First East Coast Operator Algebras Symposium

Vanderbilt University, September 20 & 21, 2003

Abstracts

Semigroups of endomorphisms of B(H)

Alexis Alevras, United States Naval Academy

We will describe the "standard form" of a semigroup of endomorphisms of $B(H)$ and discuss the problem of its uniqueness as well as some recent progress in the related problem of computing local cocycles for such semigroups.

Khovanov homology of links in $F \times I$

Marta Asaeda, University of Iowa

Khovanov homology is a homology defined on link diagrams in a disk, whose graded Euler characteristic gives the Jones polynomial. I will give a short survey, and talk about its generalization to diagrams in an oriented surface.

Eigenvalue inequalities and addition of free random variables

Hari Bercovici, Indiana University

We will discuss briefly the three-series theorem for free random variables; this leads to some questions about the eigenvalues of sums of free selfadjoint elements of a II_1 factor. One can then ask more generally for characterizations of the eigenvalues of a sum of seldadjoint elements, and this issue is resolved completely in the case of factors which embed in the ultrapower of the hyperfinite II_1 factor.

C*-algebras and numerical analysis?

Nate Brown, Penn State University

At first glance it may seem impossible that the theory of C*-algebras could be useful in numerical analysis (at least it did to me). It turns out, however, that C*-algebras have been used for some 20 years and there is now a vast body of work on applications of basic C*-theory to certain questions in the numerical approximation of infinite dimensional operators. I will discuss some of the basic problems where C*-techniques prove useful and try to explain why the notion of quasidiagonality is perfectly suited for numerical analysis.

On C^*-algebras and K-theory for infinite-dimensional Fredholm manifolds

Dorin Dumitrascu, Dartmouth College

Let M be a smooth Fredholm manifold, modeled on a separable infinite-dimensional real Hilbert space E, with Riemannian metric and Levi-Civita connection ∇. Given a Fredholm filtration $\mathcal{F} = \{M_n\}_{n=1}^{\infty}$ of M by finite-dimensional submanifolds, we associate to $(M, \nabla, \mathcal{F})$ a non-commutative direct limit C^*-algebra

$$\mathcal{A}(M, \nabla, \mathcal{F}) = \lim_{n \to \infty} \mathcal{A}(M_n)$$

that can play the role of the algebra of functions vanishing at infinity on the non-locally compact space M. If $M = E$, then this C^*-algebra is related to the C^*-algebra of an infinite dimensional Euclidean space as constructed by Higson-Kasparov-Trout for their Bott periodicity theorem. If M has a spin structure, the K-theory of this C^*-algebra is the same as the topological K-theory of M as defined by Mukherjea. Furthermore, there is a Poincaré duality isomorphism of this K-theory of M with the (compactly supported) K-homology of M, just as in the finite-dimensional setting.

The talk reports on a joint work with Jody Trout.

An obstruction to being a principal graph

Vaughan Jones, UC Berkeley

We will give two relations between the Perron-Frobenius eigenvectors of the adjacency matrices of a pair of graphs which are satisfied if the graphs are the principal and dual-principal graphs of a finite index subfactor.

The bare bones of QFT: numbers, Hopf algebras and NCG
Dirk Kreimer, IHES & Boston University

We discuss the algebraic structure of Feynman graphs, encapsulated in Hopf- and Lie algebras underlying perturbation theory. We emphasize the connection to various other branches of mathematics, ranging from number theory to noncommutative geometry, with emphasis given to the quantum equations of motion, the Dyson–Schwinger equations.

Rankin-Cohen deformations along the transverse fundamental class
Henri Moscovici, Ohio State University

The symmetry in transverse geometry comes organized in the form of certain Hopf algebras $\mathcal{H}_n$. Much like the classical Lie groups deform to QUE algebras, it turns out that a simplified version of the Hopf algebra $\mathcal{H}_1$ also admits nontrivial deformations, that are given by natural extensions of the *Rankin-Cohen brackets* (also known as *transvectants*). I will explain in this light the main results in the joint paper paper with A. Connes posted at arXiv:math.QA/0304316.

Weakly exact von Neumann algebras
Narutaka Ozawa, Tokyo University (visiting UC Berkeley)

The notion of weak exactness for von Neumann algebras was introduced by Kirchberg some times ago. In this talk, I will review this notion (as well as exactness for C*-algebras) and give a characterization of weakly exact von Neumann algebras that is analogous to that of exact C*-algebras. In particular, the group von Neumann algebra LG of a discrete group G is weakly exact if and only if the group G is exact.

Finite propagation operators which are Fredholm
John Roe, Penn State University

I will report on recent joint work with Steffen Roch and Vladimir Rabinovich which produces an abstract 'index theorem' for finite propagation operators which happen to be Fredholm.

On the free entropy dimension of some von Neumann algebras

Junhao Shen, University of Pennsylvania

The theory of free probability and free entropy was developed by D. Voiculescu from 80's. Using the concept of free entropy and free entropy dimension, he was able to show that there is no Cartan subalgebra in free group factors. In the talk we will discuss some further applications of free entropy theory on some von Neumann algebras, which include group von Neumann algebras of special linear group with integer entries.

On non-outer conjugate actions of a cyclic group on an interpolated free group factor

Maria Grazia Viola, Texas A&M University

Two automorphisms α and β on a von Neumann algebra M are said to be outer conjugate if there exists an automorphism σ of M and a unitary $U \in M$ such that $\sigma\beta\sigma^{-1} = Ad(U) \circ \alpha$. In the 70's A. Connes gave a complete classification of periodic automorphisms on the hyperfinite II_1 factor up to outer conjugacy. He showed that two such automorphisms are outer conjugate if and only if they have the same outer invariant, i.e., the same inner period and obstruction to lifting.

A very different situation appears in the case of free group factors. We will see for any prime p there exist two $\mathbb{Z}_{p^2}$-actions on an interpolated free group factor which have the same outer invariant but are not outer conjugate.