Master Class on Cuntz-Pimsner Algebras: Applications and generalizations.

Takeshi Katsura

Talk 1: The basic construction of Cuntz-Pimsner algebras and examples.

Talk 2: Ideal structures of Cuntz-Pimsner algebras.

Talk 3: K- and KK-theory of Cuntz-Pimsner algebras and other topics.

Mark Tomforde

Talk 1: Graph C*-algebras within the Cuntz-Pimsner framework.

Talk 2: Graph C^*-algebra constructions that can be generalized to the Cuntz-Pimnser algebras. Classification results for graph C^*-algebras.

Talk 3: Generalizations of graph C^*-algebras that are also Cuntz-Pimsner algebras. Leavitt path algebras.

Nadia Larsen

Talk 1: Introduction to product systems over semigroups of Hilbert C^*-correspondences and their C^*-algebras: Fowler's Toeplitz algebra and Nica-Toeplitz algebra, and Sims and Yeend's Cuntz-Nica-Pimsner algebra.

Talk 2: Basics about coactions of discrete groups and Fell bundles. A co-universal C^*-algebra for gauge-coaction preserving Nica representations for a class of product systems.

Talk 3: Examples, among others Yeend's topological k-graphs.

Sören Möller: Law of large numbers for the free multiplicative convolution

In classical probability the law of large numbers for multiplicative convolution follows directly from the law for additive convolution. In free probability, this direct relationship is missing, so the multiplicative law requires a proof of its own. We provide such a proof by using the S-transform of probability measures on $]0, \infty[$.

David Robertson: C^*-algebras generated by C^*-correspondences and applications to non-commutative geometry.

C^*-correspondences generalize the theory of Hilbert spaces by replacing the field of scalars with an arbitrary C^*-algebra. In the talk I will recall the definition of a C^*-correspondence and show how one can associate a C*-algebra to it as a universal object. I will also state a result showing that this process is functorial and respects pull-backs, and briefly explain how the theory can be applied to the study of certain non-commutative spaces. This is joint work with Dr. Wojciech Szymanski.

Olivier Gabriel: Chern character and Quantum Heisenberg Manifolds

In this talk, we will discuss the following question : is the Chern character an isomorphism in the case of Quantum Heisenberg Manifolds (QHMs) ?

Just like noncommutative tori, QHMs are deformations of homogeneous spaces. These algebras were first defined by Rieffel in 1989. In 2008, Connes and Dubois-Violette used these algebras to study noncommutative 3-spheres. Moreover, these algebras are a 'simple' case of Cuntz-Pimsner algebras.

First, we will define QHM and have a look at the commutative case. We will then study the Chern character in the case of crossed products by $\mathbb{Z}$. We will see that under natural conditions on the "basis"of the crossed product, we can prove that the Chern character is an isomorphism.

We will then see how we can translate this proof to the case of (some) Cuntz-Pimsner algebras and especially of QHMs. We will conclude by some remarks regarding the Chern character of QHMs.

E. Ortega: Algebraic Cuntz-Pimsner rings.

From a system consisting of a ring R, a pair of R-bimodules Q and P and an R-bimodule homomorphism $\psi : P \otimes Q \longrightarrow R$, we construct a $\mathbb{Z}$-graded ring $\mathcal{T}_{(P,Q,\psi)}$ called the *Toeplitz ring* and (for certain systems) a $\mathbb{Z}$-graded quotient $\mathcal{O}_{(P,Q,\psi)}$ of $\mathcal{T}_{(P,Q,\psi)}$ called the *Cuntz-Pimsner ring*. These rings are the algebraic analogs of the Toeplitz C^*-algebra and the Cuntz-Pimsner C^*-algebra associated to a C^*-correspondence (also called a Hilbert bimodule).

This new construction generalizes for example the algebraic crossed product by a single automorphism, fractional skew monoid rings by a single corner automorphism and Leavitt path algebras. We also describe the structure of the graded ideals of our graded rings in terms of pairs of ideals of the coefficient ring and show that our Cuntz-Pimsner rings satisfy the *Graded Uniqueness Theorem*.