Operator Algebras
Algèbres d'opérateurs
(Org: **Matthew Kennedy** (Waterloo) and/et **Paul Skoufranis** (York))

SERBAN BELINSCHI, CNRS - Institut de Mathématiques de Toulouse
Some regularity resuts for free convolutions of operator-valued distributions

The strong regularizing effect of free convolutions for classical, scalar-valued distributions is well-known by now, due to numerous results, starting with the pioneering work of Bercovici and Voiculescu. For obvious reasons, results of similar strength cannot be expected for operator-valued distributions. However, we will show that in some respects, free additive convolution has a regularizing effect on operator-valued distributions as well, especially in what concerns their atomic part. In this talk we will provide a sample of results in this direction and brief outlines of the ideas involved in proving them.

IAN CHARLESWORTH, University of California, Berkeley
Combinatorics of the bi-free Segal-Bargmann transform

The Segal-Bargmann transform provides an isomorphism between the L^2 space of a real Gaussian random variable and the holomorphic L^2 space of a complex one. It was adapted to the free setting by Biane; an adaptation to the setting of bi-free probability is the subject of an ongoing project of mine with Ching Wei Ho and Todd Kemp. There are a number of peculiarities in this setting arising from the fact that a central limit object in bi-free probability is a pair of variables, specified by two variances and a covariance, leading to a family of transforms with more parameters. In this talk I will give a brief overview of our results, highlighting in particular a combinatorial argument based in context free grammars as a tool for enumeration.

RAPHAEL CLOUATRE, University of Manitoba
Non self-adjoint Exel–Loring approximations and residual finite-dimensionality

An operator algebra is said to be residually finite-dimensional (RFD) if it is completely normed by its finite-dimensional representations. For C^*-algebras, several characterizations of this property are known. In this talk, we will focus on one such characterization obtained by Exel and Loring, which says that every representation can be approximated by a finite-dimensional one in some appropriate topology.

Is there a non self-adjoint version of this characterization? We illustrate how the answer appears to be sensitive to the particular choice of topology, unlike in the C^*-algebra setting. In doing so, we relate the question to the fact that the maximal C^*-cover is RFD. This is joint work in progress with Adam Dor-On.

KEN DAVIDSON, University of Waterloo
Non-commutative Choquet theory

We develop the theory of nc convex set and nc convex functions and find a good theory for studying unital completely positive maps on operator systems. In particular, there is a theory of convex nc functions that leads to a useful order on completely positive maps that leads to representation theorems as in the classical theory.

This is joint work with Matthew Kennedy.

GEORGIOS KATSIMPAS, York University
Bi-Free Entropy with respect to Completely Positive Maps

The theory of free entropy developed by Voiculescu found several applications in the world of von Neumann algebras and remains one of the most active research areas in the theory of free probability. In this talk, we shall provide an introduction

to the non-microstate approach to free entropy and develop notions of bi-free entropy with respect to completely positive maps. This extends the notions of bi-free entropy recently developed by Charlesworth and Skoufranis and introduces a proper framework for the analytical investigation of bi-free entropy. In addition, peculiarities and questions that arise within this environment of bi-free entropy will be discussed. This is joint work with Paul Skoufranis.

NICHOLAS MANOR, University of Waterloo

Exactness vs C-exactness for certain non-discrete groups*

It is known that exactness for a discrete group G is equivalent to C*-exactness, i.e., the exactness of the reduced C*-algebra $C_r^*(G)$. It is a major open problem to determine whether this equivalence holds for all locally compact groups, but the problem has recently been reduced by Cave and Zacharias to the case of totally disconnected (td) unimodular groups. We will discuss ways to extend the equivalence of exactness and C*-exactness to classes of non-discrete groups. These include those groups whose reduced C*-algebra has a trace. Using this result we will study examples of td unimodular groups, including those td groups admitting an invariant neighbourhood of the identity, and a family of td unimodular groups introduced by Yuhei Suzuki in the context of C*-simplicity.

JAMES MINGO, Queen's University

Cyclic Groups and R-cyclic operators

R-cyclic operators are a generalization of R-diagonal operators which are in turn a generalization of Haar unitary operators and circular operators.

