WABASH
EXTRAMURAL MODERN ANALYSIS
MINICONFERENCE

September 15 and 16, 2012

Abstracts

Invited Talks

9:50–10:40, Saturday, Room: 252

Dilation theory, commutant lifting and semicrossed products

Ken Davidson, *University of Waterloo*

We take a new look at dilation theory for nonself-adjoint operator algebras. Among the extremal (co)extensions of a representation, there is a special property of being fully extremal. This allows a refinement of some of the classical notions which are important when one moves away from standard examples. We show that many algebras including graph algebras and tensor algebras of C*-correspondences have the semi-Dirichlet property which collapses these notions and explains why they have a better dilation theory. This leads to variations of the notions of commutant lifting and Ando's theorem. This is applied to the study of semicrossed products by automorphisms, and endomorphisms which lift to the C*-envelope. In particular, we obtain several general theorems which allow one to conclude that semicrossed products of an operator algebra naturally imbed completely isometrically into the semicrossed product of its C*-envelope, and the C*-envelopes of these two algebras are the same.

This is joint work with Elias Katsoulis, Documenta Mathematica 16 (2011), 781–868.

10:50–11:40, Saturday, Room: 252

Subfactors with small Jones index

Dietmar Bisch, *Vanderbilt University*

We will describe some of the beautiful structures appearing in the theory of subfactors with Jones index ≤ 6. The most interesting "small" indices appear to be 4, $3+\sqrt{5}$ and 6. We will explain why this is the case.

2:00–2:50, Saturday, Room: 252

A differential complex for CAT(0) cubical spaces

Erik Guentner, *University of Hawaii*

About thirty years ago, Julg and Valette proved K-theoretic amenability for a discrete group acting properly on a simplicial tree. They studied a certain differential complex associated to the tree and showed that, while the complex is not invariant for a group acting on the tree, it may be deformed to an invariant complex. I will explain how to generalize these constructions to groups acting properly on finite cimensional CAT(0) cube complexes. This is joing work with J. Brodzki and N. Higson.

3:00–3:50, Saturday, Room 252

Simple C*-algebras with generalized tracial rank one.

Huaxin Lin, *University of Oregon*

We will introduce the notion of generalized tracial rank one (and zero) for simple C*-algebras. This class of C*-algebras includes all known classifiable separable simple C*-algebras of stable rank one. We will discuss the properties of these simple C*-algebras. We will report a classification theorem for this class of C*-algebras.

9:30–10:20, Sunday, Room: 252

Boxplus-convolution powers, in scalar-valued and operator-valued framework

Nica Alexandru, *University of Waterloo*

The free additive convolution $\boxplus$ (boxplus) is an operation with probability distributions on the real line, which reflects the addition of free selfadjoint elements in a C^*-probability space. There exists a natural way of considering convolution-powers $\mu^{\boxplus p}$ where μ is a probability distribution and p is a non-negative real number, and it is known that $\mu^{\boxplus p}$ is always defined when $p \geq 1$. In this talk I will present a joint work with Michael Anshelevich, Serban Belinschi and Maxime Fevrier, concerning the generalization of the above facts to the framework of an operator-valued noncommutative probability space over a C^*-algebra B. For a B-valued distribution μ, it turns out that one can define convolution powers $\mu^{\boxplus \eta}$ where the exponent η is a suitable positive map from B to B, instead of being just a non-negative real number. We show moreover how some other known facts from the scalar-valued framework – particularly a certain kind of "evolution towards $\boxplus$-infinite divisibility" – can also be extended to the B-valued framework.

10:30–11:20, Sunday, Room 252

Stabilizers of ergodic actions of lattices and commensurators

Jesse Peterson, *Vanderbilt University*

A strong generalization of the Margulis Normal Subgroup Theorem, due to Stuck and Zimmer, states that any properly ergodic finite measure-preserving action of an irreducible lattice in a center-free semisimple Lie group with all simple factors of higher-rank is essentially free. I will present a similar result generalizing the Creutz-Shalom Normal Subgroup Theorem for Commensurators of Lattices to actions of commensurators. As a consequence, it follows that S-arithmetic lattices enjoy the same properties as the arithmetic lattices (the Stuck-Zimmer result) and that lattices in certain product groups do as well. For example, any nontrivial ergodic measure-preserving action of $\mathrm{PSL}_n(\mathbb{Q})$, for n at least three, is essentially free.

11:30–12:30, Sunday, Room 252

Fibred coarse embedding into Hilbert space and its applications to higher index problems

Xiaoman Chen, *Fudan University*

We introduce a notion of fibred coarse embedding into Hilbert space for metric spaces, which is a generalization of Gromov's notion of coarse embedding into Hilbert space. It turns out that a large class of expander graphs admit such an embedding. We show that the maximal coarse Baum-Connes conjecture holds for metric spaces with bounded geometry which admit a fibred coarse embedding into Hilbert space. This is joint work with Qin Wang and Guoliang Yu.

