Harmonic Analysis and Operator Spaces
Analyse harmonique et espaces d'opérateurs
(Org: **Yemon Choi** and/et **Ebrahim Samei** (Saskatchewan))

MAHMOOD ALAGHMANDAN, University of Saskatchewan
Amenability properties for the centres of certain discrete group algebras

Let $\{G_i\}_{i\in I}$ be a family of finite groups, and let $G = \bigoplus_{i\in I}$ indicates the group generated by all $(x_i)_{i\in I}$ when x_i is the identity of the group G_i for all but finitely many i.

We characterize the amenability of $Z\ell^1(G)$, the center of the group algebra for G. Moreover, we study the characters on the commutative algebra $Z\ell^1(G)$, and consequently, the existence of the bounded approximate identity for the maximal ideals of $Z\ell^1(G)$ will be considered. We also study when an algebra character of $Z\ell^1(G)$ belongs to c_0 or ℓ^p.

Time permitting, we will mention some results about the amenability constant of the center of the group algebra for some particular finite groups.

This is a joint project with Yemon Choi and Ebrahim Samei.

MICHAEL BRANNAN, Queen's University
Representations of quantum group convolution algebras

In this talk, we will discuss some aspects of the (non-self-adjoint) representation theory of quantum group convolution algebras $L^1(\mathbb{G})$ on Hilbert spaces. Inspired by the classical case where $L^1(\mathbb{G})$ is the group algebra of a locally compact group, there are many interesting questions that one can ask about such representations. For instance, what conditions on the quantum group $\mathbb{G}$ and a given bounded representation $\pi : L^1(\mathbb{G}) \to B(H)$ ensure that π is similar to a $*$-representation? Another important question is whether or not there exists an analogue of the classical result of Cowling-Haagerup relating representations to Fourier multipliers: Do the matrix elements of π always give rise to completely bounded multipliers of the dual convolution algebra $L^1(\hat{\mathbb{G}})$? We will address these and other questions in this talk, as well as discuss some concrete examples. As expected, the theory of completely bounded maps will play a prominent role in the quantum setting.

This talk is based on joint work with Matthew Daws (Leeds) and Ebrahim Samei (Saskatchewan).

YEMON CHOI, Saskatchewan

ELCIM ELGUN, University of Waterloo
The Eberlein Compactification of Locally Compact Groups

Given a locally compact group G, the Eberlein compactification G^e is the spectrum of the uniform closure of the Fourier-Stieltjes algebra $B(G)$. It is a semitopological compactification and thus a quotient of the weakly almost periodic compactification G^w. We aim to study the structure and complexity of G^e. On one hand, for certain abelian groups, weak*-closed subsemigroups of $L^\infty[0,1]$ may be realised as quotients of G^e, thus showing that G^e is large and complicated in these situations. Conversely, the structures of G^e for certain semidirect product groups show that aspects of the structure of G^e can be quite simple. The levels of complexity complexity of these structures mimic those of G^w, yet many questions about the sizes of their differences remain.

FEREIDOUN GHAHRAMANI, University of Manitoba
Automorphisms and derivations of the p-Volterra algebras and p-weighted convolution algebras

Let $1 \leq p < \infty$ and $V_p = L^p[0,1]$ be the Lebesgue space of p-integrable functions on $[0,1]$. The space V_p can be made into a (radical) Banach algebra with the convolution product

$$(f \star g)(x) = \int_0^x f(x-y)g(y)dy \quad (\text{a.e. } x \in (0,1), \quad f, g \in V_p).$$

The Banach algebra $V = V_1$ (known as the Volterra algebra) has been the subject of much study. In [1], [2], [3] and [4] derivations and automorphisms of this algebra were studied. This talk is about our recent work on derivations and automorphisms of V_p for $p > 1$, as well as the automorphisms and derivations of the p-version of the weighted convolutions algebras on the half-line. This is joint work with Sandy Grabiner.

References.

[1] F. Ghahramani, The group of automorphisms of $L^1(0,1)$ is connected. *Trans. Amer. Math. Soc.* 314 (1989), no. 2, 851–859.

[2] F. Ghahramani, The connectedness of the group of automorphisms of $L^1(0,1)$, *Trans. Amer. Math. Soc.* 302 (1987), no. 2, 647–659.

[3] N. P. Jewell, A. M. Sinclair, Epimorphisms and derivations on $L^1(0,1)$ are continuous, *Bull. London Math. Soc.* 8 (1976), no. 2, 135–139.

[4] H. Kamowitz, and S. Scheinberg, Derivations and automorphisms of $L^1(0,1)$, *Trans. Amer. Math. Soc.* 135 (1969) 415–427.

MAHYA GHANDEHARI, Dalhousie University

Matrix coefficients of unitary representations and projections in $L^1(G)$.

For a locally compact group G, the Fourier-Stieltjes algebra of G, denoted by $B(G)$, is the set of all the matrix coefficient functions of G equipped with pointwise algebra operations. In this talk, we study subspaces of $B(G)$, called $A_\pi(G)$, generated by all the matrix coefficient functions of G associated with a fixed unitary representation π. In particular, we consider the subspaces $A_\pi(G)$ for irreducible unitary representations π. We then discuss the construction of projections in $L^1(G)$ using elements of $A_\pi(G)$ when π admits a certain admissibility condition.

