The Nest Celebration

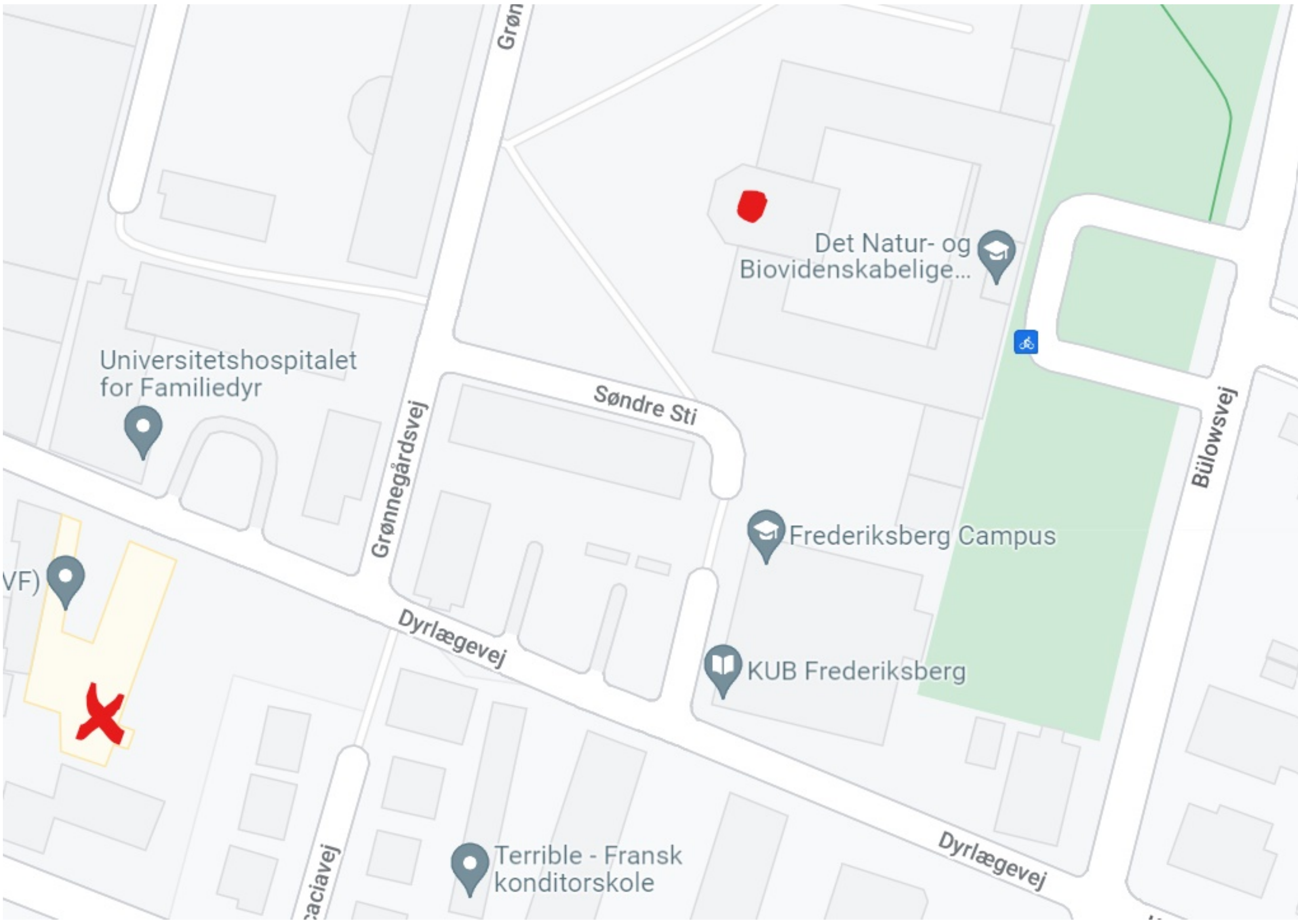
June 13 – 16 2022

Programme

	Monday 13	Tuesday 14	Wednesday 15	Thursday 16
9:00-9:30	Registration			
9:30-10:30	Echterhoff	Gorokhovsky	Skandalis	Meyer
10:30-11:00	Coffee	Coffee	Coffee	Coffee
11:00-12:00	Goffeng	Landi	Li	Miranda
12:00-13:30	Lunch	Lunch	Lunch	Lunch
13:30-14:30	Radulescu	Yamashita	Gayral	
14:30-15:00	Coffee	Coffee	Coffee	
15:00-16:00	Bahns	Bunke	Voigt	
16:15	Reception		Nest	

Venue

All talks will take place in *'Festauditoriet'* (marked with a dot) at the Frederiksberg Campus, Bülowsvej 17. Lunch can be bought at the nearby canteen *'Gimle'* (marked with a cross) situated at Dyrlægevej 7.



Internet

Participants with an eduroam account should be able to use the eduroam network without any additional login requirements. Otherwise, access the network "KU guest" and follow these instructions:

- Log on to the wireless network "KU Guest".
- Open a browser and try to browse a website.
- Follow the on-screen instructions.
- You should receive an email and a text message with the password. The account will work for 24 hours.

