Abstracts of the Talks

(In Alphabetical Order)

Mohammad Ali Asadi-Vasfi (University of Tehran, Iran)

Radius of Comparison of Fixed Point Algebras and Crossed Products of Actions of Finite Groups

Abstract: The radius of comparison, based on the Cuntz semigroup, was introduced to distinguish examples of nonisomorphic simple separable unital AH algebras with the same Elliott invariant. The comparison theory of projections is fundamental to the theory of von Neumann algebras, and is the basis for the type classification of factors. A C*-algebra might have few or no projections, in which case their comparison theory tells us little about the structure of the C*-algebra. The appropriate replacement for projections is positive elements. This idea was first introduced by Cuntz in [2] with a view to studying dimension functions on simple C*-algebras. Then the appropriate definition of the radius of comparison of C*-algebras was introduced by Andrew Toms in Section 6 of [6]. Significant progress has been made on the radius of comparison of a C*-algebra A and a large subalgebra of A by N. Christopher Phillips. (See [4] and [5].) Also, the radius of comparison of commutative C*-algebras was computed prcisely by Zhuang Niu and George A. Elliott in [3].

The relation between the radius of comparison of a simple unital C*-algebra and the radius of comparison of its crossed product and fixed point algebras under an action of a finite group with the tracial Rokhlin property will be discussed in my talk. The talk is based on a joint work with Nasser Golestani and N. Christopher Phillips. We encourage the reader to go through the references displayed in this abstract, and check [1] for further details.

References:

[1] M. A. Asadi-Vasfi, N. Golestani, and N. C. Phillips, *The Cuntz semigroup and the radius of comparison of the crossed product by a finite group*, arXiv: 1908.06343v1 [math.OA].
[2] J. Cuntz, *Dimension functions on simple C*-algebras*, Math. Ann. **233**(1978), 145–153.
[3]G. A. Elliott and Z. Niu, *On the radius of comparison of a commutative C*-algebra*, Canad. Math. Bull. **56**(2013), 737–744.
[4] N. C. Phillips, *The C*-algebra of a minimal homeomorphism with finite mean dimension has finite radius of comparison*, arXiv: 1605.07976v1 [math.OA].
[5] N. C. Phillips, *Large subalgebras*, arXiv: 1408.5546v2 [math.OA].
[6] A. S. Toms, *Flat dimension growth for C*-algebras*, J. Funct. Anal. **238**(2006), 678–708.

Michal Doucha (Czech Academy of Sciences, Czech Republic)

Property(T), Quantitative Wang's Theorem, and Generic Unitary Representations

Abstract: One of the definitions of property(T) is that a group G has property(T) if every unitary representation of G that weakly contains the trivial representation actually contains it strongly. This automatically generalizes into two different directions: One is a quantitative version of that statement saying that almost invariant vectors are close to invariant vectors. The second is the Wang's theorem which allows us to substitute any finite-dimensional irreducible representation for the trivial representation from the original definition. We unify these two generalizations by proving a quantitative version of the Wang's theorem. We provide several applications of that result. One of them concerns description of "generic unitary representations", i.e. unitary representations whose unitary equivalence class is generic in the sense of Baire category. This is based on joint work with Maciej Malicki and Alain Valette.

Marzieh Forough (Czech Academy of Sciences, Czech Republic)

$\mathcal{Z}$-stability of C*-algebras Associated to Hilbert $C(X)$-correspondences

Abstract: Let X be a compact metric space and $\mathcal{E}$ be a Hilbert C*-correspondence over $C(X)$. Then one can associate to $\mathcal{E}$ a Cuntz-Pimsner C*-algebra. This C*-algebra is simple and unital provided $\mathcal{E}$ is full, non-periodic, and minimal. Right Hilbert $C(X)$-module of continuous sections of a vector bundles over X with twisting the left multiplication with a minimal homeomorphism provides us an example of such correspondences. Cuntz-Pimsner algebra of such C*-correspondence over $C(X)$ can be viewed as a generalization of crossed products of homeomorphisms. Studying orbit breaking subalgebras of such (generalized) crossed products is a powerful tool to understand their properties, such as K-theoretic properties or $\mathcal{Z}$-stability, which are central in the Elliott classification program of C*-algebras.

In this talk, I will discuss how to identify orbit breaking subalgebras in the Cuntz-Pimsner algebra associated to a C*-correspondence as above. Then I will explain the Cuntz-Pimsner algebra is $\mathcal{Z}$-stable when the minimal homeomorphism has mean dimension zero. This is joint work with Adamo, Archey, Georgescu, Jeong, Strung, and Viola.

Naser Golestani (Tarbiat Modares University, Iran)

Group Actions on Tracially $\mathcal{Z}$-absorbing C*-algebras

Abstract: Tracial $\mathcal{Z}$-absorption was defined by Hirshberg and Orovitz in 2013 to be a local version of $\mathcal{Z}$-absorption. The two notions are not equivalent in general, but coincide for simple, unital, separable, nuclear algebras. We give a distinguishing example which is purely infinite. A stably finite example was given by Niu and Wang. We define a suitable notion of tracial $\mathcal{Z}$-absorption for simple nonunital C*-algebras and we prove its permanence properties. We study integer actions and finite group actions with the weak tracial Rokhlin property on these algebras. Then we obtain crossed products which are simple and tracially $\mathcal{Z}$-absorbing. The talk is based on a joint work with M. Amini, S. Jamali, and N. C. Phillips.

