THE

CONFERENCE 2017

INFORMATION

AND

ABSTRACTS

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Practical information

Welcome

We are happy to welcome you to the Young Mathematicians in C^*-Algebras conference 2017. Since you have already gotten hold of this booklet, you probably already found the location of the conference. Nonetheless, we have included some information about where the different events take place.

Locations

University of Copenhagen has buildings all around Copenhagen city, but Faculty of Science is mainly concentrated around Universitetsparken (English: the university park). A large part, including the Department of Mathematics, is in the building called the H.C. Ørsted Institute (named after the Danish physicist called Hans Christian Ørsted), and this is where all parts of the conference, except lunch and excursions, will take place. With high probability, this is the building you are in now.

Most of the conference will take place in the HCØ building either in auditorium 2 or in the southern end of the main hall (this is probably where you received this folder, since this was where registration took place). To be more precise, the different events will take place at the following locations:

- **Mini-courses** takes place in **auditorium 2**.
- **Participant talks** takes place in **auditorium 2**.
- **Breaks** takes place in the **southern end** of the main hall.
- **Lunch** takes place in the canteen of the **Biocenter**.
- **Reception** takes place in the **HCØ canteen** of the main hall.
- **Conference dinner** takes place in the **HCØ canteen** of the main hall.

To find these places you can use the map on page 9.

Internet

If you have **eduroam** then you should just be able to log-on using your usual settings. If you do not have eduroam or cannot get it to work, then you should log-on to the network called **KU Guest** with the following login information:

Username: The email address you registered with
Password: 827556

Who are the organisers?

Here is the list of organisers:

- Matias L. Andersen
- Sara E. Arklint
- Kevin A. Brix
- Chris Cave
- Martin S. Christensen
- Olivier Gabriel
- Valerio Proietti
- Eduardo P. Scarparo

If you have any question or need any help, it is easy to find the organisers. They all wear light blue badges that say "YMC*A organiser", so they should not be that hard to identify. They can also be reached using the e-mail address:

`ymca2017conference@googlegroups.com`

Lunch

We do not provide lunch, and people are free to go wherever they choose to eat lunch. But for your convenience, we have booked tables at the canteen in the Biocenter building. Most people will probably go there, so you can just follow the crowd.

Reception

There will be a reception featuring pizza, beer and soft drinks on Monday. The reception starts at 18:00 in the HCØ canteen.

Dinner

There will be a conference dinner Wednesday. The dinner will start at 18:30 in the HCØ canteen where Indian food and beverages will be served.

Excursions

On Wednesday, we have several different excursions arranged. **It is important that you remember** to bring some cash for the excursion (see the descriptions for more info). We are going there by public transport, so if you do not have a FlexCard (as mentioned under Public transport) you will need cash.

- **Bouldering:** Bouldering is a form of climbing, on not-too-high walls, typically 3-4 meters. This also means that no safety harness is required, instead large mattresses are laid out to break your fall. Therefore, all you need is a pair climbing shoes (which you can borrow, free of charge) and you're ready to go! The climbing takes place at Nørrebrohallen, which is within walking distance of HCØ.
  - You should bring **50 DKK in cash** for the entrance.
- **Islands Brygge harbour:** Islands Brygges harbour offers the opportunity for open air swimming right in the centre of the city. The quality of the water is checked daily and has to b approved by the authorities before swimmers are let in. There are five pools in all, two of which are specifically for children. The diving towers are one, three, and five metres high respectively.
  - You should bring **48 DKK in cash**, or your FlexCard, for the public transport.
- **Dyrehavsbakken:** Bakken is the worlds oldest amusement park - or at least they claim to be. Located ten minutes outside Copenhagen, tucked away in the beautiful woods of Dyrehaven, Bakken offers a nostalgic historic ambiance and an array of amusements and thrill rides. Entrance is free, but the amusements are not, so bring extra cash if you want to use these. Prices depend on the amusement, but range from 20 to 45 DKK. Being located outside Copenhagen, transportation is also more expensive than the other excursions.

