Title: Grassmannians over Banach Spaces

Abstract: Let X be a Banach space. We write $Gr(n, X)$ for the Grassmannian of rank n over X, that is the set of all n-dimensional subspaces of X which is equipped with a certain topology. Let $Gr(\infty, X) = \bigcup_{n=1}^{\infty} Gr(n, X)$.

First, we will focus on the study of the topology on $Gr(\infty, X)$. In particular, we will investigate the topology given by the Banach-Mazur distance on $Gr(\infty, X)$. Second, we will investigate the differential structure of $Gr(\infty, X)$. Also, the submanifolds of $Gr(\infty, X)$ and the Grassmanninas over the quotient spaces of X are studied.

16. Denny Leung, Department of Mathematics, National University of Singapore, Singapore 119076

    Title: Maximal ideals in Banach algebras of bounded linear operators

    Abstract: Let X be a Banach space and let $L(X)$ be the space of bounded linear operators on X. It is a natural problem to analyze the structure of the algebraic ideals in $L(X)$. In general, this is a difficult problem and the complete structure of the (two-sided closed) ideals in $L(X)$ is known only for a handful of Banach spaces X. By an observation of Dosev and Johnson, if the set

    $$\mathcal{M}_X = \{T \in L(X) : I_X \text{ does not factor through } T\}$$

    is closed under addition (where I_X is the identity operator on X), then $\mathcal{M}_X$ is the unique maximal ideal in $L(X)$. In this talk, I will exploit this observation to identify some classes of Banach space X so that $L(X)$ has a unique maximal ideal. The results apply, for example, if $X = (\oplus \ell^p)_{\ell_q}$ or $(\oplus S)_{\ell_q}$, where S is the Schlumprecht space and $1 \leq p, q < \infty$.

17. Chin-Cheng Lin, National Central University, Taiwan

    Title: $\mathcal{A}_{p,\mathbb{E}}$ weights, maximal operators, and Hardy spaces associated with a family of general sets

    Abstract: Suppose that $\mathbb{E} := \{E_r(x)\}_{r \in \mathcal{I}, x \in X}$ is a family of open subsets of a topological space X endowed with a nonnegative Borel measure μ satisfying certain basic conditions. We establish an $\mathcal{A}_{\mathbb{E},p}$ weights theory with respect to $\mathbb{E}$ and get the characterization of weighted weak type (1,1) and strong type (p, p), $1 < p \leq \infty$, for the maximal operator $\mathcal{M}_{\mathbb{E}}$ associated with $\mathbb{E}$. As applications, we introduce the weighted atomic Hardy space $H^1_{\mathbb{E},w}$ and its dual $BMO_{\mathbb{E},w}$, and give a maximal function characterization of $H^1_{\mathbb{E},w}$. Our results generalize several well-known results.

18. Huaxin Lin, University of Oregon, USA

    Title: Classification of Simple Amenable C*-algebras of Low Real Rank

    Abstract: We will report some of recent development for the classification of simple amenable C*-algebras. We will concentrate on the case that C*-algebras are non-unital. The classification of non-unital C*-algebras whose positive cone of K_0 is not zero can be easily reduced to the unital case. We will discuss the case that C*-algebras are simple and stably projectionless.

19. Yingfen Lin, Queen's University Belfast, UK

    Title: A Fourier inversion theorem and prime ideals for nilpotent Lie groups

    Abstract: I will give a version of the Fourier inversion theorem for general connected, simply connected nilpotent Lie groups G by showing that operator fields defined on suitable submanifolds of g^* are images of Schwartz functions under the Fourier transform. As an application,

the prime ideals of $L^1(G)$ will be characterised. This is a joint work with Jean Ludwig and Carine Molitor-Braun.

20. Chih-Neng Liu, Department of Applied Mathematics, National Sun Yat-Sen University, Kaohsiung, 80424, Taiwan

    Title: Generalized n-circular projections on JB*-triples and Hilbert $C_0(\Omega)$-modules

    Abstract: Being expected as a Banach space substitute of the orthogonal projections on Hilbert spaces, generalized n-circular projections also extend the notion of generalized bicontractive projections on JB*-triples. In this paper, we study some geometric properties of JB*-triples related to them. In particular, we provide some structure theorems of generalized n-circular projections on an often mentioned special case of JB*-triples, i.e., Hilbert C*-modules over abelian C*-algebras $C_0(\Omega)$.

