GPOTS 2017

May 22-26

Titles and Abstracts

Plenary Speakers

Nate Brown, Penn State University

Nuclear C^*-algebras and analogies

Abstract: Understanding the structure and classification of injective factors was one of the great W^*-achievements of the last century. Over the last decade, progress in nuclear C^*-algebra theory revealed deep and powerful analogies with that work. These analogies were crucial beacons for progress on both the Toms-Winter Conjecture and Elliott's Classification Program.

On the geometric side, analogies between nuclear C^*-algebras and coarse geometry are also emerging. In this case, we are hopeful said analogies will lead to K-theory results for certain nuclear C^*-algebras (e.g. Kunneth Theorem or Baum-Connes type results). With Rufus Willett and Guoliang Yu, we have formalized this into the "K-computability Project."

In this talk, I will review the analytic analogies described in the first paragraph and discuss the geometric analogies which lead to the K-computability Project.

George Elliott, University of Toronto

The classification question for nuclear C^*-algebras

Abstract: Since the beginning of the subject of operator algebras, classification questions have risen to the surface.

Amazingly, the amenable von Neumann algebras and C^*-algebras have been largely amenable to this purpose!—even to the extent of allowing actions of amenable groups to be studied as well. In the case of C^*-algebras, this co-operation has been somewhat grudging. (And the analysis of amenable inclusions has been so far almost entirely restricted to von Neumann algebras.)

This lecture will survey progress on the classification of amenable (= nuclear) C^*-algebras, which has recently attained heights in the finite case comparable to those achieved in the infinite case by Kirchberg and Phillips twenty years ago.

Thierry Giordano, University of Ottawa
A model of Cantor minimal $\mathbb{Z}^2$-systems

ABSTRACT: *Joint work with Ian F. Putnam and Christian F. Skau.*

In 1992, Herman, Putnam and Skau used ideas from operator algebras to present a complete model for minimal actions of the group $\mathbb{Z}$ on the Cantor set, i.e. a compact, totally disconnected, metrizable space with no isolated points. The data (a Bratteli diagram, with extra structure) is basically combinatorial and the two great features of the model were that it contained, in a reasonably accessible form, the orbit structure of the resulting dynamical system and also cohomological data provided either from the K-theory of the associated C*-algebra or more directly from the dynamics via group cohomology. This led to a complete classification of such systems up to orbit equivalence. This classification was extended to include minimal actions of $\mathbb{Z}^2$ and then to minimal actions of finitely generated abelian groups. However, what was not extended was the original model and this has handicapped the general understanding of these actions.

In this talk I will indicate how we can associate to any dense subgroup H of $\mathbb{R}^2$ containing $\mathbb{Z}^2$ a minimal action of $\mathbb{Z}^2$ on the Cantor set, such that its first cohomology group is isomorphic to H.

Adrian Ioana, UC San Diego
Prime II_1 factors arising from irreducible lattices in products of simple Lie groups of rank one

ABSTRACT: A II_1 factor is called prime if it cannot be decomposed as a tensor product of II_1 factors. In this talk, I will present joint work with Daniel Drimbe and Daniel Hoff in which we show that II_1 factors associated to icc irreducible lattices in products of simple Lie groups of rank one are prime. This provides the first examples of prime II_1 factors arising from lattices in higher rank semisimple Lie groups.

Jens Kaad, Syddansk Universitet
Operator $*$-correspondences: Representations and pairings with unbounded KK-theory

ABSTRACT: In this talk I will describe a very general class of hermitian bimodules called operator $*$-correspondences. This kind of bimodules typically arises as the domain of a metric connection acting on a C^*-correspondence. Relying on the representation theory of completely bounded multilinear maps we shall then see how operator $*$-correspondences can be represented as

bounded operators on a Hilbert space. As a further application and motivation for introducing operator $*$-correspondences I will describe how they (under an extra compactness assumption) admit an explicit pairing with a suitable abelian monoid of twisted unbounded Kasparov modules. The talk is partly based on joint work with David Blecher and Bram Mesland.

Mehrdad Kalantar, University of Houston

Stationary C^*-dynamical systems

Abstract: We introduce the notion of stationary actions in the context of C^*-algebras. As an application of this concept we prove a new characterization of C^*-simplicity in terms of unique stationarity. This ergodic theoretical characterization provides an intrinsic and conceptual understanding of why C^*-simplicity is stronger than the unique trace property. In addition it allows us to conclude C^*-simplicity of new classes of examples, including recurrent subgroups of C^*-simple groups.

This is joint work with Yair Hartman.

David Kerr, Texas A&M University

Almost finiteness and $\mathcal{Z}$-stability

Abstract: I will introduce a notion of almost finiteness for group actions on compact spaces as an analogue of both hyperfiniteness in the measure-preserving setting and of $\mathcal{Z}$-stability in the C*-algebraic setting. This generalizes Matui's concept of the same name from the zero-dimensional context and is related to dynamical comparison in the same way that $\mathcal{Z}$-stability is related to strict comparison in the context of the Toms-Winter conjecture. Moreover, for free minimal actions of countably infinite groups on compact metrizable spaces the property of almost finiteness implies that the crossed product is $\mathcal{Z}$-stable, which leads to new examples of classifiable crossed products.

Nadia Larsen, University of Oslo

Cuntz-Pimsner algebras from subgroup C^*-correspondences

Abstract: Rieffel-induction can be described by means of a C^*-correspondence with right and left actions encoding how representations of a locally compact group and a fixed closed subgroup are related via induction and restriction. Viewing the C^*-correspondence over the group C^*-algebra of the subgroup, it seems natural to study its associated Cuntz-Pimsner algebra. It turns out that the resulting objects can be characterized in terms of familiar

C^*-algebras, and there is a variety of outcomes depending on whether the subgroup is open, discrete or compact. Some intriguing connections with other constructions surface along the way. This is joint work with Steve Kaliszewski and John Quigg.

