# ABSTRACTS

**Mathis Alleysson** (Toulouse)

*A Leftshetz fixed point theorem in K-theory for manifolds with boundary*

We study full ellipticity for equivariant pseudodifferential operator on the Monthubert groupoid associated with manifold with boundary. Let a compact group act on the manifold, we want to reproduce a localization argument of M. Atiyah and G. Segal for the Fredholm index of fully elliptic operator. To achieve this, we introduce the push-forward in K-theory via deformation to the normal cone and embed it in a suitable framework for full ellipticity.

**Alessandro Carotenuto** (Zagreb)

*Noncommutative Geometric Yang–Baxter solutions from bimodule connections*

A well established research path in quantum differential geometry consists in the generalization of classical geometric representation theory to the noncommutative world. In this spirit, Heckenberger and Kolb calculi for irreducible quantum flag manifolds have provided the ground floor for quantum versions of Borel–Weil–Bott theorems and of some of their consequences. However, the category of representation of a quantum group is somehow richer than its classical counterpart, as it showcases a non trivial braided monoidal structure. It is then natural to hope to be able to realize also such additional structures by noncommutative geometric means. In this talk I will review a recent work where we took a first step in this direction, realizing the components of a braiding as generalized flip maps associated to bimodule connections.

**Mouderik Chamoux** (Göttingen)

*Representations of Lie groupoids and their bisections*

I will talk about the question of integration and differentiation of Lie groupoid representations. While the question is well understood for Lie groups it remains open for Lie groupoids. Throughout the talk we will explore the interplay between Lie groupoids and their bisection group to understand what Lie group notions should transfer to the former or the latter setting.

**Enli Chen** (Delft)

*Isomorphism Between Universal and Reduced Yang-Baxter-Deformed Toeplitz Algebras*

We study a class of C*-algebras arising from Yang-Baxter deformations of the classical Toeplitz relations. These relations naturally give rise to two C*-algebras: the universal algebra and the reduced algebra obtained from the Fock representation. We prove that these two algebras are canonically isomorphic, showing that the Fock representation is faithful.

**Pierre Clare** (Nancy)

*C*-algebraic Plancherel theorems*

The noncommutative geometry approach to the representation theory of groups allows to view spaces of representations as the spectra of certain C*-algebras, the study of which can in turn shine a light on the topology and the geometry of these spaces. In these two talks, I will review classical results describing the structure of reduced C*-algebras relevant to the representation theory of real and p-adic reductive groups, before presenting more recent results involving C*-algebras introduced in the context of harmonic analysis on homogeneous spaces, as well as automorphic representation theory.

**Marie Dautheville** (Metz)

*A base point problem in p-adic* $\mathrm{SL}(n)$

Let $F$ be a non-archimedean local field and $G$ a $p$-adic group. Consider the tempered dual of $G$. Each connected component is parametrized by a Levi subgroup $M$ of $G$ and an orbit $\mathcal{O}_\sigma = \{\sigma \otimes \chi,\ \chi \in \mathcal{X}^u_{nr}\}$ in the set discrete series of $M$. There are several ways to compute the geometry of a connected component of the tempered dual. One of them is the Wasserman formula, which was proved for $p$-adic groups by Afgoustidis and Aubert. However, their theorem holds under two assumptions. The one we are interested in concerns the existence of a fixed point in $\mathcal{O}_\sigma$ under the action of the subgroup of the Weyl group that stabilizes $\mathcal{O}_\sigma$. In their paper, Afgoustidis and Aubert prove that this assumption holds for classical groups. But does this also hold for $G = \mathrm{SL}(n, F)$? The answer is no, in general. In this talk, we will construct a family of representations that don't have a fixed point in their orbit and discuss the cases where there is always a fixed point.

**Christelle Gebara** (Montpellier)

*$\mathcal{N}$-Fredholm operators between $\mathcal{N}$-Hilbert spaces*

Fredholm operators between Hilbert spaces are defined as operators invertible modulo compact ones. These operators have an important property, their index is well defined. For example, on compact manifold all elliptic differential operator are Fredholm but in some situation like covering spaces the usual index is not finite. To solve this problem we turn to the notion of Fredholm operator relative to Von Neumann algebra ($\mathcal{N}$-Fredholm). In this talk I will define the notion of $\mathcal{N}$-Fredholm operator between $\mathcal{N}$-Hilbert spaces. Then I will give a sufficient condition for Dirac-type operator to be $\mathcal{N}$-Fredholm on complete manifold.