Talks

The Sine Gordon Model in hyperbolic signature

Dorothea Bahns

The Sine Gordon model is classic in QFT and for almost 50 years, it has been one of the corner stones in constructive Euclidean QFT. I will report on recent results on the quantized Sine Gordon model in hyperbolic signature, the construction of a Haag-Kastler net of von Neumann algebras and the so called adiabatic limit. I will touch upon the question how this model in the adiabatic limit opens a way to study the Wick rotation, Osterwalder Schrader positivity and the relation between Euclidean and hyperbolic QFT from a very concrete point of view

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A homotopy theoretic approach to KK-theory

Ulrich Bunke

I will explain several homotopy-theoretic constructions of a stable infty-category representing KK-theory. I will in particular analyze how close one can get to a nice formula for the mapping spaces in this category by only using very simple features of the category of C^*-algebras. Consequences of the approach are effordless constructions of E_∞-ring structures on K-theory spectra for commutative or strongly self-absorbing algebras, an abstract understanding of UCT, and a version of Swan's theorem.

Proper actions, fixed-point algebras, and deformation via coactions

Siegfried Echterhoff

The notion of proper actions of groups on spaces has various generalizations for group actions of noncommutative C^*-algebras A, which all allow the construction of generalized fixed-point algebras A^G which are Morita equivalent to ideals in the reduced crossed products $A \rtimes_r G$. The weakest version was introduced by Rieffel in 1990 and it played an important role in his theory of deformations via actions of $\mathbb{R}^d$. In this talk we report on some joint work with Alcides Buss on a version of proper actions which allows the construction of maximal (or exotic) generalized fixed-point algebras which are Morita equivalent to ideals in the maximal (resp. exotic) crossed products. We will report on several applications including Landstad duality for coactions and deformation of C*-algebras via coactions in the sense of Kasprzak and Bowmick, Neshveyev, and Sangha.

Quantum seaweeds

Victor Gayral

Seaweeds (aka biparabolic subalgebras of $\mathrm{sl}_n(\mathbb{C})$ form a class of Lie algebras which can be described by purely combinatorial objects (meander graphs). This combinatorial description allows in particular to characterize very easily seaweeds which are also Frobenius Lie algebras (ie which admit an open coadjoint orbit). In this talk, I will explain how to construct a class of locally compact quantum groups (in the von Neumann algebra setting) deforming Lie groups whose Lie algebras are Frobenius seaweeds. All this relies on the construction of an explicit dual unitary 2-cocycle (aka non-formal Drinfeld twist) itself based on the construction of a quantization map of the Kohn-Nirenberg type. The talk will be based on a joint work in progress with P. Bieliavsky, S. Neshveyev and L. Tuset.

The index of hypoelliptic operators on (regular) Carnot manifolds

Magnus Goffeng

We will discuss the index theory of hypoelliptic operators on Carnot manifolds – manifolds whose Lie algebra of vector fields is equipped with a filtering induced from a filtration of sub-bundles of the tangent bundle. Under the additional assumption that the Carnot manifold is regular, i.e. has isomorphic osculating Lie algebras in all fibres, and admits a flat coadjoint orbit, we provide a solution to the index problem for Heisenberg elliptic pseudodifferential operators in terms of geometric K-homology. This result extends work of Baum and van Erp on contact manifold. Up to a technical issue of constructing a global Hilbert space bundle of representations associated to the flat coadjoint orbits via Kirillov's orbit method, the problem is reduced to computations in the K-theory of twisted groupoid C*-algebras. Examples of index theorems that follow from this solution cover Toeplitz operators and operators of the form $\Delta_H + \gamma T$ on regular polycontact manifolds. Joint work with Alexey Kuzmin.

Heisenberg calculus and cyclic cohomology

Alexander Gorokhovsky

On a compact contact manifold, a pseudodifferential operator in the Heisenberg calculus with an invertible symbol is a Fredholm operator. In this talk I will discuss solution of the problem of finding a local formula for the index of such an operator as an expression in terms of the principal symbol of the operator and geometric data. This is a joint work with E. van Erp.

Hopf algebroids braided algebras and noncommutative gauge transformations

Giovanni Landi

We study bialgebroids of noncommutative principal bundle as a quantization of the gauge groupoid of a classical principal bundle. The gauge group of the noncommutative bundle is isomorphic to the group of bisections of the bialgebroid, and we give a crossed module structure for the bisections and the automorphisms of the bialgebroid. Examples include: Galois objects of Taft algebras (an incarnation of Jackson derivatives), monopole bundles over quantum spheres and quantum projective spaces and bundles over θ manifolds. For all of tese there is in fact an explicit antipode for the bialgebroid making it a Hopf algebroid. We weaken the constructions by allowing for braided Lie algebras of infinitesimal gauge transformations.