Terry Loring, University of New Mexico
Multivariate Pseudospectrum and K-theory

ABSTRACT: We will discuss a common generalization of the Taylor spectrum and the pseudospectrum, called the multivariate pseudospectrum. Applied to the case of three or more hermitian matrices, this variation on the spectrum leads to spaces with interesting topology that can be computed by reliable numerical methods. Connections with D-branes and topologically protected states of matter will be discussed, but only briefly. Emphasis will be placed on connections with recent advances in real K-theory.

John McCarthy, Washington University
Functional Calculus for Noncommuting Operators

ABSTRACT: The Riesz-Dunford functional calculus lets you make sense of $f(T)$ when f is a holomorphic function on some open set $U \subseteq \mathbb{C}$ and T is an operator with spectrum in U. The Taylor functional calculus generalizes this to when $U \subseteq \mathbb{C}^d$ and T is a d-tuple of commuting operators. But how does one define a functional calculus for non-commuting operators? In this talk we will discuss non-commutative functions, and how they can be used to construct a functional calculus for non-commuting d-tuples.

As an application, consider an equation like

$$X^3 + 2X^2Y + 3XYX + 4YX^2 + 5XY^3 + 6Y^2XY + 7XY + 8YX + 9X^2 = 10$$

If (X, Y) is a pair of matrices that satisfy this equation, then, generically in X, we will show that Y must commute with X.

The talk is based on joint work with Jim Agler.

Paul Muhly, University of Iowa
Applications of Geometric Invariant Theory to Free Analysis

ABSTRACT: In this talk, which is based upon joint work with Erin Griesenauer and Baruch Solel, I will discuss advances in the problem of identifying Arveson's boundary representations and C^*-envelopes of subalgebras of homogeneous C^*-algebras built from algebras of generic matrices. Specifically, let X be a compact subset of the d-tuples of $n \times n$ matrices, $M_n^d(\mathbb{C})$, and let

$\mathbb{G}(d, n, X)$ be the closed subalgebra of $C(X, M_n(\mathbb{C}))$ generated by the "coordinate functions", $\mathfrak{z} \to Z_k$, where $\mathfrak{z} = (Z_1, Z_2, \ldots, Z_d) \in M_n^d(\mathbb{C})$. The problems that we address include: Describe the C^*-subalgebra of $C(X, M_n(\mathbb{C}))$ generated by $\mathbb{G}(d, n, X)$, $C^*(\mathbb{G}(d, n, X))$. Calculate sufficiently many boundary representations of $C^*(\mathbb{G}(d, n, X))$ for $\mathbb{G}(d, n, X)$ to determine the Shilov boundary ideal of $C^*(\mathbb{G}(d, n, X))$ for $\mathbb{G}(d, n, X)$.

Gelu Popescu, University of Texas at San Antonio
Operator theory on noncommutative polyballs
ABSTRACT: The talk is a survey of several aspects of operator theory on noncommutative polyballs including an analogue of Sz.-Nagy/Foias theory of contractions, a theory of free holomorphic functions on polyballs and their automorphisms, as well as results concerning the curvature invariant and Euler characteristic associated with the elements of the polyball and an extension of Arveson's version of Gauss-Bonnet-Chern theorem from Riemannian geometry. Several open problems are pointed out.

Sarah Reznikoff, Kansas State University
Generalized uniqueness theorems and Cartan subalgebras
ABSTRACT: Graph algebras and generalizations have provided a wealth of examples of C*-algebras with underlying combinatorial structure. Uniqueness theorems have been central to the analysis of these algebras. The new genre of generalized uniqueness theorems that has been developed and extended over the last half-decade identifies a salient C*-subalgebra, the cycline subalgebra, from which injectivity of a representation lifts. In this talk we review the background results, survey extensions of these, and present new connections with Renault's analysis of Cartan pairs.

David Sherman, University of Virginia
Setting boundaries
ABSTRACT: I will start by surveying some of the main mathematical concepts around the Choquet boundary for unital function spaces, due in largest part to Bishop and de Leeuw in 1959. Then I will discuss how the entire framework generalizes (or should generalize) to a noncommutative version. Many of the principal ideas originated in Arveson's 1969 work, but the actual results have been arriving gradually, and some of them are quite recent. I will point out places where there is more left to do.

Roger Smith, Texas A&M University
A Galois correspondence for crossed products

ABSTRACT: If a discrete group G acts on an operator algebra A (C^* or von Neumann) the question arises of whether the algebras between A and its crossed product by G can be characterized by subgroups of G. When A is a simple C^*-algebra and G acts by outer automorphisms, a positive answer has been given by Landstad-Olesen-Pedersen when G is abelian, by Choda (with some rather restrictive extra hypotheses) and by Izumi when G is finite. In this talk I will give a positive solution for all discrete groups G and discuss some consequences.

This is joint work with Jan Cameron.

Mark Tomforde, University of Houston
Classification of Graph Algebras

ABSTRACT: Over the past two decades, graph C^*-algebras have emerged as a class of C^*-algebras that is simultaneously large and tractable. In addition to being used to define the construction, the graphs provide useful tools for analyzing and codifying the structure of their associated C^*-algebras. Based on the success of this approach, researchers have also introduced algebraic counterparts of the graph C^*-algebras, known as Leavitt path algebras, for which many similar results have been obtained. In the past few years great strides have been made in the classification of graph algebras, including results for both the graph C^*-algebras and Leavitt path algebras. These classification results have illuminated the relationships among not only the graph, the algebra, and the C^*-algebra, but also among related objects such as the graph groupoid, the shift space of the graph, and the diagonal subalgebra of the C^*-algebra. This talk will survey recent results for the classification of graph C^*-algebras and Leavitt path algebras. We will discuss the significance of these results and also describe some open problems and questions remaining to be answered.