21. Rui Liu, Nankai University, China

    Title: Approximation properties, frames, and dilations of operator-valued measures

    Abstract: This talk is on the intersection topics between functional analysis and applied harmonic analysis: 1) 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. We give a concrete frame for reduced free group C*-algebra, and also prove that a separable operator space has the completely bounded approximation property if and only if it has a completely bounded frame if and only if it is completely isomorphic to a completely complemented subspace of an operator space with a completely bounded basis. 2) This is on a general dilation theory of operator-valued measures and frames for Banach spaces, 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.

22. Lajos Molnár, University of Szeged and Budapest University of Technology and Economics, Hungry

    Title: Jordan isomorphisms as preservers

    Abstract: Preserver problems concern the descriptions of transformations on given structures that preserve certain given quantities/operations/relations etc which are characteristic of the underlying structures. In this talk we give a survey of preserver problems whose solutions provide us with characterizations of Jordan isomorphisms on operator algebras, matrix algebras or on its substructures (unitary groups, positive cones, etc). We will present several classical results and also recent ones.

23. Mehdi S. Monfared, University of Windsor, Canada

    Title: Almost periodic functionals and finite-dimensional representations

Abstract: Following the early pioneering works of Young, Lau, Wong, Duncan, and Ülger, almost periodic functionals have been a subject of extensive studies by many authors. In this talk we discuss some recent results concerning almost periodic functionals and finite-dimensional representations. Perhaps the simplest connection between almost periodic functionals and representation theory is that every coordinate functional of a finite-dimensional representation is almost periodic. In the reverse direction, we show that if A is an involutive Banach algebra, (π, H) is an involutive representation of A, and $\xi, \eta \in H$ are algebraically cyclic vectors such that $\pi_{\xi,\eta} \in AP(A)$ (the space of almost periodic functionals on A), then $\dim H < \infty$.

Next we discuss the properties of a homomorphism $\alpha_A \colon A \longrightarrow U(A)$, where $U(A)$ is a residually finite-dimensional (RFD) Banach algebra. We show that the pair $(\alpha_A, U(A))$ satisfies the following properties: (1) the universal property, (2) the existence of a bijection between finite-dimensional representations of A and $U(A)$, (3) the existence of lifts for a large class of AP-functionals on A to AP-functionals on $U(A)$. For these reasons, $(\alpha_A, U(A))$ can be regarded as a Banach algebra analogue of the almost periodic compactification of topological groups.

We shall also discuss how the adjoint map $\alpha_A^* \colon U(A)^* \longrightarrow A^*$ can be used to construct a Banach algebra $\mathscr{A}(A)$ (associated with A) and a continuous linear mapping $\eta \colon \mathscr{A}(A) \longrightarrow AP(A)$. When applied to $L^1(G)$ (G compact), we find that $\mathscr{A}(L^1(G)) = A(G)$ is the Fourier algebra of G, and $\eta(\check{f}) = S(f)$ is the Fourier series expansion of f.

The results in this talk are based on a joint work with M. Filali.

24. Chi-Keung Ng, Nankai University, China

    Title: Metric preserving bijection between thin positive bells of non-commutative L^p-spaces

    Abstract: Let M be a von Neumann algebra and $p \in [1, \infty]$. Consider the non-commutative L^p-space $L^p(M)$ associated to M with canonical positive cone $L^p_+(M)$. By employing essentially normed space techniques, we extend our earlier result and show that for any $\epsilon \in (0, 1]$, the thin positive bell

$$L^p_+(M)^1_{1-\epsilon} := \{T \in L^p_+(M) : 1 - \epsilon \leq \|T\| \leq 1\},$$

    as a metric space, is a complete Jordan *-invariant for the von Neumann algebra M.