Contributed Talks

11:50–12:15, Saturday, Room: 252

Eigenvalues of sums of Hermitian matrices and Jordan canonical forms of matrices: an intersection theory point of view

Wing Suet Li, *Georgia Tech*

It is well known that the eigenvalues of (positive semi-definite) Hermitian matrices A, B, and $C = A+B$ can be described by triples of decreasing sequences of numbers satisfying the Littlewood-Richardson rule. On the other hand, the same triple describes the relations between the invariant factors of a nilpotent matrices T and the restriction of T to an invariant subspace M of T and the compression of T to $M^{\perp}$, at least when these numbers are integers. Moreover, these triples of sequences also satisfies the Horn inequalities. In this talk I will explain the connections between these two seemily unrelated theorems through the intersections of certain objects similar to Schubert varieties. This talk is based on the joint work with H. Bercovici and K. Dykema.

4:00–4:20, Saturday, Room: 252

On groups with quasidiagonal C*-algebras

José Carrión, *Purdue University*

Halmos termed an operator acting on a Hilbert space $\mathcal{H}$ *quasidiagonal* if it is a compact perturbation of a block-diagonal operator, i.e. if it is of the form $D + K$ for some compact operator K and where the operator D has a block-diagonal matrix with respect to some orthonormal basis of $\mathcal{H}$. The corresponding notion for C^*-algebras is a local approximation property with connections to several areas of mathematics.

Rosenberg proved that for a (reduced) group C^*-algebra $C^*_\lambda(\Gamma)$ to be quasidiagonal the group Γ must be amenable. This begs the question, is the C^*-algebra of every amenable group quasidiagonal? (We only consider discrete groups.)

We examine this question, providing a quantitative version of Rosenberg's theorem and giving a "group-theoretic" description of quasidiagonality. Examples of groups we consider are the so-called LEF groups introduced by Vershik and Gordon; the topological full groups associated with Cantor minimal systems studied by Giordano-Putnam-Skau, Matui, Grigorchuk-Medynets and Juschenko-Monod; and some classical examples from group theory. We also study the question of when group C^*-algebras are *strongly quasidiagonal*, that is, when every representation of the C^*-algebra is quasidiagonal. Our talk is based on a joint project with Dadarlat and Eckhardt.

4:00–4:20, Saturday, Room: 274

Weighted Shifts and Disjoint Hypercyclicity

Ozgur Martin, *Miami University*

For a series of free R-diagonal operators, we prove an analogue of the three series theorem. We show that a series of free R-diagonal operators converges almost uniformly if and if two numerical series converge. The condition involves only two numerical series, this is due to the circular symmetry of the R-diagonal operators.

4:30–4:50, Saturday, Room: 252

Quotients and Duality in Matrix Systems

Ali S Kavruk, *University of Illinois at Urbana Champaign*

4:30–4:50, Saturday, Room: 274

Deddens Algebras for Weighted Shifts

Daniel Sievewright, *Western Michigan University*

We describe the possible structure of the Deddens algebra associated with a weighted shift, focusing on injective weighted shifts of finite multiplicity. We give necessary and sufficient condtions for

such an algebra to have a nontrivial invariant subspace. Then, several examples are given to show that we cannot strengthen the results about the structure of the Deddens algebra.

5:00–5:20, Saturday, Room: 252

An analogue of Kolmogorov's three series theorem for R-diagonal operators

Ping Zhong, *Indiana University*

For a series of free R-diagonal operators, we prove an analogue of the three series theorem. We show that a series of free R-diagonal operators converges almost uniformly if and if two numerical series converge. The condition involves only two numerical series, this is due to the circular symmetry of the R-diagonal operators.

5:00–5:20, Saturday, Room: 274

Noncommutative martingale concentration and Poincaré type inequalities

Qiang Zeng, *Indiana University*

We prove a concentration inequality for noncommutative martingales by extending Oliveira's argument for random matrices. By integration we obtain a Burkholder type inequality with satisfactory constant. Pushing the discrete time result to continuous time, we obtain noncommutative Burkholder-Davis-Gundy inequalities. From here we establish noncommutative Poincaré type inequalities for "nice" semigroups with a positive curvature condition. These results allow us to prove a noncommutative transportation inequality which generalizes a famous result in the commutative case due to Bobkov and Götze. Finally we give various examples which satisfy the assumptions of our main theorems, including classical diffusion processes and certain group von Neumann algebras. Joint work with Marius Junge.

5:30–5:50, Saturday, Room: 252

Dimension functions on $C_0(X, A)$

Joan Bosa, *Univ. Autonoma de Barcelona*

Blackadar and Handelman wrote in 1982 an important article about the structure of C*-algebras. In there, they stated two conjectures concerning the basic structure of the sets $(L)DF(A)$ of (lower semicontinuous) dimension functions on a C*-algebra A. In this article talk I will explain how we have answered positively both conjectures for some classes of C*-algebras.

5:30–5:50, Saturday, Room: 252

Similarity results for operators of class C_0 and the algebra $H^\infty(T)$

Raphael Clouatre, *Indiana University*

The classification theorem for a C_0 operator describes its quasisimilarity class by means of its Jordan model. The purpose of this talk will be to investigate when the relation between the operator and its model can be improved to similarity. More precisely, we study the algebra $H^\infty(T)$ associated to the operator T and obtain similarity to the model in the case where the minimal function of T can be written as a product of inner functions satisfying the so-called (generalized) Carleson condition.