Contributed Talks

Konrad Aguilar, University of Denver
Convergence of quotients of AF algebras in Quantum Propinquity by convergence of ideals

ABSTRACT: We provide conditions for when quotients of AF algebras are quasi-Leibniz quantum compact metric spaces building from our previous work with F. Latremoliere. Given a C*-algebra, the ideal space may be equipped with natural topologies. Next, we impart criteria for when convergence of ideals of an AF algebra can provide convergence of quotients in quantum propinquity, while introducing a metric on the ideal space of a C*-algebra. We then apply these findings to a certain class of ideals of the Boca-Mundici AF algebra by providing a continuous map from this class of ideals equipped with various topologies including the Jacobson and Fell topologies to the space of quotients with the quantum propinquity topology.

Scott Atkinson, Vanderbilt University

Minimal faces and Schur's Lemma for embeddings into $R^{\mathcal{U}}$

Abstract: As shown by N. Brown in 2011, for a separable II_1-factor von Neumann algebra N, the invariant $\mathbb{H}\mathrm{om}(N, R^{\mathcal{U}})$ given by unitary equivalence classes of embeddings of N into $R^{\mathcal{U}}$–an ultrapower of the separable hyperfinite II_1-factor–takes on a convex structure. This provides a link between convex geometric notions and operator algebraic concepts; e.g. extreme points are precisely the embeddings with factorial relative commutant. The geometric nature of this invariant yields a familiar context in which natural curiosities become interesting new questions about the underlying operator algebras. For example, such a question is the following. "Can four extreme points have a planar convex hull?"

The goal of this talk is to present a recent result generalizing the characterization of extreme points in this convex structure. After introducing this convex structure, we will see that the dimension of the minimal face containing an equivalence class $[\pi]$ is one less than the dimension of the center of the relative commutant of π. This result also establishes the "convex independence" of extreme points, providing a negative answer to the above question. Along the way we make use of a version of Schur's Lemma for this context.

Clifford Bearden, University of Houston

TBA

Abstract:

Michael Brannan, Texas A&M University

Orthogonal free quantum group factors are not free group factors

Abstract: In this talk I will survey some recent results on the structural theory of a class of II_1-factors arising from a family of discrete quantum groups, called the orthogonal free quantum groups FO_n. A question that has been around for some time is whether or not an orthogonal free quantum group factor $L(FO_n)$ can be isomorphic to a free group factor $L(F_k)$. We answer this question in the negative by proving that $L(FO_n)$ is a strongly 1-bounded von Neumann algebra in the sense of Kenley Jung. We obtain this result by proving a certain spectral regularity result for the edge reversing operator on the quantum Cayley tree of FO_n and connect this result to a recent free entropy dimension result of Jung and Shlyakhtenko. This is joint work with Roland Vergnioux.

Simone Cecchini, Northeastern University
C^*-algebras and positive scalar curvature

ABSTRACT: A Dirac-type operator on a complete Riemannian manifold is of Callias-type if its square is a Schrödinger-type operator with a potential uniformly positive outside of a compactset.

We develop the theory of Callias-type operators twisted with Hilbert C^*-module bundles and prove an index theorem for such operators. As an application, we derive an obstruction to the existence of complete Riemannian metrics of positive scalar curvature on noncompact spin manifolds in terms of closed submanifolds of codimension-one.

In particular, when N is a closed even dimensional spin manifold, we show that if the cylinder $N \times R$ carries a complete metric of positive scalar curvature, then the (complex) Rosenberg index on N must vanish.

Ian Charlesworth, University of California, Los Angeles
Bi-free probability

ABSTRACT: Bi-free probability is a generalization of free probability to study pairs of left and right faces in a non- commutative probability space. In this talk, I will demonstrate a characterization of bi-free independence inspired by the "vanishing of alternating centred moments" condition from free probability. Time permitting, I will also show how these ideas can be used to introduce a bi-free unitary Brownian motion and a liberation process which asymptotically creates bi-free independence.

Alexandru Chirvasitu, University of Washington
Softness and rigidity for discrete quantum groups

ABSTRACT: We discuss the interplay between "soft" properties for discrete quantum groups (such as residual finiteness) and representation-theoretic rigidity properties thereof, such as property (T).

One of the main results will be that property (T) discrete quantum groups with with the Kirchberg factorization property are automatically residually finite, extending the corresponding result for ordinary discrete groups.

(joint w/ A. Battacharya, M. Brannan and S. Wang)

Raphael Clouatre, University of Manitoba
The Kadison property for representations of amenable operator algebras

ABSTRACT: An operator algebra is said to have the *Kadison property* if all its bounded representations are completely bounded. It is a long-standing

open problem to determine whether this is satisfied by every C^*-algebra. On the other hand, due to work of Haagerup and Gifford, it is known that the Kadison property for C^*-algebras is equivalent to a weaker version of amenability, called the *total reduction property*.

In this talk, we investigate whether non self-adjoint operator algebras with the total reduction property necessarily have the Kadison property. We obtain positive results in the case where either the domain or codomain of the representation is residually finite dimensional. We also explain why these facts are meaningful with regards to the general problem. Finally, we exhibit connections to the harder question of determining whether operator algebras with the total reduction property are necessarily similar to C^*-algebras.

