ABSTRACTS

INVITED Lectures

Connes's Embedding Conjecture and its equivalent. 4 lectures

Narutaka Ozawa

I will lecture on Connes's Embedding Conjecture, which is considered as one of the most important open problems in the field of operator algebras. It asserts that every finite von Neumann algebra is approximable by matrix algebras in suitable sense. It turns out, most notably by Kirchberg, that Connes's Embedding Conjecture is equivalent to surprisingly many other important conjectures which touches almost all the subfields of operator algebras and also to other branches of mathematics such as quantum information theory and noncommutative real algebraic geometry.

Operator Algebras and Continued - 4 lectures

Florin Boca

TBA 2 lectures

Pierre Fima

Representations of C*-algebras from interval maps

Nuno Martins

Given a family of interval maps, we construct partial isometries acting on Hilbert spaces associated to the orbit of each point. Then we prove that such partial isometries give rise to representations of certain C*-algebras. We study the irreducibility of these representations. Finally, we state the conditions to have unitarily equivalence between two such representations. Co-authors: C. Correia Ramos and Paulo R. Pinto

On pro-C*-algebras of profinite groups

Paolo Pinto

We investigate when a C*-algebra can be given different structures of pro-C*-algebras, leading us to the notion of the profinite completion of a C*-algebra (which is a pro-C*-algebra). We consider a natural homomorphism from the (full) group C*-algebra of a locally compact group to the pro-C*-algebra of the profinite completion of the group. We prove that this homomorphism is injective for amenable residually finite discrete groups. The talk is based on a joint work with R. El Harti and N.C. Phillips.

Rieffel Quantization, Twisted Crossed Products and Spectral Analysis

Marius Mantoiu

To a continuous action of a vector group on a C*-algebra, twisted by the imaginary exponential of a symplectic form, one associates a Rieffel deformed algebra as well as a twisted crossed product. We show that the second one is isomorphic to the tensor product of the first one with the C*-algebra of compact operators in a separable Hilbert space and we indicate some applications. We also use the functorial properties of Rieffel?s pseudodifferential calculus to study families of operators associated to topological dynamical sys- tems acted by a symplectic space. Information about the spectra and the essential spectra are extracted from the quasi-orbit structure of the dynamical system. The semi-classical behavior of the families of spectra is also studied. Co-authors: Ingrid Beltita (patially)

Cohomology and charge classes

John Roberts

I will give sufficient conditions on simplicial sets relevant to AQFT which lead together with a net of von Neumann algebras satisfying duality to a tensor C*-category describing the structure of sectors or more generally of charge classes.

SESSION TALKS

Holonomy groupoid of manifolds with fibred corners

Guillaume Laurent

Following work of Connes, Monthubert, Skandalis and Androulidakis, we associate to every manifold with fibred boundary then to every manifold with fibred corners a longitudinally smooth groupoid. We then show that the associated compactly supported pseudodifferential calculus coincides with Melrose's ϕ-calculus and we introduce an extended algebra of smoothing operators that is shown to be stable under holomorphic functional calculus. Finally we show that the groupoid we built has a natural geometric meaning as a holonomy groupoid of singular foliation, it is an explicit example of a singular leaf space in the sense of Androulidakis and Skandalis. This result allows the conceptual interpretation of ϕ-calculus as the pseudodifferential calculus associated with the holonomy groupoid of the singular foliation defined by the manifold with fibred corners.

The space of sofic approximations revisited

Liviu Paunescu

If G is a sofic, non-amenable group, then the space of its sofic approximations is non-separable. This is because there are approximations (that are sequences) that can be re-parametrized uncountable may times, to give a family of approximations at some fix distance one from another. In the talk, that is more work in progress, I'll try to define an equivalence relation on the space of sofic approximations that will rule out this redundancy.

Twisted modular Hecke operators and Hecke correspondences between line bundles

Banerjee Abishek

Given a principal congruence subgroup $\Gamma = \Gamma(N) \subseteq SL_2(\mathbb{Z})$, Connes and Moscovici have introduced a modular Hecke algebra $\mathcal{A}(\Gamma)$ that incorporates both the pointwise multiplicative structure of modular forms and the action of the classical Hecke operators. It is well known that a Γ-modular form g of weight k may be described as a global section of the k-th tensor power of a certain line bundle $p(\Gamma) : \mathscr{L}(\Gamma) \longrightarrow \Gamma\backslash\mathbb{H}$. The purpose of this talk is twofold: First, we develop a theory of modular Hecke algebras for Hecke correspondences between the line bundles $\mathscr{L}(\Gamma)$ that lift the classical Hecke correspondences between modular curves $\Gamma\backslash\mathbb{H}$. Secondly, for each $\sigma \in SL_2(\mathbb{Z})$, we define a collection $\mathcal{A}_\sigma(\Gamma)$ of twisted modular Hecke operators and study Hopf actions on $\mathcal{A}_\sigma(\Gamma)$ analogous to $\mathcal{A}(\Gamma)$. We also use these Hopf actions to define Rankin-Cohen brackets on $\mathcal{A}_\sigma(\Gamma)$.

