Abstracts

Alain Connes:

"Operator systems, spectral truncation and tolerance relations"

I will explain my recent work with Walter van Suijlekom extending the framework of NCG to take into account spectral truncations for the geometry of space-time using the operator systems to which Ed Effros contributed so fundamentally; I will also discuss tolerance relations and their significance in the joint work with Katia Consani on the Riemann-Roch formula for the Arakelov compactification of Spec Z

Stefaan Vaes:

"Measure equivalence embeddings of free groups and free group factors"

I will present a recent joint work with Tey Berendschot in which we give a simple and explicit proof that the free group $\mathbb{F}_2$ admits a measure equivalence embedding into any nonamenable locally compact second countable group. I will also explain a new concept of measure equivalence and measure equivalence embeddings for II_1 factors. In particular, we prove that a II_1 factor M is nonamenable if and only if the free group factor $L(\mathbb{F}_2)$ admits a measure equivalence embedding into M.

Magdalena Musat:

"Infinite dimensional phenomena in the analysis of Quantum Information Theory"

Factorizable completely positive maps, introduced by C. Anantharaman-Delaroche within the framework of operator algebras, have proven to have interesting applications in the analysis of quantum information theory, leading also to reformulations of the Connes Embedding Problem. In recent work with M. Rørdam, we show that (infinite dimensional) von Neumann algebras are, indeed, needed to describe such channels. The proof uses analysis of matrices of correlations arising from projections, respectively, unitaries, in tracial von Neumann algebras. We also establish a new view point on factorizable channels, leading to central questions in C* -algebra theory.

Marius Dadarlat:

"A generalized Dixmier-Douady theory and applications"

We will give a succinct survey of the generalized Dixmier-Douady theory for bundles of stable strongly self-absorbing C*-algebras that we have developed in joint work with Pennig. Then, we will present a computation of the cohomological invariants that classify these bundles, obtained in collaboration with McClure and Pennig. Finally, we will discuss an application to amenable group actions on Kirchberg algebras based on results of Izumi, Matui, Meyer, Gabe and Szabo.

Alekos Kechris:

"The compact action realization problem"

In this talk I will discuss realizations of countable Borel equivalence relations by continuous actions of countable groups, focusing in particular on the problem of realization by continuous actions on compact spaces and more specifically subshifts. This also leads to considering a natural universal space for actions and equivalence relations via subshifts and the study of the descriptive and topological properties in this universal space of various classes of countable Borel equivalence relations, especially the hyperfinite ones.

This is based on recent work of J. Frisch, S. Iyer, F. Shinko, Z. Vidnyánszky and the speaker.

Gilles Pisier:

"From local to global lifting? The tensor product viewpoint."

The main problem we will consider is whether the local lifting property (LLP) of a C^*-algebra implies the (global) lifting property (LP). Kirchberg showed that this holds if the Connes embedding problem has a positive solution (but it might hold even if its solution is negative). We conjecture that our recently constructed example of a non-exact C^*-algebra with both LLP and WEP might be a counterexample. While our investigation is not conclusive we obtain several fairly simple conditions in terms of tensor products that are equivalent to the validity of the implication [WEP and LLP] $\Rightarrow$ LP.

Adrian Ioana:

"Wreath-like product groups and rigidity of their von Neumann algebras."

Wreath-like products are a new class of groups, which are close relatives of the classical wreath products. Examples of wreath-like product groups arise from every non-elementary hyperbolic groups by taking suitable quotients. As a consequence, unlike classical wreath products, many wreath-like products have Kazhdan's property (T). I will present several rigidity results for von Neumann algebras of wreath-like product groups. We show that any group G in a natural family of wreath-like products with property (T) is W*-superrigid: the group von Neumann algebra L(G) remembers the isomorphism class of G. This provides the first examples of W*-superrigid groups with property (T). For wreath-like products with property (T) belonging to a wider class, we show that any isomorphism between their group von Neumann algebras arises from an isomorphism of the groups. As an application, we prove that any countable group can be realized as the outer automorphism group of L(G), for an icc property (T) group G. This is joint work with Ionut Chifan, Denis Osin and Bin Sun.

