Southern Ontario Operator Algebra Seminar 2018

Schedule

All talks will be in MC, Room 5501, and all breaks will be nearby.

Saturday February 17th, 2018

- 9AM-10AM: Kenneth Davidson (University of Waterloo), Part 1.
- 10AM-11AM: Break
- 11AM-12PM: Sarah Browne (Pennsylvania State University).
- 12PM-2PM: Lunch Break
- 2PM-3PM: Jianchao Wu (Pennsylvania State University).
- 3PM-4PM: Break
- 4PM-5PM: Kenneth Dykema (Texas A&M University), Part 1.

Sunday February 18th, 2018

- 9AM-10AM: Kenneth Dykema (Texas A&M University), Part 2.
- 10AM-11AM: Break
- 11AM-12PM: Christopher Schafhauser (University of Waterloo).
- 12PM-2PM: Lunch Break
- 2PM-3PM: Kenneth Davidson (University of Waterloo), Part 2.

Abstracts

Sarah Browne (Pennsylvania State University)

E-theory spectrum

E-theory is an invariant of C*-algebras and in particular is a collection of abelian groups defined in terms of homotopy classes of certain morphisms of C*-algebras. This makes it a natural object to define in terms of stable homotopy groups. In my talk I will detail the notion of E-theory for real and complex graded C*-algebras. I will give the framework we require, namely a spectrum of quasi-topological spaces, to represent the E-theory groups as a stable homotopy theory. If time allows, I will highlight how we encode E-theory properties into this construction.

Kenneth Davidson (University of Waterloo)

Part 1: Free semigroupoid algebras

A free semigroupoid algebra is the WOT-closure of the algebra generated by a Toeplitz-Cuntz-Kreiger family of a graph. We obtain a structure theory for these algebras analogous to that of free semigroup algebra. These results are applied to obtain a Lebesgue-von Neumann-Wold decomposition of TCK families, along with reflexivity, a Kaplansky density theorem and classification for free semigroupoid algebras. Several classes of examples are discussed.

This is joint work with Adam Dor-On and Boyu Li.

Part 2: Dilations, inclusions of matrix convex sets, and completely positive maps

We discuss relations between two matrix convex sets. Two problems of concern are: 1. When is there is unital completely positive map that takes A_i to B_i for $1 \leq i \leq n$; and 2. If $\mathcal{S}$ and $\mathcal{T}$ are matrix convex sets, can you determine whether $\mathcal{S}$ is contained in $\mathcal{T}$. We will discuss recent work with Adam Dor-On, Orr Shalit and Baruch Solel providing partial answers to these questions.

Kenneth Dykema (Texas A&M University)

Part 1: Upper triangular forms and joint spectral distribution measures in finite von Neumann algebras

The Brown measure is a sort of spectral distribution measure for arbitrary elements of finite von Neumann algebras. A remarkable advance, made by Haagerup and Schultz, was the construction of hyperinvariant subspaces for elements of finite von Neumann algebras that effect decomposition of an element according to its Brown measure. We use these to write such an element in a Schur-type upper triangular form, wherein the "diagonal" part is normal and the "upper triangular" part has Brown measure supported at 0. In the first talk, we will apply this to make a construction of an analogue of Brown measure for commuting operators in a finite von Neumann algebra, namely, a joint spectral distribution measure.

Part 2: Upper triangular forms and decomposability in finite von Neumann algebras

In the second talk, we will explore how properties of the upper triangular form of an operator relate to decomposability of the operator, in the sense of Foias. All told, this includes joint work with, variously, Ian Charlesworth, Joseph Noles, Fedor Sukochev and Dmitriy Zanin.

Christopher Schafhauser (University of Waterloo)

AF-Embeddings of exact C^*-algebras

A famous question of Blackadar and Kirchberg asks if every separable, exact, quasidiagonal C^*-algebra embeds into an AF-algebra. We provide a partial answer to this question showing that a separable, exact C^*-algebra which satisfies the UCT and admits a faithful quasidiagonal trace embeds in an AF-algebra. Moreover, the AF-algebra may be chosen to be simple with unique trace, and the embedding may be chosen to be trace-preserving and to obtain a given morphism on the K_0-group. The key tool is a new classification result for faithful morphisms from separable, exact, UCT C^*-algebras with a faithful amenable trace into simple, unital, Q-stable, AF-algebras with unique trace in terms of K_0 and tracial data.

As a consequence, for an action of a (countable discrete) amenable group on a compact metrizable space X which preserves a faithful probability measure, the crossed product embeds into an AF-algebra. In particular, taking the space to be a point, this also shows that the C^*-algebra of an amenable group embeds into an AF-algebra recovering a result of Ozawa-Rordam-Sato and Tikuisis-White-Winter. In fact, we obtain a stronger result: any such group algebra admits a trace-preserving embedding into a UHF-algebra.

Jianchao Wu (Pennsylvania State University)

Demystifying Rokhlin dimension

The theory of Rokhlin dimension was introduced by Hirshberg, Winter and Zacharias as a tool to study the regularity properties of C^*-algebras in relation with group actions. It was inspired by the classical Rokhlin lemma in ergodic theory. Since then, it has been greatly developed as well as simplified, and connections to other areas have been discovered. In this talk, I will present some newer perspectives to help us understand this concept. In particular, I will explain its relation to the Schwarz genus for principal bundles in the context of generalized Borsuk-Ulam theorems. I will also indicate how one can extend the theory beyond residually finite groups. This includes recent and ongoing joint projects with Gardella, Hajac, Hirshberg, Hamblin, Tobolski and Zacharias.