This is joint work with Laurent Marcoux.

Kristin Courtney, University of Virginia
Finite Dimensionally Normed Elements in an RFD C-algebra*

ABSTRACT: A characterization of residual finite dimensionality for a C*-algebra is that the norm of any element is the supremum of its norms in finite-dimensional representations. Here we study the subset of an RFD C*-algebra A for which this supremum is achieved, showing that it is always dense in A, but need not be all of A. We show that the latter condition is equivalent to A having no infinite-dimensional irreducible representation or to A having no simple infinite-dimensional AF subquotient. Examples from locally compact groups, mapping telescopes, and just infinite C*-algebras distinguish this and other subclasses of RFD C*-algebras. Our proof relies on AF mapping telescopes, which were proven to be projective by Loring and Pedersen. This is joint workwith Tatiana Shulman.

Danny Crytser, Kansas State University
Essential inclusions

ABSTRACT: An inclusion $B \subset A$ of C*-algebras is called essential if every nonzero closed two-sided ideal of A has nonzero intersection with B. Work of Nagy and Reznikoff on graph C*-algebras (generalized by Brown-Nagy-Reznikoff to k-graph algebras) shows that the inclusion of the so-called abelian core of a graph C*-algebra is essential. The key fact used to prove this is the existence of a family of pure states on the subalgebra which have unique extension to the larger algebra. In this talk I will give a generalization of this to a much broader class of inclusions. An application to simplicity of groupoid C*-algebras is given. Joint work with Gabriel Nagy.

Raul Curto, University of Iowa
Toral and Spherical Aluthge transforms

ABSTRACT: We introduce two natural notions of multivariable Aluthge transforms (toral and spherical), and study their basic properties. In the case of 2-variable weighted shifts, we first prove that the toral Aluthge transform does not preserve (joint) hyponormality, in sharp contrast with the 1-variable case. Second, we identify a large class of 2-variable weighted shifts for which hyponormality is preserved under both transforms. Third, we consider whether these Aluthge transforms are norm-continuous. Fourth, we study how the Taylor and Taylor essential spectra of 2-variable weighted shifts behave under the toral and spherical Aluthge transforms; as a special case, we consider the Aluthge transforms of the Drury-Arveson 2-shift. Finally, we briefly discuss the class of spherically quasinormal 2-variable weighted shifts, which are the fixed points for the spherical Aluthge transform.

The talk is based on joint work with Jasang Yoon.

Sayan Das, Vanderbilt University
Poisson Boundaries of finite von Neumann algebras

ABSTRACT: In my talk, I shall discuss the notion of noncommutative Poisson boundary, for finite von Neumann algebras (due to Izumi, Creutz and Peterson). I shall also talk about a noncommutative generalization of "Double Ergodicity of the boundary" (due to Kaimanovich), and provide some applications to the study bounded derivations on a finite von Neumann algebras. This is based on joint work with Jesse Peterson.

Valentin Deaconu, University of Nevada, Reno
Cuntz-Pimsner algebras from groupoid actions

ABSTRACT: We describe several C^*-correspondences constructed from groupoid actions. There are connections with crossed products and with graph C^*-algebras. We illustrate with some examples.

Ken Dykema, Texas A&M University
Commuting operators in finite von Neumann algebras

ABSTRACT: We find a joint spectral distribution measure for families of commuting elements of a finite von Neumann algebra. This generalizes the Brown measure for single operators. Furthermore, we find a lattice (based on Borel sets) consisting of hyperinvariant projections that decompose the spectral distribution measure. This leads to simultaneous upper triangularization results for commuting operators. Both of these constructions behave well with respect to multivariate holomorphic functional calculus. (Joint work with Ian Charlesworth, Fedor Sukochev and Dmitriy Zanin.)

Caleb Eckhardt, Miami University
Free Groups and Quasidiagonality

ABSTRACT: Quasidiagonality is an important but somewhat mysterious property for C*-algebras. There are two qualitative obstructions to quasidiagonality for a set of operators. We'll discuss the basics of quasidiagonality and how certain representations of free groups put a quantitative face on these two obstructions.

Eric Evert, UC San Diego
Extreme Points of Matrix Convex Set

ABSTRACT: The solution set of a linear matrix inequality (LMI) is known as a spectrahedron. Free spectrahedra, obtained by substituting matrix tuples instead of scalar tuples into an LMI, arise canonically in the theory of operator algebras, systems and spaces and the theory of matrix convex sets. Indeed, free spectrahedra are the prototypical examples of matrix convex sets, set with are closed with respect to taking matrix convex combinations. They also appear in systems engineering, particularly in problems governed by a signal flow diagram.

Extreme points are an important topic in convexity; they lie on the boundary of a convex set and capture many of its properties. For matrix convex sets, it is natural to consider matrix analogs of the notion of an extreme point. These notions include, in increasing order of strength, Euclidean extreme points, matrix extreme points, and Arveson boundary points. This talk will, in the context of matrix convex sets over $\mathbb{R}^g$, provide geometric unified interpretations of Euclidean extreme points, matrix extreme points, and Arveson boundary points.

Adam Fuller, Ohio University
Boundary Representations of Operator Spaces

ABSTRACT: We introduce the notion of boundary representations for an operator space. We will show that an operator space has enough boundary representations to generate the triple envelope (or Shilov boundary) of an operator space. This gives an operator space analogue for the result of Arveson and Davidson and Kennedy that an operator system has enough boundary

representations to generate the C*-envelope. This talk is based on joint work with Michael Hartz and Martino Lupini.