In this talk I will present a new connection between cyclic groups and R-cyclic operators. The main result is that the transpose of an R-cyclic operator can be naturally decomposed, with respect to the cyclic group, into freely independent pieces. Thus is joint work with Octavio Arizmendi (Guanajuato).

BRENT NELSON, Michigan State University

Free Stein Irregularity and Dimension

Given an n-tuple X of non-commutative random variables, its free Stein discrepancy relative to the semicircle law (the non-commutative analogue of classical Stein discrepancy relative to the Gaussian distribution) measures how "close" the distribution of X is to the semicircle law. By considering free Stein discrepancies relative to a broader class of laws, one can define a quantity called the free Stein irregularity. I will discuss this quantity and show how it can be related to other free probabilistic quantities such as the free Fisher information and the non-microstates free entropy dimension. I will also show how it can be easily computed for a number of interesting examples. This is based on joint work with Ian Charlesworth.

MIKAEL PICHOT, McGill University

A virtual action of a braid group

I will discuss rigidity properties of geometric actions of the braid group on 4 strands.

GUY SALOMON, University of Waterloo

The mysterious connection between proximal actions and Poisson boundaries

An action of a discrete group G on a compact Hausdorff space X is said to be *proximal* if for every two points $x, y \in X$ there is a net $g_\alpha \in G$ such that $\lim g_\alpha x = \lim g_\alpha y$, and *strongly proximal* if the natural action of G on the space $P(X)$ of probability measures on X is proximal. G is said to be *strongly amenable* if all of its proximal actions have a fixed point and *amenable* if all of its strongly proximal actions have a fixed point.

In this talk, I will present relations between some fundamental operator theoretic concepts to proximal and strongly proximal actions, and hence to strongly amenable and amenable groups. In particular, I will focus on the C^*-algebra of continues

functions over the universal minimal proximal G-action and characterize it in the category of G-operator-systems. I will then present some connections to the Poisson boundaries of G. The talk is based on joint work with Matthew Kennedy and Sven Raum.

MARIA GRAZIA VIOLA, Lakehead University
Regularity properties of Cuntz-Pimsner algebras

Let $\mathcal{H}$ be a finitely generated C*-correspondence over the $C(X)$, where X is an infinite compact, metrizable space. We can associate to $\mathcal{H}$ the Cuntz-Pimsner algebra $\mathcal{O}(\mathcal{H})$, which is a generalization of both Cuntz-Krieger algebras and crossed products by $\mathbb{Z}$. It is a result of Schweizer that when the C*-correspondence is full, nonperiodic, and minimal, the C*-algebra $\mathcal{O}(\mathcal{H})$ is simple and unital.

In the case of crossed products by minimal homeomorphisms, the orbit breaking subagebra, defined by Putnam, is a large subalgebra of $C(X) \rtimes_\alpha \mathbb{Z}$, in the sense of N. C. Phillips. We show that the Cuntz-Pimsner algebra $\mathcal{O}(\mathcal{H})$ also contains a large subalgebra, at least for a large class of C*-correspondences. We will discuss some properties that $\mathcal{O}(\mathcal{H})$ and/or its large subalgebra have, focusing on properties needed for classification. In particular, we will describe in details the case where the C*-correspondence is a line bundle, with left multiplication given by a twist by a homeomorphism. This is joint work with M. S. Adamo, D. Archey, M. Forough, M. Georgescu, J. A Jeong, and K. Strung.

DILIAN YANG, University of Windsor
The ideal structures of self-similar k-graph C-algebras*

Let G be a discrete group and Λ be a k-graph. If there is a self-similar action of G on Λ, we call (G, Λ) a self-similar k-graph. One can associate (G, Λ) a universal C*-algebra, called the *self-similar k-graph C*-algebra of* (G, Λ). The class of those C*-algebras embraces many known important C*-algebras, such as k-graph C*-algebras of Kumjian-Pask, Exel-Pardo algebras, and Katsura algebras, and Nekrashevych algebras. In this talk, we will discuss the structures of their gauge-invariant ideals and primitive ideals.

This is joint work with Hui Li.