Kirillov's orbit method to the Baum-Connes conjecture for algebraic groups

Kang Li

The orbit method for the Baum-Connes conjecture was first developed by Chabert and Echterhoff in the study of permanence properties for the Baum-Connes conjecture. Together with Nest they were able to apply the orbit method to verify the conjecture for almost connected groups and p-adic groups.

In this talk, we will discuss how to prove the Baum-Connes conjecture for linear algebraic groups over local fields of positive characteristic along the same idea. It turns out that the unitary representation theory of unipotent groups plays an essential role in the proof. As an example, we will concentrate on the Jacobi group, which is the semi-direct product of the symplectic group with the Heisenberg group. It is well-known that the Jacobi group has Kazhdans property (T), which is an obstacle to prove the Baum-Connes conjecture. If time permits, we will also discuss my recent joint work with Maarten Solleveld about quasi-reductive groups.

Homological algebra in triangulated categories

Ralf Meyer

I will survey my work with several coauthors on homological algebra in triangulated categories, especially in equivariant Kasaparov categories. This started with my work with Ryszard on the Baum-Connes conjecture, and become even more relevant in the classification of purely infinite C*-algebras that fail to be simple. The rough idea is that a triangulated category such as an equivariant Kasparov category together with a homological functor such as a combination of K-theory functors usually generates the whole setup of homological algebra, with projective resolutions, derived functors, and spectral sequences. When projective resolutions are short enough, then the theory also produces an invariant that classifies objects up to isomorphism.

To b or not to b, that is the question

Eva Miranda

Nest and Tsygan investigated deformation quantization of symplectic manifolds with boundary via b-calculus. b-Structures and other generalizations (such as E-symplectic structures) are ubiquitous and sometimes hidden, unexpectedly, in a number of problems including the space of pseudo-Riemannian geodesics and regularization transformations of the three-body problem. E-symplectic manifolds include symplectic manifolds with boundary, corners and regular symplectic foliations. But how general can such structures be?In this talk, I will explain how to associate an E-symplectic structure to a Poisson structure with transverse structure of semisimple type. This should enable us to address a number of open questions in Poisson Geometry and Hamiltonian Dynamics from a brand-new perspective.
This is joint work (in progress) with Ryszard Nest.

Dimension formulae of Gelfand-Graev, Jones and their relation to automorphic forms and temperdness of quasiregular representations

Florin Radulescu

Vaughan Jones introduced a formula computing the von Neumann dimension for the restriction to a lattice of the left regular representation of a semisimple Lie group. It is a variant of a formula by Atiah Schmidt computing the formal dimension in the Haris Chandra trace formula for discrete series. It is surprisingly similar (in the case of $PSL(2,\mathbb{Z})$) to the dimension of the space of automorphic forms and is similar to a formula proved by Gelfand, Graev. We use an extension of this formula to provide a method for computing the formal trace of representations of $PSL(2,\mathbb{Q}_p)$ (or more general situations), when analyzing the quasi regular representation on $PSL(2,\mathbb{R})/PSL(2,\mathbb{Z})$. It provides a method to obtain estimates for eigenvalues of Hecke operator

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The Godbillon-Vey invariant in KK-theory with real coefficients

Georges Skandalis

Using our definition of KK-theory with real coefficients, we construct a natural $KK_{\mathbb{R}}$ class representing the Godbillon-Vey invariant of a foliation of codimension 1.
- We will start by recalling the Godbillon-Vey invariant and the construction of KK-theory with real coefficients
- The Godbillon-Vey invariant deals with a (densely defined) infinite trace, and we will explain how such a trace gives indeed a $KK_{\mathbb{R}}$-element.
- Connes showed that this trace is indeed the Godbillon-Vey invariant, by using his index theorem for measured foliations. We will give an explicit proof of the fact that the longitudinal index theorem for foliations indeed implies Connes' theorem - by means of cyclic cohomology.

Complex quantum groups, deformations, and the Meyer-Nest formalism

Christian Voigt

The Meyer-Nest approach to the Baum-Connes conjecture is a versatile categorical framework which allows one to approach a range of questions in operator K-theory in a unified manner. In this talk I will illustrate this with the example of complex semisimple quantum groups, where a naïve translation of the classical construction of topological K-theory does not give the correct result. Starting from general categorical considerations, I will present a proof of a quantum version of the Connes-Kasparov conjecture in this case, which subsumes the Connes-Kasparov isomorphism for classical complex semisimple groups.

Homology and K-theory of dynamical systems (beyond totally disconnected case)

Makoto Yamashita

Étale groupoids give convenient framework to formulate and understand various concepts in dynamical systems. Previously we compared integral homology of torsion free ample groupoids to the operator K-theory of associated C*-algebra. In this work we remove the total disconnectedness from the groupoid, and treat proper maps from totally disconnected spaces as a kind of resolution. The connection between homology algebra and C*-algebraic K-theory is given by a combination of Segal's approach to classifying spaces and Meyer-Nest theory for KK-categories. For the groupoids coming from Smale spaces, we also prove that the groupoid homology is isomorphic to Putnam's homology defined in terms of factor maps from shifts of finite type. Based on joint work with V. Proietti.