    In the case when $p \in (1, \infty)$ and $M \ncong \mathbb{C}$, if M is either a semifinite algebra, a hyper-finite algebra or a type III_0-factor with a separable predual, we have a stronger conclusion as follows: if $\Phi : L^p_+(M)^1_{1-\epsilon} \to L^p_+(N)^1_{1-\epsilon}$ is a metric preserving bijection, then there exists a Jordan *-isomorphism $\Theta : N \to M$ such that $\Phi(S^{1/p}) = \Theta_*(S)^{1/p}$ for all $S \in L^1_+(M)^1_{(1-\epsilon)^p}$.

    This is a joint work with Chi-Wai Leung and Ngai-Ching Wong.

25. Zhong-Jin Ruan, University of Illinois at Urbana Champaign, USA

    Title: Approximation Properties for Group C*-algebras

    Abstract: In this talk, I plan to discuss some local (i.e. finite dimensional) operator space approximation properties for group C*-algebras

26. Volker Runde, University Alberta, Canada

    Title: Wittstock moduli of elementary operators and their application to generalized notions of amenability

Abstract: Let $\mathfrak{A}$ be a C^*-algebra, and let $T : \mathfrak{A} \to \mathcal{B}(\mathfrak{H})$ be completely bounded. We call $|T| : \mathfrak{A} \to \mathcal{B}(\mathfrak{H})$ a *Wittstock modulus* of $\mathfrak{A}$ if $|T|$ is completely positive such that $\||T|\|_{cb} \leq \||T\|_{cb}$ and $|T| \pm \operatorname{Re} T \geq 0$ and $|T| \pm \operatorname{Im} T \geq 0$. As a consequence of G. Wittstock's celebrated decomposition theorem, every completely bounded operator has a Wittstock modulus. We give a concrete description of Wittstock moduli of elementary operators and put it to work towards settling the question of whether a pseudo- or approximately amenable C^*-algebra is actually amenable.

27. Ebrahim Samei, University of Saskatchewan, Canada

    Title: Twisted Orlicz algebras and complete isomorphism to operator algebras

    Abstract: Let G be a locally compact group, let $\Omega : G \times G \to \mathbb{C}^*$ be a 2-cocycle, and let (Φ,Ψ) be a complementary pair of Young functions. In this talk, we consider the twisted convolution $\circledast$ coming from Ω over $L^\Phi(G)$. We present sufficient conditions under which $(L^\Phi(G), \circledast)$, with the maximal operator space structure, becomes a Banach algebra which is completely isomorphic to an operator algebra. We apply our methods to compactly generated group of polynomial growth and demonstrate that our results could be applied to variety of cases.

    This is a joint work with Serap Oztop and Varvara Shepelska

28. Chun-Yen Shen, National Taiwan University, Taiwan

    Title: A two weight $T1$ and Tb theorem for the Hilbert transform

    Abstract: One of the major open problems in nonhomogeneous Harmonic analysis is to find the necessary and sufficient conditions for the boundedness of two weights inequality for singular integrals. In this talk, we will first discuss the famous two weights problem for the Hilbert transform and outline our proof that settles this longstanding open problem. We then discuss some of the main difficulties for higher dimensional singular integrals. Some of the important applications to other fields will be also discussed. The talk is based on joint work with Eric Sawyer and Ignacio Uriarte-Tuero.

29. Nico Spronk, University of Waterloo, Canada

    Title: Traces on group C*-algebras

    Abstract: With Brian Forest (Waterloo) and Matthew Wiersma (Alberta), I investigated conditions for locally compact G characterizing when $C^*_r(G)$. Using structure theory we achieve this characterization for compactly generated G. In particular, if G is almost connected then $C^*_r(G)$ must be amenable. Recently M. Kennedy and S. Raum gained a result which does not require compact generation, and generalizes ours. However, our result allows us to observe many instances where the space of traces is infinite dimensional. Moreover, we study the interplay of the property that $C^*_r(G)$ admits a trace and other properties such as inneramenability and the QSIN condition. In passing, we show that inner amenable groups are not closed under extension. We also study when $C^*_r(G)$ admits an amenable trace.