**Magnus Goffeng** (Lund)

*Poisson transforms and the Baum-Connes conjecture*

We discuss Poisson transforms for semisimple Lie groups, and in particular Knapp-Wallach's Szegö maps from the boundary of a symmetric space to its interior. The study

of Poisson transforms is motivated by Julg's program to prove the Baum-Connes conjecture with coefficients in real rank one and to prove the remaining open conjecture of Julg needed to conclude the Baum-Connes conjecture with coefficients in real rank one. We will discuss a method to produce operators in the Heisenberg calculus, and use that to prove sharp mapping properties for the Szegö maps and compactness of commutators with functions on the Furstenberg boundary. Based on joint work with Heiko Gimperlein.

**Eva-Maria Hekkelman** (Bonn)

*Almost all drums sound awful*

Musical intervals which sound pleasant, consist of frequencies that are rational multiples of each other. In joint work with Malte Leimbach and Oliver Fürst we show that the sound of a generic drum (i.e. the spectrum of the Laplacian on a Riemannian manifold) contains no such harmonies at all. Our theorem has implications for the research programme in NCG on spectral truncations popularised by Connes & Van Suijlekom. Namely, it provides the computation of these truncations for generic manifolds. As a consequence, we see that Gromov–Hausdorff convergence of the state spaces fails for 'almost all' manifolds.

**Arturo Jaime** (Paris)

*Group $C^*$-algebras and $p$-summability*

An important construction in noncommutative geometry is the Connes-Chern character, which relates suitable classes of the $K$-homology of a $C^*$-algebra $A$ to classes in cyclic cohomology, where that suitability is the condition of $p$-summability of the Fredholm module with respect to a dense $*$-subalgebra of $A$. It turns out one can translate the condition of $p$-summability to the Cuntz picture of $K$-homology (pairs of $*$-representations of $A$). This fact, along with techniques from $KK$-theory, can be applied to certain group $C*$-algebras to obtain an obstruction to $p$-summability in $K^0$ arising in the even group cohomology with respect to the dense $*$-subalgebra $\mathbb{C}[G]$. If time permits we will also relate this to the (in)ability to strengthen certain group stability properties. This is based on joint work with Forrest Glebe.

**Paul Le Breton** (Paris)

*Weighted deformations of Lie groupoids*

Since the pioneering work of Connes on longitudinal pseudodifferential calculus along foliations, Lie groupoids appeared as a powerful and unifying tool to study various "singular" differential operators. A key ingredient in this study is a geometrical construction called the "deformation to the normal cone" (DNC) of groupoids. However, when studying some singular operators such as Hörmander's sums of squares, a classical DNC does not allow to capture all the underlying geometry; one has to define "wheighted" deformations. Starting with any Lie groupoid $G$ and any sub-riemannian structure on its Lie algebroid, we define a weighted deformation of $G$, allowing to study new classes of differential operators.

**Lucas Lemoine** (Paris-Est)

*Factorization of the Dirac operator on foliations*

On a foliation induced by a Riemannian submersion, the Dirac operator is the sum of two natural operators, a longitudinal and a transverse one, up to bounded curvature terms. This result gives a geometric viewpoint on the work of A. Connes, M. Hilsum, and G. Skandalis on wrong-way functoriality in bounded KK-theory. In this talk, I will describe how to construct a hypoelliptic transverse operator on a foliation, allowing for a factorization theorem in unbounded KK-theory.

**Thibaut Lescure** (Caen)

*Bruhat decomposition of operator algebras and noncommutative boundaries of buildings*

Let G be a discrete group acting on a building $B$. In 2010, Caprace and Lécureux defined a compactification $X$ of the building. Lécureux then showed that if the action of $G$ on $B$ is proper, then the action of $G$ on $X$ is amenable. I will introduce a Bruhat decomposition of $C^*$-algebras as both a noncommutative analogue of this situation and a generalization of existing notions such as graph products of $C^*$-algebras. One can also construct a noncommutative analogue of the crossed product $C(X) \rtimes G$, called the covariance algebra, whose universality and nuclearity can be established using $C^*$-theory and the combinatorics of Coxeter groups.

