WABASH MINI-CONFERENCE, September 16–17, 2016

Titles and Abstracts

INVITED TALKS

SCOTT ATKINSON, Vanderbilt University

Graph products of completely positive maps

Abstract: In operator algebras, graph products unify the notions of free products and tensor products. In this talk, we will establish the graph product of unital completely positive maps on a universal graph product of C*-algebras and show that it is unital completely positive itself. The proof is an adaptation of Boca's argument for the free version of this result; it utilizes an alternative length function specifically for words in a graph product and a Stinespring construction for concatenation. If time permits, we will discuss applications of this result to positive-definite functions on groups, unitary dilation, and a graph product version of von Neumanns inequality. No prior knowledge of graph products will be assumed.

ALEXANDER DRANISHNIKOV, University of Florida

Gromov's scalar curvature conjecture for abelian groups

Abstract: Gromov's scalar curvature conjecture states that the macroscopic dimension of the universal covering of an n-manifold with positive scalar curvature has macroscopic dimension at most n-2. We say Gromov's conjecture holds for a finitely presented group G if it holds for all manifolds with the fundamental group G. There are three different cases of Gromov's conjecture: 1. when a manifold is spin, 2. when it is not spin but its universal covering is spin, and 3. when the universal covering is not spin. In the first two cases there are classical and coarse index theory which allow to make progress on the conjecture for groups satisfying the Novikov conjecture. Until recently in the third case there was no any technique. Using recent results of Schoen -Yau we can prove Gromov's conjecture for abelian groups regardless if the universal covering spin or not.

KEN DYKEMA, Texas A&M University

Decomposability and upper-triangular forms in finite von Neumann algebras

Abstract: The spectrum of an operator contains essential information. Even better is when we can find invariant subspaces that break the operator into pieces with conditions on the spectrum. This is the meaning of decomposability of an operator, in the sense of Foias. Haagerup and Schultz proved existence of invariant subspaces that do this for an arbitrary element of a finite von Neumann algebra, but where "spectrum" is replaced by "support of Brown measure." These Haagerup-Schultz subspaces have been used to provide Schur-type upper triangular forms of such elements of finite von Neumann algebras. In this talk, we describe how decomposability of these operators relates to properties of these Schur-type upper triangular forms. (Joint work with Joe Noles and Dmitriy Zanin).

BEN HAYES, University of Virginia

1-bounded entropy with applications to von Neumann algebras.

Abstract: I will discuss 1-bounded entropy, which is a invariant of a tracial von Neumann algebra related to free probability and free entropy dimensions which measures how many matricial approximations it has. I will present discuss applications, including nonisomorphism results in II_1-factors, as well as applications to regularity problems and type III algebras.

BRENT NELSON, UC Berkeley

Free transport for interpolated free group factors

Abstract: A few years ago in a landmark paper, Guionnet and Shlyakhtenko proved the existence of free monotone transport from the joint law of a free semicircular family. In particular, these results imply that the von Neumann algebra (resp. C*-algebra) generated by a free semicircular family is isomorphic to the von Neumann algebra (resp. C*-algebra) generated by self-adjoint operators with a joint law "close" to the semicircle law in a certain sense. Notably, the von Neumann algebra generated by a free semicircular family is a free group factor. In this talk, I will discuss how to obtain corresponding results for the interpolated free group factors using an operator-valued framework. This is joint work with Michael Hartglass.

BOGDAN NICA, McGill University

Boundaries of hyperbolic groups

Abstract: Hyperbolic groups form a broad, yet unified class of 'negatively-curved' groups. One of the remarkable features of this class of groups is a rich boundary theory. There are topological, dynamical, and analytic aspects to this theory, and the focus of this talk will be on the latter. I will highlight a certain 'euclidean' property, known as Ahlfors regularity, and I will discuss several results that build on it.

JAMES PASCOE, Washington University in St. Louis

Noncommutative Positivstellensatze

Abstract: So-called real algebraic geometry studies the theory and structure of positive polynomials. The results classically are very strong and essentially any question you might have about the positivity, or nonnegativity, of a polynomial on a semi-algebraic set is decidable, although the proof may be very long a result going back to Tarski. Typically, one can generate an algebraic certificate for positivity for example any polynomial which is a sum of Hermitian squares is positive, and often the converse is true, at least under relaxation. Positivity questions about noncommutative polynomials, that is, elements of the free associative algebra, evaluated on self-adjoint matrices arise naturally in the engineering context of matrix inequalities. Recent work, essentially stemming from older functional analysis methods developed by Putinar and Schmüdgen has sought to formalize the theory of matrix inequalities. Some important results from the commutative setting

fail in the noncommutative setting, such as the Tarski-Seidenberg theorem. Moreover, the nonnegativity of a noncommutative polynomial on a semi-algebraic set may be undecidable. However, the positive results are usually much cleaner and much nicer. Additionally recent work has shown that in several instances operator theoretic and operator algebraic conjectures can be rephrased in this framework. This talk will describe the classical situation, the beginnings of the noncommutative theory and some of my recent work.

CONTRIBUTED TALKS

ZHIWEI HAO, University of Texas at San Antonio:

On asymptotic random matrices with entries in non-commutative algebra

Abstract: In this talk we will introduce the fluctuations of traces of random matrix with noncommutative entries and its generalized transpose. We shall discuss some application for the Gaussian random matrices. There is also an analysis of asymptotic second order relations between semicircular matrices and their transposes, with results not very similar to the commutative (i.e. Gaussian random matrices) framework. Finally, we will discuss some results about Boolean independent.

BENJAMIN PASSER, Technion-Israel Institute of Technology:

Path Classes of Equivariant Morphisms

Abstract: I will present some joint work with Alexandru Chirvasitu concerning the two Noncommutative Borsuk-Ulam conjectures of Baum, Dabrowski, and Hajac. Very roughly speaking, these conjectures propose circumstances under which equivariant maps between C^*-algebras with (quantum) group actions cannot be path-trivial. We show that one of the conjectures is false in the noncommutative setting (but with a counterexample that is nuclear and separable) and describe some progress in resolving the other conjecture.