30. Keith Taylor, Dalhousie University, Halifax, Canada

    Title: Constructing Projections in $L^1(G)$

    Abstract: An element $f \in L^1(G)$, where G is a locally compact group, is called a projection if it is a selfadjoint idempotent ($f * f = f^* = f$). There are several problems which have been

studied for many years: For which G do there exists nontrivial projections in $L^1(G)$? can one construct explicitly a projection when one exists? Can one describe all projections? We will survey the results so far and spend some time on what is arguably the easiest nonabelian case of two dimensional crystal groups where the questions are already illuminating.

31. Ali Ulger, University of Koc, Turkey

Title: On Some Theorems of Reiter/Varopoulos/Saeki/Helson, and Sets of Synthesis

Abstract: Consider the group algebra $L^1(\mathbb{R}^n)$. For a closed subset E of $\mathbb{R}^n$, let $J(E)$ and $k(E)$ be the smallest and the largest closed ideals of $L^1(\mathbb{R}^n)$ with hull E, and $S = \{x \in \mathbb{R}^n : ||x|| = 1\}$ the unit sphere of $\mathbb{R}^n$. If $J(E) = k(E)$, the set E is said to be a set of synthesis. In this talk I will present a series of new/recent results about the following classical theorems and answer the following questions.

Theorem 1 (Reiter, Math. Ann. (135), 1958). Let $n \geq 3$ and E be a closed subset of $\mathbb{R}^n$. Then the set $F = E \cup S$ is a set of synthesis if and only if $S \subseteq E$ and E is a set of synthesis.

The fact that S is not a set of synthesis does not explain the reason why this theorem holds. Whence the question:

Question 1. What makes that Reiter's theorem holds?

Theorem 2. (Varopoulos, Proc. Phil. Soc. Camb.(62), 1966). For $n = 3$, the equality $J(S)^{\perp} \cap C_0(\mathbb{R}^n) = k(S)^{\perp} \cap C_0(\mathbb{R}^n)$ holds.

It is rare that for a closed set F that fails to be a set of synthesis the equality $J(F)^{\perp} \cap C_0(\mathbb{R}^n) = k(F)^{\perp} \cap C_0(\mathbb{R}^n)$ holds. Whence the question:

Question 2. What makes that this equality holds? What is the difference between a set of synthesis E and a set F for which the equality $J(F)^{\perp} \cap C_0(\mathbb{R}^n) = k(F)^{\perp} \cap C_0(\mathbb{R}^n)$ holds? Beside S and sets of synthesis, for which sets the above equality holds?

A closed $H \subseteq \mathbb{R}^n$ is said to be an Helson set if the restriction homomorphism $\phi : L^1(\mathbb{R}^n) \to C_0(H)$, $\phi(f) = \widehat{f}|H$, is surjective. Here $\widehat{f}$ is the Fourier transform of f.

Helson's Theorem from which Helson sets originated is the following.

Theorem 3 (Helson, Studia Math. (XIV), 1954). Let E be a compact perfect subset of $\mathbb{R}$ such that the restriction homomorphism $\phi : L^1(\mathbb{R}) \to C(E)$, $\phi(f) = \widehat{f}|E$, is surjective. Then $k(E)^{\perp} \cap C_0(\mathbb{R}) = \{0\}$.

In view of this theorem, the following question arises naturally.

Question 3. Let $H \subseteq \mathbb{R}^n$ be an Helson set. What makes that $k(H)^{\perp} \cap C_0(\mathbb{R}^n) = \{0\}$?

Theorem 4 (Saeki, J. Math. Soc. Jap. (21), 1969). If H is an Helson set of synthesis then, for any set of synthesis E, the union $H \cup E$ is a set of synthesis.

Given that whether the union of two sets of synthesis is a set of synthesis or not is not known, it is natural to wonder:

Question 4. What makes that Saeki's theorem holds?

In this talk I shall try to answer these questions.

A couple of the results are extracted from joint works with my coauthors E. Kaniuth and A. To-Ming Lau.

