Noncommutative boundaries and hyperrigidity of operator systems

Boris Bilich, Mathematics dept., University of Haifa / University of Göttingen

Classical Shilov and Choquet boundaries provide analogues of the maximal modulus principle and peaking phenomenon for abstract function systems. Arveson extended this to noncommutative boundary theory by defining Shilov and Choquet boundaries for operator systems within C*-algebras, offering crucial tools for their study. He demonstrated that many results from commutative boundary theory have noncommutative analogs. Among his later works, in an attempt to generalize approximation rigidity results for function systems, Arveson introduced the concept of hyperrigidity for operator systems and conjectured that an operator system is hyperrigid if and only if its Choquet boundary is everything. However, recent work by the author and Dor-On has produced a counterexample to this conjecture, revealing new challenges in defining noncommutative rigidity for approximations and understanding the gap between the Choquet boundary being everything and hyperrigidity.

In this talk, I will outline the principles of noncommutative boundary theory and demonstrate the tools provided by dilation theory. I will present Arveson's hyperrigidity conjecture, explore the construction of counterexamples, and show how operator systems associated with correspondences offer a natural framework for discovering new counterexamples and testing emerging conjectures. In particular, I will demonstrate that the conjecture holds for certain well-known and broad classes of C*-correspondences.

Noncommutative ergodic theory and SAT actions

Guy Salomon, Mathematics dept., Holon Institute of Technology

I will give an introduction to noncommutative ergodic theory and discuss a new framework of (commutative) ergodicity based on SAT (strongly approximate transitive) actions. These will give rise to a noncommutative generalization of a theorem of Nevo and Zimmer about factors of certain nonsingular actions that naturally arise when studying lattices of higher rank Lie groups. I will explain the main ideas behind its proof, which are new even in the commutative case.

The talk is based on joint work with Uri Bader.

Weighted Cuntz-Krieger algebras

Baruch Solel, Mathematics dept., Technion - IIT

We fix a finite directed graph E with no sources or sinks and consider the graph correspondence X_E. The algebra we study are subalgebras of $\mathcal{L}(\mathcal{F}(X_E))/K(\mathcal{F}(X_E))$ that are generated by a weighted shift on the Fock correspondence $\mathcal{F}(X_E)$ modulo $K(\mathcal{F}(X_E))$. The weights are given by a sequence $\{Z_k\}$ of positive, adjointable operators on $\{(X_E)^{\otimes k}\}$. If $Z_k = I$ for every k, we get the Cuntz-Krieger algebra $C^*(E)$. For a general $Z := \{Z_k\}$, we write $C^*(E, Z)$ for the algebra and refer to it as the weighted Cuntz-Krieger algebra associated with E and Z.

We show that the weighted Cuntz-Krieger algebra $C^*(E, Z)$ is isomorphic to a Cuntz-Pimsner algebra $O(q(F), q(\mathcal{D}))$ associated with a C^*-correspondence $q(F)$ over a C^*-algebra $q(\mathcal{D})$.

We then use results that are known for Cuntz-Pimsner algebras to study the simplicity of the weighted Cuntz-Krieger algebras and the collection of all gauge-invariant ideals. This is done under the assumption that the weights are essentially periodic.

This is a joint work with L. Helmer.

Rieffel deformations of locally compact quantum groups

Ami Viselter, Mathematics dept., University of Haifa

We give an introduction to the theory of locally compact quantum groups and present an old-new construction called the Rieffel deformation, which allows constructing quantum groups from simple classical objects. If time permits, we show how to construct Levy processes, i.e. "continuous-time random walks", on Rieffel deformation quantum groups.

Based on joint work with Adam Skalski.