Samuel Harris, University of Waterloo
Connes' Embedding Problem and Quantum XOR Games

ABSTRACT: We briefly outline the theory of two-player quantum XOR games. Motivated by the weak Tsirelson problem regarding probabilistic correlations, we develop a theory of unitary correlation sets which can be thought of as strategies for quantum XOR games. We show that Connes' embedding problem holds if and only if every quantum XOR game with a perfect commuting (qc) strategy also has a perfect approximately finite-dimensional (qa) strategy.

Benjamin Hayes, Vanderbilt University
1-Bounded Entropy and Regularity Problems in von Neumann Algebras

ABSTRACT: We define and investigate the 1-bounded entropy, which is an invariant of a tracial von Neumann algebras that measures, in some rough sense, "how many" embeddings it has into the ultrapower of the hyperfinite II_1-factor. We give applications to new structural results on free group factors, as well as nonisomorphism results for Free-Araki woods factors and algebras arising as crossed products of free Bogoliubov actions.

Leonard Huang, University of Colorado Boulder
Bundles of Hilbert C^*-Modules and Square-Integrable Representations of Groupoids

ABSTRACT: Given an upper-semicontinuous bundle $\mathcal{A}$ of C^*-algebras over a locally compact Hausdorff space X, we propose a definition of an upper-semicontinuous $\mathcal{A}$-bundle of Hilbert C^*-modules over X, which is basically a topological space fibered over X whose fiber over each $x \in X$ is a Hilbert A_x-module. We then show that the class of upper-semicontinuous $\mathcal{A}$-bundles of Hilbert C^*-modules over X defines a category that is naturally equivalent to the category of Hilbert $\Gamma_0(\mathcal{A})$-modules. Using this natural equivalence and taking inspiration from Ralf Meyer's theory of square-integrable group representations, we show how to construct a theory of square-integrable representations of locally compact Hausdorff groupoids that promises to yield interesting results.

Marius Ionescu, United States Naval Academy

Obstructions to lifting cocycles on groupoids and the associated C^*-algebras

ABSTRACT: In this talk that is based on joint work with Alex Kumjian I present the construction of groupoid twsts given a short exact sequence of locally compact abelian groups $0 \to A \to B \to C \to 0$ and a continuous C-valued 1-cocycle ϕ on a locally compact Hausdorff groupoid Γ. The twist is trivial if and only if ϕ lifts. The cocycle determines a strongly continuous action of $\widehat{C}$ into $\operatorname{Aut} C^*(\Gamma)$ and we prove that the C^*-algebra of the twist is isomorphic to the induced algebra of this action if Γ is amenable. We apply our results to a groupoid determined by a locally finite cover of a space X and a cocycle provided by a Čech 1-cocycle with coefficients in the sheaf of germs of continuous $\mathbb{T}$-valued functions. We prove that the C^*-algebra of the resulting twist is continuous trace and we compute its Dixmier-Douady invariant.

Lara Ismert, University of Nebraska-Lincoln

TBA

ABSTRACT:

Cristian Ivanescu, MacEwan University

The Cuntz semigroup of the tensor product of C-algebras*

ABSTRACT: We propose to study how the Cuntz semigroup of the tensor product $A \otimes A$ relates to the Cuntz semigroup of A. We restrict our attention to C*-algebras which are unital, simple, separable, nuclear, stably finite, $\mathcal{Z}$-stable, satisfy the UCT, with finitely generated K_0-group and have trivial K_1-group. This is joint work with Dan Kucerovsky (UNB).

Yongle Jiang, SUNY at Buffalo

Continuous cocycle superrigidity for full shifts and groups with one end

ABSTRACT: We present a continuous version of Sorin Popa's Cocycle Superrigidity theorem, i.e. we show that for a finitely generated non-torsion group G, the full shift (G, A^G) is continuous H-cocycle rigid for any finite set A and any countable discrete group H if and only if G has one end. This is joint work with Nhan-Phu Chung.

Steven Kaliszewski, Arizona State University

Coaction Functors II

ABSTRACT: In their study of the application of crossed-product functors to the Baum-Connes Conjecture, Buss, Echterhoff, and Willett introduced certain properties that are important for "exotic" crossed-product functors to have. In this talk I'll discuss analogues of these properties for coaction functors, and whether they are preserved when the coaction functors are composed with the full crossed product functor to make a crossed-product functor.

This is joint work with Magnus Landstad and John Quigg.

Ehssan Khanmohammadi, Franklin & Marshall College

An Inverse Spectrum Problem for Infinite Graph

Abstract: In this talk we present our extensions of some recent results on inverse eigenvalue problems of finite graphs to the infinite setting by means of functional analytic methods. We show that for a given infinite graph G on countably many vertices, and a compact, infinite set of real numbers Λ there is a real symmetric matrix A whose graph is G and its spectrum is Λ. We also show that any two such matrices constructed by our method are approximately unitarily equivalent.

Craig Kleski, Miami University

Finite-dimensional operator systems and their generated C-algebras*

Abstract: The interplay between a finite-dimensional operator system in $B(H)$ and its generated C*-algebra is surprisingly complex. Arveson initiated a study of operator systems (necessarily finite dimensional) in matrix algebras in 2008. We expand on that study to include finite-dimensional operator systems generating subhomogeneous and CCR algebras. We show that their C*-envelopes may be computed using peak points or strong boundary points. These notions, imported from function spaces, are emerging as a useful tool in noncommutativeChoquet theory.

