IMU 2022 Annual Meeting
Operator Algebras Session

On invariant Von-Numann subalgebras rigidity property

Tattwamasi Amrutam (Ben-Gurion University of the Negev)

We say that a countable discrete group Γ satisfies the invariant von Neumann subalgebras rigidity (ISR) property if every Γ- invariant von Neumann subalgebra $\mathcal{M}$ in $L(\Gamma)$ is of the form $L(\Lambda)$ for some normal subgroup $\Lambda \lhd \Gamma$. We show that many "negatively curved" groups, including all torsion free non-amenable hyperbolic groups and torsion free groups with positive first L^2 -Betti number under a mild assumption, and certain finite direct products of them have this property. If time permits, we also discuss whether the torsion-free assumption can be relaxed.

This is a joint work with Yongle Jiang.

Dilations of unitary tuples and their surprising applications

Orr Shalit (Technion — Israel Institute Technology)

In the last several years we have been interested in the problem dilating a tuple of unitaries to a constant multiple of another tuple of unitaries. This remarkably simple notion has led us to new and elegant proofs of some known results of great interest, such as continuity of spectra of almost Mathieu operators or the existence of a norm continuous representation of the field of rotation C*-algebras. In this talk I will discuss these applications, as well as a recent work in which we refine our methods to handle tuples of one-parameter groups of unitaries. Our results can be applied to unitary groups satisfying certain commutation relations, yielding Haagerup and Rørdam's deep result, that the infinite ampliation of the unbounded operators satisfying the Heisenberg commutation relations are a bounded perturbation of strongly commuting operators.

The talk is based on a recent joint with Malte Gerhold and an earlier joint work with Malte Gerhold, Satish Pandey and Baruch Solel.

Connes embeddability versus flexible Hilbert Schmidt stability for property (T) groups

Alon Dogon (Weizmann Institute of Science)

In his seminal paper from 1976, Alain Connes singled out an approximation property for tracial von Neumann algebras, and asked whether all separable II_1 factors satisfy it. This turned out to be an extremely interesting question, connecting to many branches of mathematics. Only recently was it resolved in the negative by methods coming from the field of quantum complexity theory. However, the question of whether all group von Neumann algebras are Connes embeddable persists. A resolution in the negative would also provide a much desired example of a non-Sofic group. On the other side of the story, several new rigidity properties of groups, colloquially referred to as *stability*, have gathered considerable attention. Among them is *Flexible Hilbert Schmidt stability*: A group G is flexibly HS-stable if any *approximate* finite dimensional unitary representation of G is close to a compression of a genuine representation of slightly larger dimension. In this talk, we will explain ongoing work of the author, which gives conditional statements of the form "If G is flexibly HS-stable, then there exists a non-Connes embeddable group". This statement is shown to hold for property (T) groups under certain conditions (which are satisfied generically). The techniques are operator algebraic in nature.

Ratio-limits and Toeplitz quotients for random walks on relatively hyperbolic groups

Adam Dor-On (University of Haifa)

When studying quotients of C*-algebras generated by creation and annihilation operators on analogues of Fock space, the question of uniqueness of the *smallest equivariant quotient* plays an important role in answering fundamental questions in the theory. The study goes back to works of Cuntz, and Cuntz and Krieger, on uniqueness theorems for C*-algebras arising from symbolic dynamics, and has been gradually extended to include several broad classes of examples of Toeplitz quotients.

When associating such Toeplitz quotient C*-algebras to random walks on a group G, new notions of *ratio-limit space* and *boundary* emerge from their computation, and the question of uniqueness of smallest G-quotients becomes intimately related to the group dynamics on the ratio-limit boundary.

In this talk we explain how we extended results of Woess to show that there is a unique smallest G-quotient for a large class of symmetric random walks on relatively hyperbolic groups. This sheds light on some questions of Woess on ratio-limits for random walks on relatively hyperbolic groups, and extends a result mine on Toeplitz quotient C*-algebras for random walks.

This talk is based on joint work with Ilya Gekhtman.

Hyperbolic geometry of matrix convex sets

Eli Shamovich (Ben-Gurion University of the Negev)

Wittstock introduced matrix convex sets as quantizations of classical convex sets. By a result of Webster and Winkler, the category of compact matrix convex sets is dual to the category of operator systems. Recently, Davidson and Kennedy have greatly expanded the "continuous" theory of compact matrix convex sets. In this talk, however, I will focus on the "analytic" theory of uniformly bounded open matrix convex sets and, in particular, the iteration theory of nc self-maps. I will discuss fixed points results and versions of the Denjoy–Wolff theorem for the row ball and the maximal quantization of the unit ball of $\mathbb{C}^d$. I will present an application to the isomorphism problem of quotients of the free semigroup algebra. Lastly, I will present some open questions.