Ionut Chifan:

"Wreath-like product groups and rigidity of their von Neumann algebras, II"

Wreath-like products are a new class of groups, which are close relatives of the classical wreath products. Examples of wreath-like product groups arise as quotients of non-elementary (relative) hyperbolic groups via deep methods in geometric group theory. As a consequence, unlike classical al wreath products, many wreath-like products have Kazhdan's property (T). In this talk, which is a continuation of Ioana's talk, we will present several applications of wreath-like product groups to the study of rigidity and other structural aspects of group von Neumann algebras. First, we show that for a large class of property (T) wreath-like products any isomorphism between their group von Neumann algebras arises from an isomorphism of the groups. Combining this with a new group theoretic development we establish a converse to a well-known result of Connes: any countable group can be realized as the outer automorphism group of a property (T) group factor. Then, we will highlight new families of property (T) wreath-like products which are completely recognizable from both their von Neumann algebras, $L(G)$ and their reduced C^*-algebras, $C_r^*(G)$. In the last part, we will explain how wreath-like products can be used to show the category of property (T) factors is embedding universal. This has several applications to the structure of II_1 factors arising from model theoretic considerations. This is based on several works with Daniel Drimbe, Adrian Ioana, Denis Osin and Bin Sun.

Eleanor Rieffel:

"Wigner's friend inequalities; theory, experimental prospects, and open questions"

Recently, there has been renewed interest in Wigner's friend scenarios, leading to new inequalities, with assumptions strictly weaker than those of Bell's inequalities, fundamental inequalities violated by quantum mechanics. I will begin with background on the Wigner's friend scenario, before discussing a proposal for an ambitious but feasible experiment, the realization of which, if the results violate the inequalities as predicted by quantum theory, forces rejection of at least one of four metaphysical assumptions that are widely held by scientists. Experimentalists have carried out a proof-of-principle experiment in which a photon plays the role of Wigner's friend. The feasibility of full experiment rests on technological assumptions related to the realization of human level artificial intelligence and large-scale fault-tolerant quantum computers. I will discuss quantitative estimates for the resources needed to realize the experiment, including large spatial distances. The last part of the talk will include speculation and open questions related to experiments that could be carried out in the intermediate term, especially to related theory, such as operator algebraic approaches to entanglement, reversibility and distributed quantum systems. The talk will touch on topics related to stimulating discussions I had with Ed Effros over the years.

Marius Junge:

"From noncommutative geometry to complexity"

Starting from basic concepts in noncommutative geometry, more precisely an operator space version of Lipschitz norms on C*algebras, we will discuss basic properties of the complete average diameter of a quantum system. The complete average diameter turns out to additive under tensor products. The second motivation for this work is a recent paper by Jaffe et al on complexity for quantum channels. Lipschitz norms provide what could be called 'resource dependent complexity theory'. Particular examples are given by generating systems on groups and the notion of depth of a quantum circuit. All of this and the fundamental connection to concentration inequalities will be formulated in an operator algebra language.

Dan Voiculescu:

"Quasicentral modulus as a noncommutative nonlinear condenser capacity and some semi-finite thoughts"

The quasicentral modulus plays a key role in normed ideal perturbations of Hilbert space operators. I will explain why the quasicentral modulus is a noncommutative analogue of the condenser capacity in nonlinear potential theory. I will also comment about extending the quasicentral modulus to the semifinite setting.

Ben Hayes:

"A random matrix approach to the Peterson-Thom conjecture"

The Peterson-Thom conjecture asserts that any diffuse, amenable subalgebra of a free group factor is contained in a unique maximal amenable subalgebra. This conjecture is motivated by related results in Popa's deformation/rigidity theory and Peterson-Thom's results on L2-Betti numbers. I will discuss my 2020 paper which gave an approach to this conjecture in terms of so-called strong convergence of random matrices by formulating a conjecture which is a natural generalization of the Haagerup- Thorbjornsen theorem whose validity implies the Peterson-Thom conjecture. I will also comment on recent results in this direction, as well as the methods involved in the proof of my result which include usage of local reflexivity of C*-algebras as defined by Effros-Haagerup.

Sorin Popa:

"Non-isomorphism of $A^{*n}, 2 \leq n \leq \infty$, for a non-separable abelian W*-algebra A"

I will present some recent joint work with Remi Boutonnet, Daniel Drimbe and Adrian Ioana in which we prove that if A is a non-separable abelian tracial W*-algebra then its free powers $A^{*n}, 2 \leq n \neq \infty$, are non-isomorphic, with trivial fundamental group, $\mathcal{F}(A^{*n}) = 1$, whenever $n < \infty$.