Scott LaLonde, University of Texas at Tyler

Permanence properties of exact groupoids

Abstract: A locally compact groupoid is said to be exact if its associated reduced crossed product functor is exact. In this talk, we will investigate permanence properties of exact groupoids, some of which are "expected" since they generalize known results for exact groups. We will see that exactness descends to certain types of closed subgroupoids, and that any action of an exact groupoid on a locally compact Hausdorff space yields an exact transformation groupoid. The latter result also admits a partial converse: if G acts on a suitable space X and the transformation groupoid $G \ltimes X$ is exact, then

G is necessarily exact. If time permits, we may also discuss the related notion of inner exactness and some preliminary results about Fell bundlesover exact groupoids.

Jireh Loreaux, Southern Illinois University Edwardsville
Essential codimension and diagonals of finite spectrum normal operators

ABSTRACT: Kadison characterized the diagonals of projections and observed the presence of an integer, which Arveson later recognized as a Fredholm index obstruction applicable to any normal operator with finite spectrum coincident with its essential spectrum whose elements are the vertices of a convex polygon. Recently, in joint work with Kaftal, we linked the Kadison integer to essential codimension of projections. This talk will highlight an analogous link between Arveson's obstruction and essential codimension, and then explain that this obstruction occurs precisely when the normal operator is diagonalizable by a Hilbert-Schmidt perturbation of the identity.

Kathryn McCormick, University of Iowa
Algebras of cross-sections and Azumaya algebras

ABSTRACT: Let R be a finite bordered Riemann surface, and let $\Gamma_c(\overline{R})$ denote the continuous sections of a flat $PU_n(\mathbb{C}))$ matrix bundle over $\overline{R}$. We show that the subalgebra of continuous holomorphic sections, $\Gamma_h(\overline{R})$, is an Azumaya algebra. We then discuss the implications of this result for the representation theory of nonselfadjoint subalgebras of continuous trace C^*-algebras.

Brent Nelson, University of California, Berkeley
Derivations on non-tracial von Neumann algebras

ABSTRACT: Given a non-tracial von Neumann algebra M with a fixed faithful normal state φ, one can study derivations on M as densely defined operators on the corresponding L^2-space. In the study of tracial von Neumann algebras, analyzing such derivations has proven to be a very successful strategy. This is in part because it allows one to bring to bear two very powerful theories: deformation/rigidity and free probability. When a derivation on M is closable and interacts nicely with the modular automorphism group (i.e. is "μ-modular" for some $\mu > 0$), one is able to replicate much of the analysis from the tracial context. In this talk, I will discuss results in this direction alongwith some examples.

Rachael Norton, University of Iowa
Pick interpolation in the context of W^*-correspondences

ABSTRACT: Since the original proof of Pick's interpolation theorem in 1915, there have been a variety of generalizations to operator theory, all but two of which may be recovered by Muhly and Solel's result from 2004. Muhly and Solel think of Nevanlinna-Pick interpolation as an instance of commutant lifting. Constantinescu, Johnson, and Popescu, on the other hand, use the displacement equation to prove results which are fundamentally different from Muhly and Solel's. In this talk, we address the differences and discuss circumstances under which the theorems are equivalent.

Stefanos Orfanos, DePaul University
Crossed Products and MF algebras

ABSTRACT: (joint work with Weihua Li) We discuss the following result: By imposing an almost periodicity condition on the group action, the crossed product $A \rtimes G$ inherits the MF property from A, with G assumed to be discrete, amenable and residually finite. We also give two applications of this result.

Sandeepan Parekh, Vanderbilt University
Maximal Amenable subalgebras in q-Gaussian factors.

ABSTRACT: For $-1 < q < 1$, Bozejko and Speicher's q-Gaussian factors can be thought of as q-deformed versions of the free group factor. Indeed they are known to share several properties in common with the free group factors like being non-injective, strongly solid, isomorphic to LF_n (for $|q|$ small enough). Continuing this line of investigation, in a joint work with K. Shimada and C. Wen, we show the generator masa in these factors are maximal amenable by constructing a Riesz basis in the spirit of Radulescu.

Cornel Pasnicu, University of Texas at San Antonio
The weak ideal property and topological dimension zero

ABSTRACT: Following up on previous work, we prove a number of results for C*-algebras with the weak ideal property or topological dimension zero, and some results for C*-algebras with related properties. Some of the more important results include:

- The weak ideal property implies topological dimension zero.
- For a separable C*-algebra A, topological dimension zero is equivalent to $\mathrm{RR}(\mathcal{O}_2 \otimes A) = 0$, to $D \otimes A$ having the ideal property for some (or

any) Kirchberg algebra D, and to A being residually hereditarily in the class of all C*-algebras B such that $\mathcal{O}_\infty \otimes B$ contains a nonzero projection.

- Extending the known result for $\mathbb{Z}_2$, the classes of C*-algebras with residual (SP), which are residually hereditarily (properly) infinite, or which are purely infinite and have the ideal property, are closed under crossed products by arbitrary actions of abelian 2-groups.

- If A and B are separable, one of them is exact, A has the ideal property, and B has the weak ideal property, then $A \otimes_{\min} B$ has the weak ideal property.

- If X is a totally disconnected locally compact Hausdorff space and A is a $C_0(X)$-algebra all of whose fibers have one of the weak ideal property, topological dimension zero, residual (SP), or the combination of pure infiniteness and the ideal property, then A also has the corresponding property (for topological dimension zero, provided A is separable).

- Topological dimension zero, the weak ideal property, and the ideal property are all equivalent for a substantial class of separable C*-algebras including all separable locally AH algebras.

- The weak ideal property does not imply the ideal property for separable Z-stable C*-algebras.

We give other related results, as well as counterexamples to several other statements one might hope for.

This is joint work with N. Christopher Phillips.