32. Ya-Shu Wang, Nation Chung Hsing University, Taiwan

    Title: Orthogonally multiplicative maps between Figá-Talamanca-Herz algebras

    Abstract: In this talk, we will introduce the Figá-Talamanca-Herz algebra $A_p(G)$ and the representation of linear orthogonally multiplicative maps on $A_p(G)$.

33. Ngai-Ching Wong, National Sun Yat-sen University, Kaohsiung, Taiwan

    Title: The geometry of convex combinations of positive elements determines a noncommutative L^p space

    Abstract: Let $\mathcal{M}, \mathcal{N}$ be semi-finite von Neumann algebras with faithful semi-finite normal traces $\tau_{\mathcal{M}}, \tau_{\mathcal{N}}$, respectively. Suppose that $\varphi : L^p(\mathcal{M}, \tau_{\mathcal{M}}) \cap \mathcal{M}_+ \to L^p(\mathcal{N}, \tau_{\mathcal{N}}) \cap \mathcal{N}_+ (1 < p < +\infty)$, is a surjective mapping satisfying that $\|x+y\|_p = \|\varphi(x)+\varphi(y)\|_p$ for all $x, y \in L^p(\mathcal{M}, \tau_{\mathcal{M}}) \cap \mathcal{M}_+$. Then there exist uniquely a Jordan *-isomorphism J of $\mathcal{M}$ onto $\mathcal{N}$, and a positive selfadjoint operator $h \in L^p(\mathcal{N}, \tau_{\mathcal{N}})$ (h can be unbounded in $\mathcal{N}$) affiliated with the center of $\mathcal{N}$ such that

    $$\varphi(x) = J(x)h, \quad x \in L^p(\mathcal{M}, \tau_{\mathcal{M}}) \cap \mathcal{M}_+ \tag{1}$$

    Suppose, in additional, that $\mathcal{M}$ or $\mathcal{N}$ is a factor, then φ is an isomorphism or an anti-isomorphism of $\mathcal{M}$ onto $\mathcal{N}$, and h is proportional to the identity of $\mathcal{N}$; so there exists uniquely a Jordan *-isomorphism J such that there exists uniquely a strictly positive number λ such that $\varphi(x) = \lambda J(x)$ for every $x \in L^p(\mathcal{M}, \tau_{\mathcal{M}}) \cap \mathcal{M}_+$.

34. Shuang Zhang, University of Cincinnati, USA

    Title: Some recent results around multiplier algebras

    Abstract: We outline some recent results about the ideal structure and some additional properties of the multiplier algebras of certain simple C*-algebras. Assume that $\mathcal{A}$ is a simple, σ-unital, non-unital, non-elementary C*-algebra, I_{min} denotes the intersection of the ideals of $M(\mathcal{A})$ that properly contain $\mathcal{A}$. Then $I_{min} \neq \mathcal{A}$ for several categories of C*-algebras, including when $\mathcal{A}$ separable. It is natural that the quotient $I_{min}/\mathcal{A}$ is purely infinite and simple whenever $I_{min} \neq \mathcal{A}$. If A has strict comparison of positive element by traces then $I_{min} = I_{cont}$, the closure of the linear span of the elements $\mathcal{T} \in M(\mathcal{A})_+$ such that the evaluation map $\hat{T}(t) = \tau(T)$ is continuous. However, if $I_{min} \neq I_{cont}$ for certain Villadsen $\star$ s AH algebras.

35. Yong Zhang, Department of Mathematics, University of Manitoba, Winnipeg R3T 2N2, Canada

Title: Attractive points, fixed points and amenability properties of semigroups

Abstract: Let S be a semigroup acting on a subset C of a Banach space E as self-mappings. We investigate Atsushiba and Takahashi's notion of common attractive point for such actions. If E is a strictly convex and reflexive Banach space and C is a closed and convex subset of E, we show that the existence of a common attractive point implies the existence of common fixed point for the semigroup action. For a nonexpansive semigroup action on a subset of a Hilbert space, we show that the existence of a common attractive point is ensured by various amenability properties of the semigroup. This is joint work with A. T.-M. Lau.