**Wannes Malfait** (Bruxelles)

*Totally positive split real semisimple quantum groups of classical type*

In recent joint work with K. De Commer and G. Janssens we construct a locally compact quantum group from the Cartan data of a Lie algebra of classical type, "integrating" the Borel part of the quantized enveloping algebra. The first part of the talk will elaborate on what the previous sentence means and give an overview of the most important parts of the construction. The remainder will focus on how we show "integrability", a key aspect of the construction.

**Kai Mao** (Metz)

*Coarse indice for spaces with proper actions of étale groupoids*

In this talk, we present a framework of Roe algebras and coarse index maps for spaces equipped with proper actions of étale groupoids. Extending the classical group-equivariant case to this setting involves several difficulties, and we discuss techniques for addressing them. We prove that the Baum–Connes assembly map factors through the coarse index map. If time permits, we will also discuss some of the KK-theoretic computations involved. This talk is based on the preprints arXiv:2609.37679 and arXiv:2610.29879.

**Arthur Massar** (Louvain)

*Quantization of nilpotent symplectic Lie groups*

A unitary dual 2-cocycle $\Omega$ on a locally compact group $G$ leads to both a quantization of $G$ as a locally compact quantum group, and deformations of $G$-module algebras. The construction of such dual cocycles is thus of great interest, but it remains quite involved in general. In this presentation we will discuss an explicit construction of a dual unitary 2-cocycles on every nilpotent symplectic Lie group. In doing so we show that for every nilpotent Lie group $G$, there is a bijective between isomorphism classes of Lie—symplectic structures, cohomology classes of I-factorial unitary 2-cocycles, and cohomology classes of I-factorial unitary dual 2-cocycles.

**Ada Master** (Lund)

*Lion taming by logarithm: a new representative of the $\gamma$-element for higher rank groups*

With the success of Julg's programme for proving the Baum–Connes conjecture with coefficients for semisimple Lie groups of real rank one, attention turns to higher rank. Unlike in rank one, where the group acts 'conformally' on its full flag manifold, a sphere, in higher rank it acts 'multi-conformally'. Yuncken produced a representative of Kasparov's $\gamma$-element for $SL(3,\mathbb{C})$, from the Bernstein–Gelfand–Gelfand complex. In this talk, we will 'logarithmically dampen' the BGG-complex to construct a higher order spectral triple representing $\gamma$, for every complex semisimple Lie group. I will also indicate why proving BCC is, nonetheless, still out of reach. Based on joint work with Magnus Goffeng.

**Edward McDonald** (Paris-Est)

*The easiest proof of Weyl's law*

Weyl's law counts the asymptotic density of eigenvalues of an elliptic operator on a closed manifold, and this century-old result probably has dozens of distinct proofs. I will explain a very easy and conceptual proof using double operator integrals and some basic ideas from noncommutative geometry. Based on joint work with Eva-Maria Hekkelman.

**Leandre Portela** (Marseille)

*Geometric and Algebraic Perspectives on Gauge Theories*

How much of a gauge theory is encoded in its underlying geometry? Ordinary gauge theories describe fields using bundles over spacetime, while noncommutative geometry opens the door to algebraic descriptions in which fields and interactions acquire a geometric interpretation. In particular, derivation-based noncommutative geometry (Dubois-Violette, Kerner, Madore, 1990; Masson, Nieuviarts, 2021), spectral approaches (Connes, Lott, 1989; Chamseddine, Connes, Marcolli, 2007), and transitive Lie algebroids (Lazzarini, Masson, 2012; Fournel, Lazzarini, Masson, 2013) offer different perspectives on this question, allowing structures of Yang–Mills–Higgs type to emerge from the underlying geometric and algebraic data. Through concrete examples, we will explore how these

frameworks relate geometry, fields, and interactions, with an emphasis on the mathematical choices behind their construction.

**Florian Thiry** (Toulouse)

*A filtered approach to Fully Ellipticity*

We will begin by giving a general framework (using groupoids) to Ellipticity and to its relative side: Fully Ellipticity. We will express the obstruction to perturb an Elliptic operator into a Fully Elliptic one. Finally we will decompose this obstruction in the case of a relative framework obtained using a filtration. During the whole talk we will look at several concrete examples, mainly about the (families of) manifolds with boundary or corners.