W*-superrigidity for left-right wreath products

Mihai Berbec

Over the last years, Popa's deformation/rigidity theory lead to a lot of progress in the classification of *group measure space* II_1 *factors* $L^\infty(X) \rtimes G$ associated with free, ergodic, probability measure preserving actions of countable groups. In comparison, our understanding of group von Neumann algebras LG is much more limited. The famous Connes' theorem ('76) implies that all II_1 factors LG coming from *amenable* groups G with infinite conjugacy classes (icc) are isomorphic. Although *nonamenable* groups with nonisomorphic group II_1 factors were already discovered (Murray-von Neumann '43, Scwartz '63, McDuff '69), the general question on how LG depends on G remains largely unanswered, especially when G is a "classical group" like $SL(n, \mathbb{Z})$ or a free group $\mathbb{F}_n$. The first W^**-superrigidity* theorem for group von Neumann algebras was established by Ioana, Popa and Vaes ([IPV10]) in 2010: for a large class of *generalized wreath product groups* $\mathcal{G} = (\mathbb{Z}/2\mathbb{Z})^{(I)} \rtimes \Gamma$, it was shown that if $L\mathcal{G} \cong L\Lambda$ for an *arbitrary* group Λ, then Λ must be isomorphic with $\mathcal{G}$. Such a group $\mathcal{G}$ is called W^**-superrigid.* So $\mathcal{G}$ is W*-superrigid if the group von Neumann algebra $L\mathcal{G}$ "remembers" $\mathcal{G}$. The class of groups covered by [IPV10] contains all $(\mathbb{Z}/2\mathbb{Z})^{(I)} \rtimes (\Gamma \wr \mathbb{Z})$, where Γ is an arbitrary nonamenable group and $I = (\Gamma \wr \mathbb{Z})/\mathbb{Z}$. We extend their results and prove W*-superrigidity for the more natural *left-right wreath products* $\mathcal{G} = (\mathbb{Z}/2\mathbb{Z})^{(\Gamma)} \rtimes (\Gamma \times \Gamma)$, where the direct product $\Gamma \times \Gamma$ acts on Γ by left-right multiplication, and where Γ is either the free group $\mathbb{F}_n$ with $n \geq 2$, or any icc hyperbolic group, or any nontrivial free product $\Gamma_1 * \Gamma_2$. (This is a joint work with Stefaan Vaes) Co-authors: Stefaan Vaes

Noncommutative torus, Theta functions and the Weil-Brezin-Zak transform

Francesco D'Andeea

I will explain how, using the Weil-Brezin-Zak transform of solid state physics, finitely generated projective modules over the noncommutative torus can be interpreted as deformations of vector bundles on elliptic curves, under the condition that the deformation parameter of the nc-torus and the modular parameter of the elliptic curve satisfy a non-trivial relation. I will conclude with some remarks about formal deformations of vector bundles on the torus and twists based on the Lie algebra of the 3-dimensional Heisenberg group, and outline some open problems. Co-authors: Gaetano Fiore, Davide Franco

TBA

Stephano Rossi

Based on a recent joint work with A. D'Andrea, L.S. Cirio and C. Pinzari, the talk will mainly focus on topological aspects of compact quantum groups, such as connectivity and its opposite notion, namely total disconnectedness. By revisiting the notion of connectedness due to Wang, we will give its categorical counterpart in the frame of C^* tensor categories. This approach turns out to be far-reaching, inasmuch as it allows to define the connected component of the identity for any compact quantum group, which of course reduces to the usual notion in commutative cases. Rather surprisingly, this quantum subgroup may fail to be normal unlike the classical case, which is no doubt one of the most interesting novelties. Motivated by the deep analogy with the classic theory, we will finally describe the intriguing problem of giving conditions for a matrix compact quantum group (in the sense of Woronowicz) to have finitely many connected components.

Negative curvature and the structure of group algebras.

Thomas Sinclair

I will explain how, using the Weil-Brezin-Zak transform of solid state physics, finitely generated projective modules over the noncommutative torus can be interpreted as deformations of vector bundles on elliptic curves, under the condition that the deformation parameter of the nc-torus and the modular parameter of the elliptic curve satisfy a non-trivial relation. I will conclude with some remarks about formal deformations of vector bundles on the torus and twists based on the Lie algebra of the 3-dimensional Heisenberg group, and outline some open problems. Co-authors: Gaetano Fiore, Davide Franco