Abstracts

Alexander Belton
Functions which fail to preserve non-negativity

Abstract:

Recall the Schur product theorem, that the Hadamard product of two non-negative-definite matrices, formed by multiplying corresponding entries, is itself non-negative definite. It is a simple consequence of this theorem that every analytic function with non-negative Maclaurin coefficients, when applied to each entry, preserves the non-negative-definiteness of matrices of any order. The converse is also true: any function which preserves non-negative-definiteness for matrices of any order is necessarily analytic and has non-negative Maclaurin coeffficients.

For matrices of fixed order, the situation is more interesting. This talk will present recent work which shows the existence of polynomials with some negative coefficients which nevertheless preserve non-negative-definiteness. (Joint work with Dominique Guillot, Apoorva Khare, Mihai Putinar and Yuan Xu).

Uwe Franz
Gaussianity and Cohomology

Abstract: Lévy processes on involutive bialgebras can be classified by so-called "generating functionals", i.e. hermitian linear functionals that are positive on the kernel of a given character and vanish on the unit. Michael Schürmann has investigated the question when such functionals can be decomposed into a Gaussian part and a "rest". He showed that such a decomposition always exists for commutative algebras and obtained also several sufficient conditions on the cohomology of the algebra. In my talk I will present examples that do not admit such a decomposition and give a more detailed study of the sufficient conditions introduced by Schürmann.

(joint work with Malte Gerhold and Andreas Thom).

Michał Gnacik
Quantum random walk convergence via semigroup decomposition

Abstract: Approximating quantum Markov cocycles via quantum random walks is considered one of the fundamental problems in quantum probability. The case where the cocycle is assumed to have a bounded stochastic generator, in the Fock representation of the canonical commutation relations, has been fully resolved. However existing proofs of the approximation theorem are somewhat long and indirect. In this talk I shall discuss our new short proof which exploits semigroup decomposition for quantum stochastic cocycles. Examples and applications will be given as time permits.

(Joint work with Alexander Belton and Martin Lindsay)

Piotr M.Hajac
Non-contractibility of compact quantum groups and index pairing for their non-reduced suspensions

Abstract: Using the concept of an equivariant join $G * G$ of a compact quantum group G with itself, we define the contractibility of G as the existence of a global section of the compact quantum principal bundle $G * G$ over the non-reduced suspension SG. We unravel the pullback structure of finitely generated projective modules associated to G*G, and make it fit the Milnor connecting homomorphism formula in K-theory of unital C^*-algebras. Then, taking advantage of the compatibility of the index pairing with the connecting homomorphisms of the Mayer-Vietoris six-term exact sequences for K-theory and K-homology (which is a manifestation of the associativity of the Kasparov product), we prove that $SU_q(2)$ is not contractible, i.e. that Pflaum's quantum instanton bundle $SU_q(2) * SU_q(2)$ is not trivializable. Finally, we conjecture the non-contractibility of all non-trivial compact quantum groups, and explain how it fits the bigger picture of noncommutative Borsuk-Ulam-type conjectures. (Based on joint work with P. F. Baum, L. Dabrowski, T. Hadfield and E. Wagner.)

Robin Hillier
Conformal nets and noncommutative geometry

Abstract: Conformal nets arise in an operator algebraic approach to conformal quantum field theory. After a short introduction to conformal nets, the focus shall be on recalling some ideas of noncommutative geometry and K-theory and on giving an overview of how they help us to understand conformal nets. As a corollary we will obtain a K-theoretic description of loop groups and their representations.

Mateusz Jurczyński
Quasifree Wiener integrals

Abstract: The talk concerns Wiener-type integrals for a class of quasifree states on the CCR algebra over a Hilbert space of square-integrable vector-valued functions on the half-line. The plan is to cover sufficient background on the Weyl CCR algebra, quasifree states, (classical) Wiener integrals, chaos completeness and Tomita-Takesaki theory, for quasifree multiple Wiener integrals to be introduced and some of our results in the unfolding theory to be shared.