- Bring 96 DKK for public transport, or 48 DKK if you have a FlexCard.
- The entrance is free, but bring extra cash if you want to enjoy the amusements.

- **Glyptoteket:** Glyptoteket's exhibitions present both artworks and cultural-historical objects. The museum is located in beautiful buildings, the oldest of which was inaugurated in 1897, with additional buildings inaugurated in 1906 and 1996. For information on their current exhibitions, visit their website:

  `http://www.glyptoteket.dk/?lang=en`.

  - You should bring **48 DKK in cash**, or your FlexCard, for the public transport.

- **Copenhagen Zoo:** Copenhagen Zoo is a zoological garden, as you'd find in most major cities around the world. The unique features of Copenhagen Zoo includes a relatively new elephant house designed by Norman Foster. The house is considered one of the best elephant facilities in the world. Here the animals can be seen at close quarters, for example, when they bathe in a water tomb, which is deep enough for the elephants to dive under so their entire bodies are covered. Also, in 2013 Copenhagen Zoo opened The Arctic Ring, which gives you a unique opportunity to get close to polar bears, North Atlantic birds and seals both above and below the water surface.

  - You should bring **180 DKK in cash** for the entrance fee.
  - You should bring **48 DKK in cash**, or your FlexCard, for the public transport.

- **Medical Museion:** The Medical Museion, is located in the former Royal Academy of Surgeons from 1787 and presents a variety of topics from the history of medicine: epidemics, x-ray, surgery, psychiatry etc. The Medical Museion's exhibitions focus on you and your body: How were patients treated before antibiotics and anaesthesia were introduced, how was the body perceived in earlier times? Hear about physicians, barber surgeons, charlatans and more...

- You should bring **75 DKK in cash** for the entrance fee.
- You should bring **48 DKK in cash**, or your FlexCard for the public transport.

On Monday, there will be a list on which you should sign up for one of the excursions if there is one you would like to attend. The list will be available all of Monday.

Before the first lecture Tuesday, we will provide some practical details about the excursions, and we will point out who is in charge of the different excursions, so that you know who to follow. Please note that some excursions might be cancelled if there are not enough participants or if the weather is too bad.

Places to eat in CPH

Here is a list with some suggestions on where to eat in Copenhagen.

- **Spiseloppen:** Located in Christiania, this is a nice place to eat if you are in the neighbourhood. The restaurant is located at:

  Bådsmandsstræde 43, 1407 København K

- **Grød:** Grød, which means porridge, is a restaurant that specializes in porridge. Indeed, this is the only thing they serve, but this is not a bad thing. A bowl of porridge is about 70 DKK. Grød has 3 different restaurants located at:

  Jægersborggade 50, kld. tv, 2200 København N

  Hal 2, Stade 8A, Linnésgade 17, 1362 København K

  Falkoner alle 34, 2000 Frederiksberg C

- **Aroii:** The take-away part of the Michelin restaurant Kiin Kiin, which serves Thai food. Aroii has 3 different restaurants located at:

  Guldbergsgade 21, 2200 København

  Hausergade 38, 1128 København K

  Thorvaldsensvej 2, 1871 Frederiksberg C

- **Kate's Joint:** The menu changes regularly, but consists mainly of various Asian and African dishes. The restaurant is located at:

Blågårdsgade 12, 2200 København N

- **The Bronx Burger Bar:** As the name suggest this is a burger bar, but the high end kind. A burger with fries is about 100 DKK. Bronx has 3 different restaurants located at:

  Nørrebrogade 114, 2200 København N

  Godthåbsvej 30, 2000 Frederiksberg

  Vandkunsten 1, 1467 København K

- **Halifax:** This is a burger joint in the same category as Bronx, but maybe slightly more expensive. A burger with fries is about 130 DKK. Halifax has several restaurants, some of which are located at:

  Trianglen 1, 2100 København Ø

  Frederiksborggade 35, 1360 København K

  Larsbjørnsstræde 9, 1454 København K

  Vesterbrogade 72, 1620 København V

  Falkoner Plads, 2000 Frederiksberg

- **LêLê Street Kitchen:** If you feel like having some Vietnamese food, then LêLê Street kitchen is a good option. A large dish will cost you about 100 DKK, but they also serve smaller ones for about 50 DKK. There are 3 different street kitchens, located at:

  Vesterbrogade 56, 1620 København V

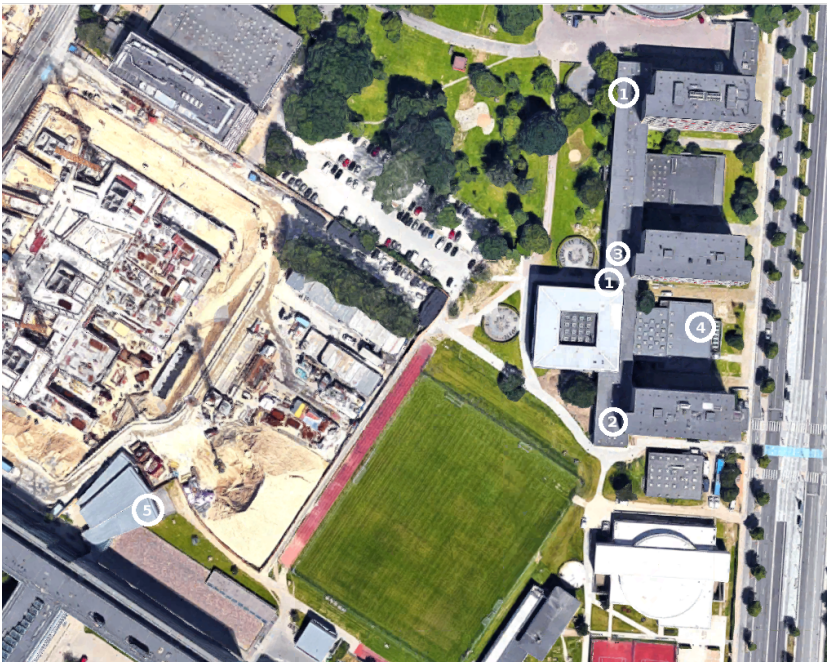
  Østerbrogade 56, 2100 København Ø

  H.C. Andersens Boulevard 8, 1553 København V

- **Copenhagen Street Food:** Located in Warehouse 7 & 8 Papirøen (english: The Paper Island), is a collection of small food trucks serving a variety of different kinds of foods. Each food truck serves at least one meal that costs 50–75 DKK. The address is:

  Trangravsvej 14, 1436 Copenhagen K

Map of the campus



(1) Entrances to the HCØ building.
(2) Southern end of the main hall.
(3) The HCØ canteen.
(4) Auditorium 2.
(5) Entrance to the Biocenter.

Public transportation

You can get around Copenhagen by bus, train, metro, bike, and of course by foot. We recommend using the website **www.rejseplanen.dk**, the corresponding app **Rejseplanen**, **CityMapper** or **Google Maps** to find the best routes. Note that Rejseplanen will always include some kind of public transportation, so it is not very well suited for short trips which may simply be taken by foot.

Buying tickets for public transportation in Copenhagen used to be very simple for tourists and others visiting, but with the recent phasing out of so-called "klippekort" (10-trip tickets), things have gotten a lot more complicated. There are several ticket options for the public transport, and which one is best suited for you depends on how much you plan to use the public transportation. The options are:

- **You can buy a single tickets each trip.** This option is probably best if you do not plan to use public transport much, since a ticket for getting around the inner city will cost 24 DKK, and last around 1 hour, which is a bit expensive in the long run. If this is the option you use, then you should note that you need to pay with cash in the buses (no large notes), and that you can only use coins and credit cards in the automates in the train stations.
- **You can buy a "FlexCard 7-days."** This option will enable you to use any public transportation in Zone 1 and Zone 2 for 7 days. Such a FlexCard will cost 260 DKK.[1]
- **You can buy a "Rejsekort."** A Rejsekort (English: travelcard) is a plastic card that can be used for almost all kinds of travel in Denmark. One simply has to check in at the starting point and for every change of transportation during the journey, and check out at the end. This

[1] Remember that with this option you will have to buy an "tillægsbillet" (english: add-on ticket) to reach the airport, since it is in Zone 3.

is done by holding the card near to a “check in” or “check out” stand, respectively, which are both easily recognized by the blue light.

You can purchase an anonymous Rejsekort for 80 DKK at various train stations, but you also have to put some money on the card to travel for. A single journey inside Zones 1 and 2 will cost either 12 DKK or 15 DKK, depending on the time of day, and going from the airport to the city will be 20 DKK. However, you cannot check in unless you have at least 70 DKK on your card. This means that a Rejsekort is really only suited for those who plan to visit Denmark frequently and/or for an extended period of time.

Mini-courses

The conference features two mini-courses. One will be given by Kate Juschenko from Nortwestern University and the other by Guoliang Yu from Texas A&M. Each mini-course consists of 4 lectures of 1 hour.

Kate Juschenko

Amenability of discrete groups

The subject of amenability essentially begins in 1900's with Lebesgue. He asked whether the properties of his integral are really fundamental and follow from more familiar integral axioms. This led to the study of positive, finitely additive and translation invariant measure on reals as well as on other spaces. In particular the study of isometry-invariant measure led to the Banach-Tarski decomposition theorem in 1924. The class of amenable groups was introduced by von Neumann in 1929, who explained why the paradox appeared only in dimensions greater or equal to three, and does not happen when we would like to decompose the two-dimensional ball. In 1940's, M. Day formally defined a class of elementary amenable groups as the largest class of groups amenability of which was known to von Neumann. He asked whether there are other groups than that. Currently there are many groups that answer von Neumann-Day's question. However, in each particular case it is algebraically difficult to show that the group is not elementary amenable, and analytically difficult to show that it is amenable. The talk is aimed to discuss recent developments and approaches in the field. In particular, it will be shown how to prove amenability of all known non-elementary amenable groups using only one single approach. We will also discuss techniques coming from random walks of groups.

Guoliang Yu

Secondary invariants of elliptic operators

In my mini-course, I will introduce the concept of secondary invariants of elliptic operators and discuss their applications to geometry and topology. The secondary invariants are defined when the elliptic operators are invertible and therefore their primary index theoretic invariants vanish. The secondary invariants live in the K-theory of certain C* algebras and serve as obstructions for the inverses of the elliptic operators to be local.

I will apply the secondary invariants to measure the degree of non-rigidity of topological manifolds and the size of moduli spaces of positive scalar curvature metrics.

Abstracts

Here you find the abstracts for the participant talks given at the conference. The abstracts are listed in the order of the schedule.

Yuki Matsuoka

On the noncommutative boundary of Hecke triangle surfaces

Let Γ be a finite index subgroup of the modular group $PSL_2(\mathbb{Z})$, and let $\mathbb{H}$ the Poincare upper half-plane.

The quotient $\Gamma \setminus \mathbb{H}$ is called modular curve and it has been studied for a long time. On the other hand, its "boundary" $\Gamma \setminus \mathbb{P}^1(\mathbb{R})$ is no longer Hausdorff and is a typical example of a noncommutative space.

The relationship between the "bulk space" $\Gamma \setminus \mathbb{H}$ and the "boundary" $\Gamma \setminus \mathbb{P}^1(\mathbb{R})$ was discovered by Y.Manin and M.Marcolli. They also studied the quotient of the boundary $\partial\mathcal{T}$ of the tree $\mathcal{T}$ associated to the modular group and relate its K-theory to the theory of modular pseudo-measures.