Benjamin Passer, Technion-Israel Institute of Technology
Minimal/Maximal Matrix Convex Sets and Dilations

Abstract: Given a compact convex subset K of Euclidean space, there are possibly multiple matrix convex sets which admit K as the first level. Among these, a minimal and maximal set are easily described, which we can denote as Wmin(K) and Wmax(K). Roughly speaking, Wmax(K) includes matrices satisfying the same linear inequalities that determine K, and Wmin(K) includes matrices admitting a normal dilation (i.e., a dilation tuple of normal and commuting operators) with joint spectrum inside K.

I will discuss some recent progress on the dilation problem: when is Wmax(K) contained in Wmin(L), and when is L minimal? Can a minimal L be chosen to admit the same symmetry as K? When can L be written as a scalar multiple of K, and what is the optimal scale? When can L = K, so that K is the first level of exactly one matrix convex set? Of particular interest here will be the unit balls of various L-p norms, and the positive parts of these unit balls, for which we have found optimal scaling constants.

This is joint work with Orr Shalit and Baruch Solel.

Sasmita Patnaik, Indian Institute of Technology, Kanpur

On Commutators of Compact Operators

ABSTRACT: A commutator is an operator of the form $AB - BA$ where A and B are bounded linear operators on a Hilbert space. On finite dimensional Hilbert space, commutators are characterized via trace condition, i.e., a matrix C is a commutator if and only if $trC = 0$. In the more interesting case of a separable infinite dimensional Hilbert space, the structure of commutators of compact operators still remains a mystery. Some progress in this direction will be discussed in the talk.

David Pitts, University of Nebraska–Lincoln

Pre-homomorphisms and Isotropy for Regular MASA Inclusion

ABSTRACT: Let $(\mathcal{C}, \mathcal{D})$ be a regular MASA inclusion, that is, a pair $(\mathcal{C}, \mathcal{D})$ of unital C^*-algebras (with the same unit) where $\mathcal{D} \subseteq \mathcal{C}$ is a MASA and the set

$$\mathcal{N}(\mathcal{C}, \mathcal{D}) := \{v \in \mathcal{C} : v\mathcal{D}v^* \cup v^*\mathcal{D}v \subseteq \mathcal{D}\}$$

has dense span in $\mathcal{C}$. An important and well-behaved class of regular MASA inclusions are the C^*-diagonals, which were introduced by Kumjian as a C^*-algebraic variant of a Cartan MASA in a von Neumann algebra.

Two interesting structural ideals in $\mathcal{C}$ are:

- $\mathcal{L}(\mathcal{C}, \mathcal{D})$, which can be viewed as a measure of the extent to which a representation $\pi : \mathcal{C} \to \mathcal{B}(\mathcal{H})$ which is faithful on $\mathcal{D}$ fails to be faithful on all of $\mathcal{C}$; and
- $\mathrm{Rad}(\mathcal{C}, \mathcal{D})$, which measures the extent to which $(\mathcal{C}, \mathcal{D})$ fails to be embeddable into a C^*-diagonal.

Let $\mathrm{Mod}(\mathcal{C}, \mathcal{D})$ denote the set of states on $\mathcal{C}$ whose restrictions to $\mathcal{D}$ are multiplicative. The ideals above are defined as the intersections of the left kernels of two subsets of $\mathrm{Mod}(\mathcal{C}, \mathcal{D})$: $\mathcal{S}_s(\mathcal{C}, \mathcal{D})$ and $\mathcal{S}(\mathcal{C}, \mathcal{D})$.

It is always the case the $\mathrm{Rad}(\mathcal{C},\mathcal{D}) \subseteq \mathcal{L}(\mathcal{C},\mathcal{D})$, but it is not known whether equality holds in general. The family $\mathcal{S}_s(\mathcal{C},\mathcal{D})$ determining $\mathcal{L}(\mathcal{C},\mathcal{D})$ is fairly easily described, but $\mathcal{S}(\mathcal{C},\mathcal{D})$ is more mysterious, which is one of the reasons for the difficulty in deciding whether $\mathrm{Rad}(\mathcal{C},\mathcal{D}) = \mathcal{L}(\mathcal{C},\mathcal{D})$. It seems likely that a good description of $\mathcal{S}(\mathcal{C},\mathcal{D})$ will be helpful in answering this question.

In this talk, I will give a description of $\mathcal{S}(\mathcal{C},\mathcal{D})$ in terms of local data obtained from $(\mathcal{C},\mathcal{D})$; this data should be regarded as isotropy data. The data comes in the form of a $\mathbb{T}$-group Γ_σ associated with each $\sigma \in \hat{\mathcal{D}}$, and the description of $\mathcal{S}(\mathcal{C},\mathcal{D})$ is in terms of certain positive definite functions on Γ_σ which we call pre-homomorphisms.

John Quigg, Arizona State University

Zappa-Szep with categories

ABSTRACT: I'll start with an alarmingly terse overview of the recent confluence of several disparate threads: self-similar groups, cocycle actions on graphs, categories of paths, left cancellative small categories, inverse semigroups, and Zappa-Szép products. Our work starts with a cocycle action of a group on a left cancellative small category, from which we form a Zappa-Szép product, which is another left cancellative small category. We define Toeplitz and Cuntz-Pimsner algebras, and compare our constructions with C^*-algebras studied by other recent dabblers: Exel (both alone and with Pardo), Donsig and Milan, and Li.

This is joint work with Erik Bédos, Steve Kaliszewski, and Jack Spielberg.