(This is joint work with Martin Lindsay)

Paweł Kasprzak
Quantum group of inner automorphisms

Abstract: Two alternative constructions of quantum group $Inn(G)$ of inner automorphisms of a locally compact quantum group G will be proposed. If G is a compact quantum group such that the equivalence class of tensor product of representations of G does not depend on their order then both constructions give the same locally compact quantum group. In the non-compact case we need the strengthening of this property which is quasitriangularity of G. In the course of the talk I will also discuss the notion of the center $Z(G)$ of a locally compact quantum group G and existence of the short exact sequence $e->Z(G)->G->Inn(G)->e$. Joint work with A. Skalski and P. Sołtan.

Anna Kula
On two problems related to classification of Lévy processes on compact quantum group

Abstract: Lévy processes on compact quantum groups can be classified in terms of their genererator or, equivalently, in terms of the Schurmann triples (consisting of a representation, a cocycle and a functional). We shall discuss two possible attempts for classification of LP by other properties: one which would depend on the cocycles on the quantum group, and the other, which would involve a generalization of the Hunt formula, known for classical Lie groups. The talk bases on the joint works with Uwe Franz, Biswarup Das, Martin Lindsay, Adam Skalski and Michael Skeide.

Martin Lindsay
Time-reversal and generation for quantum sub-Markov semigroups

Abstract: Let $(T_t)_{t\geqslant 0}$ be a sub-Markov semigroup on a von Neumann algebra with faithful normal semifinite weight (M, φ). Thus

$$T_t(\mathsf{M}_+) \subset \mathsf{M}_+, \quad T_t 1 \leqslant 1, \quad \varphi \circ T_t \leqslant \varphi \qquad (t \in \mathbb{R}_+),$$

and T is pointwise ultraweakly continuous:

$$s \mapsto \omega(T_s x) \text{ is continuous} \qquad (x \in \mathsf{M},\, \omega \in \mathsf{M}_*).$$

In this talk two related problems will be discussed: the symmetry associated with time-reversal for such semigroups, and the generation of such semigroups. The former calls for an appropriate notion of 'adjoint' for sub-Markov maps; the latter for a 'quantum' notion of Dirichlet form. They involve inducing maps on associated non-commutative L^p-spaces; specifically, interpolating between the algebra, L^∞, and the predual, L^1, and conversely extrapolating maps from the Hilbert space L^2 to the von Neumann algebra.

(Joint work with Stanisław Goldstein and Adam Skalski).

Andrzej Łuczak
Ergodic properties of Markov semigroups in von Neumann algebras

Abstract: Ergodic properties of Markov semigroups on the predual of a von Neumann algebra are investigated with the help of the notion of constrictor, which expresses the idea of closeness of the orbits of the semigroup to some set, and the notion of generalized averages which generalises to arbitrary abelian semigroup the classical notions of Cesaro or Borel means. In particular, mean ergodicity, asymptotic stability, and structure properties of the fixed-point space are analysed in some detail.

Michaël Ulrich
How to define Haar states on Dual Groups

Abstract: Dual groups have been introduced by Voiculescu in the 80's. By now they have not been studied as thoroughly as other mathematical objects as e.g Quantum Groups. The aim of this talk will be to give some results on what a Haar state on such objects would look like. We will take the example of the Unitary Dual Group.

Janusz Wysoczański
bm-independence in quantum probability and related geometry of positive cones

Abstract: We shall present a notion of non-commutative independence, which generalizes the monotonic and the boolean independences to algebras indexed by partially ordered sets. When the index set is a positive (symmetric) cone, we shall exhibit some geometrical properties of it, which are used for proving the analogue of the classical Central Limit Theorem, as well as for the construction of associated Brownian motions. As an additional result we obtain several analogues of the classical Catalan number's recurence, the solutions of which are moments of the bm-CLT laws.