We generalize their result to the case of the Hecke triangle groups G_q and further investigate this bulk-bondary correspondence.

Francesca Arici

Gysin sequences for quantum lens spaces

Gysin sequences in K-theory are six term exact sequences associated to any sphere bundle. In this talk I will concentrate on the case of Gysin sequences for circle bundles, and described how Pimsner's construction allows to obtain the same exact sequences for a class of algebras that can be thought of as noncommutative circle bundles. I will conclude by describing how this allows one to compute the K-theory groups of quantum lens spaces. This is based on joint work with S. Brain, J. Kaad, G. Landi.

Kamran Sharifi

Atiyah-Jänich theorem for inverse limits of C*-algebras

Countable inverse limits of C*-algebras (or what are now known as σ-C*-algebras) arise naturally in the study of coarse Baum–Connes assembly map and noncommutative analogues of classical Lie groups. K-theory of such algebras has been investigated by N. C. Phillips. We use his representable K-theory and the Milnor $\lim^1$-exact sequence for RK-functor to show that the space of Fredholm modular operators with coefficients in an arbitrary unital σ-C*-algebra A, 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. In particular, this shows that the Grothendieck group of A-vector bundles over X need not be isomorphic to $[X, \mathscr{F}(H)]$ of homotopy classes of continuous maps from X to the space of Fredholm operators on $H = l^2(A)$. This talk is based on the paper DOI: 10.1007/s10485-016-9474-7 of Sharifi.

Maria Ramirez-Solano

On the K-theory of C^*-algebras for substitutional tilings

Under suitable conditions, a substitution tiling gives rise to a Smale space, from which three equivalence relations can be constructed, namely the stable, unstable, and asymptotic equivalence relations. In this talk, I will give a construction of a cochain complex of abelian groups, and a cochain map between this cochain complex and itself. From its cohomology groups (resp. homology groups) we can compute the K-theory for the C^*-algebra of the stable (resp. unstable) equivalence relation for tilings of the line and of the plane. Moreover, we provide formulas to compute the K-theory for the C^*-algebras of these 3 equivalence relations. This is joint work with D. Gonçalves.

Luke Hamblin

Tilings and their C^*-algebras

A tiling is a decomposition of Euclidean space into pieces that fit together without gaps or overlaps. The most basic examples consist of periodic structures such as a tiling by unit cubes, which can be used to model the structure of a crystal of table salt. More interesting examples can be obtained by

requiring that our tiles are unable to tessellate the space in a periodic manner. Physical realizations of these aperiodic tilings are called *quasicrystals* and were first observed in man-made material in 1984, with the first naturally occurring specimen discovered in 2009. In this talk I will provide an introduction to tiling theory and explain how to associate a C^*-algebra to a tiling.

Jorge Castillejos

Constructing order zero maps

Completely positive maps that preserve orthogonality are known as order zero. These maps were introduced by Winter in his seminal work on non commutative covering dimension and have been an important tool in the spectacular progress obtained in the classification of C^*-algebras.

In this talk, I will explain some useful techniques (involving the Cuntz semigroup and Ozawa's W^*-bundles) that can be applied in order to construct order zero maps with a prescribed tracial data.

Marzieh Forough

Tracial Rokhlin property for finite groups actions on simple non-unital C*-algebras

N. C. Phillips defined the tracial Rokhlin property for finite group actions on simple unital C*-algebras. In particular, he proved that the crossed product $A \rtimes_\alpha G$ is simple until tracial rank zero provided that α is an action of a finite group G with the tracial Rokhlin property on a simple until tracial rank zero C*-algebra A.