Christopher Schafhauser, University of Waterloo

On the Tikuisis-White-Winter Theorem

ABSTRACT: A tracial state on a C*-algebra A is called amenable (resp. quasidiagonal) if there is a sequence of completely positive contractive maps from A into matrix algebras with approximately preserve the trace and approximately preserve the multiplication in the 2-norm (resp. operator norm). Every quasdiagonal trace is amenable and the converse remains open. In the nuclear setting, classical results imply every trace on a nuclear C*-algebra is amenable, but even here, the quasidiagonal question remains unsolved.

Substantial progress on this question was made recently by Tikuisis, White, and Winter: every faithful trace on a separable, nuclear C*-algebra in the UCT class is quasidiagonal. This result has several important consequences in Elliott's Program and elsewhere. We will discuss this problem and a short proof of the Tikuisis-White-Winter Theorem using Kasparov's

KK-Theory and a Hilbert module version of Voiculescu's Weyl-von Neumann Theorem due to Elliott and Kucerovsky.

Jack Spielberg, Arizona State University
The regular representation of a left-cancellative small category

ABSTRACT: Coburn's theorem on the uniqueness of the C^*-algebra of a non-unitary isometry can be thought of as stating that the regular representation of $\mathbb{Z}^+$ on $\ell^2(\mathbb{Z}^+)$ is universal for representations of $\mathbb{Z}^+$ by isometries. Since the C^*-algebra generated by this representation is also generated by the Toeplitz operators with continuous symbol, it is usually referred to as "the" Toeplitz algebra. Generalizations of Coburn's result passed through the algebras of Cuntz and Cuntz-Krieger, of directed graphs, of higher-rank graphs, of semigroups, and of certain small categories, to give "Toeplitz C^*-algebras" associated to these various oriented combinatorial objects. A unifying context for all of these examples is that of left-cancellative small categories (LCSC's). In this talk I will explain how the context of LCSC's makes it apparent that the regular representation on ℓ^2 is in general the wrong way to define a Toeplitz C^*-algebra.

Qijun Tan, Penn State University
On a Spectral Theorem of Weyl

ABSTRACT: We give a geometric proof of a theorem of Weyl on the continuous part of the spectrum of Sturm-Liouville operators on the half-line with asymptotically constant coefficients. Earlier proofs due to Weyl and Kodaira depend on special features of Green's functions for linear ordinary differential operators; ours might offer better prospects for generalization to higher dimensions, as required for example in non- commutative harmonic analysis.

Adi Tcaciuc, MacEwan University
The almost-invariant subspace problem for Banach spaces

ABSTRACT: We show that any bounded operator acting on an infinite dimensional Banach space admits a rank one perturbation that has in invariant subspace of infinite dimension and codimension. This extends to arbitrary Banach spaces a previous result that was proved only in the reflexive case.

Dan Timotin, IMAR and Indiana University
Szego type theorems for truncated Toeplitz operator

Abstract: Truncated Toeplitz operators are compressions of multiplication operators to model spaces (that is, subspaces of the Hardy-Hilbert space which are invariant with respect to the backward shift). For this class of operators we discuss Szegő type theorems concerning the asymptotics of their compressions to an increasing chain of finite dimensional model spaces.

Kun Wang, Texas A&M University
Visiting Assistant Professor

Abstract: In this paper, we study the relation between the extended Elliott invariant and the Stevens invariant of C*-algebras. We show that in general the Stevens invariant can be derived from the extended Elliott invariant in a functorial manner. We also show that these two invariants are isomorphic for C*-algebras satisfying the ideal property. A C*-algebra is said to have the ideal property if each of its closed two-sided ideals is generated by projections inside the ideal. Both simple, unital C*-algebras and real rank zero C*-algebras have the ideal property. As a consequence, many classes of non-simple C*-algebras can be classified by their extended Elliott invariants, which is a generalization of Elliott's conjecture.

Qingyun Wang, University of Oregon
TBA

Abstract:

Jianchao Wu, Penn State University
Noncommutative dimensions and dynamics

Abstract: We showcase a number of recently emerged concepts of dimensions defined for topological dynamical systems, such as the dynamical asymptotic dimension introduced by Guentner, Willett and Yu and the amenability dimension inspired by the work of Bartels, Lück and Reich. Roughly speaking, these dimensions measure the complexity of the topological dynamical system by the extent to which we can decompose the dynamical system into disjoint "towers" which are small neighborhoods of partial orbits. Having finite such dimensions often facilitates certain "algorithms" for K-theoretic computations, which makes them powerful tools for proving the Baum-Connes conjecture and the Farrell-Jones conjecture, as well as bounding the nuclear dimensions (for crossed product C*-algebras), which is a crucial regularity property in the recent breakthrough in the classification program of simple separable amenable C^*-algebras. They also turn out to

have close relations with the Rokhlin dimension, which was developed independently for C^*-dynamical system and draws inspiration from the classical Rokhlin lemma in ergodic theory and its subsequent application in the study of von Neumann algebras. These new developments have spurred growing interests in the noncommutative dimension theory, for which a focal challenge is to find ways to control these new dimensions. This talk includes work in collaboration with Hirshberg, Szabo, Winter and Zacharias as well as further recent developments.

Vrej Zarikian, United States Naval Academy
Hereditary properties for C^*-inclusions

ABSTRACT: A property P for C^*-inclusions is said to be **hereditary from above** if $A \subseteq B$ has P whenever $A \subseteq C$ has P and $A \subseteq B \subseteq C$. Likewise, P is **hereditary from below** if $B \subseteq C$ has P whenever $A \subseteq C$ has P and $A \subseteq B \subseteq C$.

In this talk, we show by example that regularity is not hereditary from above, and that the pure extension property is not hereditary from below. The former example involves ergodic theory and Kazhdan's property (T), while the latter example involves a result of Baker & Powers about restricting pure product states on the CAR algebra to the GICAR algebra.