MEHRDAD KALANTAR, Carleton University

Harmonic Operators on LC Quantum Groups

In this talk we consider the space of μ-harmonic operators in $L^\infty(\mathbb{G})$, where $\mathbb{G}$ is a locally compact quantum group, and $\mu \in C_0(\mathbb{G})^*$ is a quantum probability measure. We discuss quantum versions of various classical results, along with some applications. This talk is partly based on joint work with Matthias Neufang and Zhong-Jin Ruan.

LAURA MARTI PEREZ,

A groupoid generalization of the map $\overline{L^2(H)} \otimes L^2(H) \to A(H)$.

Let H be a locally compact group and $A(H)$ its Fourier algebra. The map $q_0 : \overline{L^2(H)} \otimes L^2(H) \to A(H)$ is a quotient map that respects the product. This result also admits an operator space version.

If we consider a locally compact groupoid G, we can define a Fourier algebra $A(G)$. In this talk we are going to present a map that extends q_0 to the groupoid context. In particular we need to define a trace-class type groupoid product on spaces that are projective tensor products of amplified L^2 row and column spaces.

MATTHEW MAZOWITA, University of Alberta

The weighted compactification of a group and topological centres

The spectrum of the algebra of LUC (left uniformly continuous) functions on a topological group G is a compact right topological semigroup with the Arens product, called the LUC-compactification of the group, and has topological centre equal to G. In the context of weights and Beurling algebras, the spectrum of the weighted LUC algebra is what we call the weighted LUC-compactification of the group. This compactification is not (in general) a semigroup but its algebraic properties reflect properties of the weight. We study this compactification and use it to find the topological centres of related semigroups and algebras and extend some results of Budak, Işık, and Pym on the existence of small sets which determine the topological centres of the LUC and group algebras to their weighted analogues.

VOLKER RUNDE, University of Alberta
Weighted Figà-Talamanca–Herz algebras

For a locally compact group G and $p \in (1, \infty)$, we define and study the Beurling-Figa-Talamanca-Herz algebras $A_p(G, \omega)$. For $p = 2$ and abelian G, these are precisely the Beurling algebras on the dual group $\hat{G}$. For $p = 2$ and compact G, our approach subsumes an earlier one by H. H. Lee and E. Samei. The key to our approach is not to define Beurling algebras through weights, i.e., possibly unbounded continuous functions, but rather through their inverses, which are bounded continuous functions. We prove that a locally compact group G is amenable if and only if one—and, equivalently, every—Beurling-Figà-Talamanca–Herz algebra $A_p(G, \omega)$ has a bounded approximate identity. This is joint work with S. Öztop and N. Spronk.

NICO SPRONK, University of Waterloo
On the algebra generated by pure positive definite functions

Let G be a locally comapct group. In his doctoral thesis at Alberta, Y.-H. Cheng studied the closed subspace $a_0(G)$, spanned by pure continuous positive definite functions, in the Fourier-Steiltjes algerba $B(G)$. We let $a(G)$ denote the closed algebra generated by $a_0(G)$. We show that $a_0(G) \subsetneq a(G)$, in general, by illustrating the examples of Heisnberg groups $\mathbb{H}_n$ and $\mathrm{SL}_2(\mathbb{R})$. We show that $a(\mathbb{H}_n)$ is contained in the spine $A^*(\mathbb{H}_n)$ – an algebra defined by M. Ilie and the speaker – and is operator amenable. We also note that $a(\mathrm{SL}_2(\mathbb{R}))$ is not operator weakly amenable though it admits no point derivations.

This represents joint work with Y.-H. Cheng and B.E. Forrest.

KEITH TAYLOR, Dalhousie University
Groups with (essentially) one point duals

Let G be a locally compact group and $\widehat{G}$ its dual space of equivalence classes of irreducible unitary representations, which carries the Mackey-Fell topology. In this talk, we consider groups G of the form $A \rtimes H$ with A abelian and H acting on A in such a manner that there exists a $\pi \in \widehat{G}$ with $\{\pi\}$ open and dense in $\widehat{G}$. In this case, π is a square-integrable representation and its matrix coefficient functions satisfy generalized orthogonality relations which lead to an abundance of projections in $L^1(G)$ and transforms on $L^2(A)$ generalizing the continuous wavelet transform of $L^2(\mathbb{R})$. We will focus on presenting examples.

BEN WILLSON, University of Windsor
A Hilbert space approach to approximate diagonals for locally compact quantum groups

For a locally compact group G, the unitary operator W on $L^2(G \times G)$ given by $W\xi(x, y) = \xi(x, x^{-1}y)$ encapsulates the structure of G. If G is amenable then one can find simple tensors in $L^2(G) \otimes L^2(G)$ which, when acted upon by W^* produce the square root of an (operator) bounded approximate diagonal for $L^1(G)$.

Using this approximate diagonal for a group algebra as a motivating example, this talk will discuss the relationship between these tensors and approximate identities and approximate translation invariant means. A general approach for approximate diagonals for predual algebras of locally compact quantum groups will be presented.

YONG ZHANG, University of Manitoba
The invariant subspace property for F-algebras

We establish Ky Fan's finite dimensional invariant subspace theorem for left amenable F-algebras. This is joint work with A. T.-M. Lau.