David Jekel:

"Title: Uniformly Super McDuff II_1 Factors"

Motivated by the study of elementary equivalence of II_1 factors and ultraproduct embeddings, we introduce the uniform super McDuff property for II_1 factors, which is a strengthening of the super McDuff property that the commutant of M in $M^{\mathcal{U}}$ is a II_1 factor. We show that the uniform super McDuff property is preserved under elementary equivalence and coincides with the Brown property (that every separable subfactor in $M^{\mathcal{U}}$ is contained in a separable subfactor with trivial relative commutant). We show that the infinitely generic II_1 factors (a certain class related to logical forcing) are uniformly super McDuff. We also show that strongly McDuff II_1 factors (the tensor product of a full II_1 factor with $\mathcal{R}$) are uniformly super McDuff, and hence also have the Brown property.

This is based on joint work with Isaac Goldbring, Srivatsav Kunnawalkam Elayavalli, and Jennifer Pi [2303.02809] Uniformly Super McDuff II_1 Factors (arxiv.org)

Srivatsav Kunnawalkam Elayavalli:

"An exotic full factor"

I will show you how to construct the first explicit separable full factor M such that M^ω is not isomoprhic to $L(F_2)^\omega$ for any ultrafilter. Moreover it is also the first full non pseudocompact factor, i.e, M^ω is not isomorphic to any matrix ultraproduct. Joint work with I. Chifan and A. Ioana.

Jesse Peterson:

"Biexact von Neumann algebras"

The notion of biexactness for groups was introduced by Ozawa in 2004 and has since become a major tool used for studying solidity of von Neumann algebras. We introduce the notion of biexactness for von Neumann algebras, which allows us to place many previous solidity results in a more systematic context, and naturally leads to extensions of these results. We will also discuss examples of solid factors that are not biexact. This is based on joint work with Changying Ding.

Priyanga Ganesan:

"Quantum graphs and colorings"

In this talk, we will explore the interaction between operator algebras and quantum information theory through a discussion on quantum graphs. Quantum graphs are an operator generalization of classical graphs that have appeared in different branches of mathematics including operator algebras, non-commutative topology, operator systems theory and quantum information theory. I will present an overview of the theory of quantum graphs and discuss the connections between different perspectives using operator algebraic methods. We will then investigate a coloring problem for quantum graphs using a quantum-input classical-output nonlocal game. Using this framework, we show that every quantum graph has a finite quantum coloring, but not necessarily finite classical coloring. We will develop a combinatorial characterization of

quantum graph coloring using the winning strategies of this game and obtain various lower bounds for the chromatic numbers of quantum graphs. This is based on joint work with Michael Brannan and Samuel Harris.

Cyril Houdayer:

"The noncommutative factor theorem for lattices in product groups"

I will present a noncommutative analogue of Bader-Shalom factor theorem for lattices with dense projections in product groups. Combining with our previous works, we obtain a noncommutative analogue of Margulis factor theorem for all irreducible lattices in higher rank semisimple algebraic groups. Namely, we give a complete description of all intermediate von Neumann subalgebras sitting between the group von Neumann algebra associated with the lattice and the group measure space von Neumann algebra associated with the action of the lattice on the Furstenberg-Poisson boundary. This is joint work with Rémi Boutonnet.

Dima Shlyakhtenko:

TBA

Narutaka Ozawa:

"Kazhdan's property (T) for $Aut(F_n)$ and $EL_n(R)$"

Kazhdan's property (T) for groups has a number of applications in pure and applied mathematics. I will report the recent development by several hands on the heavily computer assisted methods of proving property (T) (with math rigor), which eventually confirmed property (T) for $Aut(F_n)$, $n > 3$, thus solving a well-known problem in geometric group theory. I then talk about my recent human effort in coping with the computer assisted proof.

Marc Rieffel:

"Convergence of Fourier truncations for compact quantum groups"

I will sketch how to generalize the Fejer-Riesz operator systems defined for the circle group by Connes and van Suijlekom to the setting of compact matrix quantum groups and their ergodic actions on C*-algebras. These Fourier truncations form filtrations of the containing C*-algebra. I will indicate that when these truncations and their containing C*-algebra are equipped with suitable quantum metrics, then under suitable conditions the Fourier truncations converge to the containing C*-algebra for quantum Gromov-Hausdorff distance.

Mikael Rordam:

"Popa's averaging property for automorphisms on C*-algebras"

We give a characterization of when an automorphism on a C*-algebra satisfyes a certain Dixmier type averaging property, introduced by Popa. We demonstrate how this property of an automorphism, or of an action of a discrete group on a C*-algebra, leads to much easier proofs of certain results on crossed product C*-algebras.

Matt Kennedy:

"Noncommutative Choquet Theory and Noncommutative Majorization"

I will give an overview of noncommutative Choquet theory and discuss several applications to operator algebras. I will introduce a notion of noncommutative majorization, which leads to a multivariate generalization of the Schur-Horn theorem for finite von Neumann algebras.