Mehrdad Kalantar (University of Houston, USA)

Rigidity Phenomena in Non-Commutative Ergodic Theory

Abstract: We study dynamical and ergodic properties of groups, from the point of view of their associated C* and von Neumann algebras. In particular, we are interested in rigidity phenomena of these algebras. We establish some framework in which this rigidity occur and draw conclusions about representation rigidity and minimal injectivity of von Neumann algebras.

Andrew McKee (Chalmers University of Technology and University of Gothenburg, Sweden)

Approximation Properties for Group Actions via Multipliers

Abstract: Multipliers of a discrete group can be used to characterise approximation properties of the associated reduced group C*-algebra. These techniques have proved influential in the theory of approximation properties of C*-algebras: they have shed new light on some C*-algebra properties and motivated the introduction and study of others. I will begin by introducing multipliers defined on a group, and describe how they can be used to characterise approximation properties of the reduced group C*-algebra. I will then discuss some of the difficulties one encounters in trying to describe approximation properties of the reduced crossed product C*-algebra associated to a group action. To get around these difficulties I will introduce multipliers of group actions, which generalize multipliers of groups, and explain how these allow us to characterise approximation properties of reduced crossed products, as well as give new proofs of existing results on such properties.

Milad Moazami (University of Shiraz, Iran)

Non-commutative Topology and Existence of Projections Axioms in C*-algebras

Abstract: The primitive spectrum of a C*-algebra has been extensively used as a main tool of study in the realm of commutative C*-algebras. As an alternative for this underlying topological space in the non-commutative setting, Akemann proposed the so-called hull-kernel structure for a C*-algebra, in which the role of open sets is taken over by certain projections in the double dual of the algebra. With this new tool, he went quite far and established non-commutative versions of several major results such as the Stone–Weierstrass theorem, Urysohn's lemma, etc. On the other hand, beginning with the pioneering works of von Neumann, Kaplansky and others on type classification, the set of equivalence classes of projections with its order structure has been widely exploited in the structure theory of C*-algebras. As a result, axioms that guarantee the abundance of projections to a certain extent, have become an indispensable part of this area.

In this talk, I will first review some of the more important such axioms and their relationships, and then present characterizations of them in terms of Akemann's "non-commutative topology". Next, by introducing the notion of a σ-compact projection, I will state a new characterization of Rickart C*-algebras as well as go over its proof. A similar characterization for the so-called small projections property and some other new information about this axiom will also be discussed. This is based on a joint work with G. H. Esslamzadeh.

Zahra Naghavi (Tarbiat Modares University, Iran)

Furstenberg Boundary of Minimal Actions

Abstract: Let Γ be a countable discrete group. A Γ-boundary in the sense of Furstenberg is a minimal strongly proximal Γ-space. In 2014, Kalantar and Kennedy proved that the spectrum of Γ-injective envelope of complex numbers $\mathrm{I}_\Gamma(\mathbb{C})$, is identified with the universal Γ-boundary. Generalizing this, we show that the spectrum of $\mathrm{I}_\Gamma(C(X))$ when X is a minimal Γ-space, is the universal minimal strongly proximal extension of X in the sense of Glasner. This helps us to characterize the notion of (Γ, X)-boundary when X is minimal and finite. As an application, we answer a problem of Hadwin and Paulsen in negative and find necessary and sufficient conditions for the corresponding reduced crossed product to be exact.

Hamed Najafi (Ferdowsi University of Mashhad, Iran)

Operator Lipschitz Functions and Unitarily Invariant Norms

Abstract: In this talk, we introduce some relations between the scalar Lipschitz or Hölder functions and operator Lipschitz or operator Hölder functions. Also, we introduce some famous operator Lipschitz type inequalities for normed ideals of compact operators.

Kamran Sharifi (Shahrood University of Technology, Iran)

The Baum–Connes Assembly Map and Atiyah-Jänich Theorem

Abstract: We briefly study the Baum–Connes assembly map and review some conjectures concerning the K-theory of C*-algebras. We also review the K-theory of inverse limit of C*-algebras that arise naturally in the study of coarse Baum–Connes assembly map and noncommutative analogues of classical Lie groups (introduced by N. C. Phillips in 1990). If A is a σ-C*-algebra, we show that the inclusion map from the space of all A-Kasparov cycles to the space of all A-Fredholm operators is a weak homotopy equivalence. Then we use the representable K-theory of σ-C*-algebras and the Milnor $\lim^1$-exact sequence for RK-functor to show that the space of A-Fredholm operators, represents the functor $X \mapsto \mathrm{RK}_0(C(X, A))$ from the category of countably compactly generated spaces to the category of abelian groups. This fact can be regarded as a generalization of Atiyah-Jänich Theorem for σ-C*-algebras. In particular, we show that the Grothendieck group of A-vector bundles over X need not be isomorphic to $[X, \mathcal{F}(H)]$ of homotopy classes of continuous maps from X to the space of Fredholm operators on $H = l^2(A)$. We finally obtain a Milnor $\lim^1$-exact sequence for homotopy groups of A-Fredholm operators.