In a joint work with N. Golestani, we define and study the tracial Rokhlin property for finite group actions on simple C*-algebras which are not necessarily unital. We also give a definition for simple (not necessarily) until tracial rank zero C*-algebras. Our notion generalizes the Lin's definition of the unital case. In this talk, I will discuss finite group actions with the tracial Rokhlin property on simple C*-algebras. In particular, I will show that if α is an action of a finite group G with the tracial Rokhlin property on a simple tracial rank zero C*-algebra A, then $A \rtimes_\alpha G$ is a simple tracial rank zero C*-algebra. Finally, I will address some problems concerning simple tracial

rank zero C*-algebras and finite group actions with the weak tracial Rokhlin property.

Jamie Gabe

Approximate Murray-von Neumann equivalence of $*$-homomorphisms

When comparing projections in an operator algebra, there are two usual notions: unitary equivalence and Murray-von Neumann equivalence. Arguably, the latter is the "correct" relation to consider. When comparing $*$-homomorphisms between two C^*-algebras, a well-established notion is that of approximate unitary equivalence. However, this equivalence relation often turns out to be a bit too strong, in the same sense as unitary equivalence of projections is a bit too strong. To make up for this, I have introduced a slight weakening, called approximate Murray-von Neumann equivalence. I will explain this concept, and how it relates to a $2x2$-matrix trick of Connes.

Anna Krogager

A class of II_1 factors with exactly two group measure space decompositions

The group measure space construction of Murray and von Neumann associates to every free ergodic probability measure preserving group action $\Gamma \curvearrowright (X,\mu)$ a crossed product II_1 factor $L^\infty(X) \rtimes \Gamma$. It is a natural question to ask in how many ways a given II_1 factor decomposes as such a crossed product. In this talk, I will present joint work with Stefaan Vaes in which we construct the first II_1 factors having exactly two group measure space decompositions up to unitary conjugacy. Also, for every positive integer n, we construct a II_1 factor M that has exactly n group measure space decompositions up to conjugacy by an automorphism.

Tobe Deprez

Rigidity for von Neumann algebras given by locally compact groups

In recent years, Popa's deformation/rigidity theory has lead to a wealth of classification and rigidity results for von Neumann algebras given by countable groups and their actions on measure spaces. In this talk, I will present the first rigidity and classification results for von Neumann algebras given by locally compact groups and their actions. We establish that the crossed product von Neumann algebra $L^\infty(X,\mu) \rtimes G$ has a unique Cartan subalgebra, when $G \curvearrowright (X,\mu)$ is free and probability measure preserving and G is a connected simple Lie group, or a group acting on a tree. From this, we deduce a W^* strong rigidity result for irreducible actions of products of such groups. I will also show that the group von Neumann algebra of such groups are strongly solid. More generally, our results hold for locally compact groups that are non-amenable, weakly amenable and belong to Ozawa's class $\mathcal{S}$. This is joint work with Arnaud Brothier and Stefaan Vaes.

Samuel Evington

Continuous Families of Subfactors

Vaughan Jones' discovery of the rich combinatorial structure arising from a pair of II_1 factors $N \subset M$ earned him a Fields Medal in 1990 and founded a new branch of operator algebras: subfactor theory.

Subsequently, a variety of methods for constructing subfactors were developed and investigated. Often, such constructions produce not just one subfactor but a whole parametrised family of subfactors. My research examines the continuity of these families. The main tool is Ozawa's theory of W*-bundles, hybrid C*/W*-objects originally developed with the classification of C*-algebras in mind.

The talk will begin with an overview of the relevant subfactor theory. I will then outline my research.

Yusuke Sawada

On the equivalence of the left and right relative tensor products

When a von Neumann algebra acts on a Hilbert space, the relative tensor product of such Hilbert spaces is defined. There are two ways which we define it by changing left or right Hilbert space into the operator space. We call them the left and right relative tensor products respectively. We will show that the two categories consisting of all bimodules (i.e. Hilbert spaces on which von Neumann algebras act from left and right) with left and right relative tensor products are equivalent. This is a joint work with Shigeru Yamagami.

Maria Gerasimova

Unitarisability of discrete groups

A discrete group G is called *unitarisable* if for every Hilbert space H and every uniformly bounded representation $\pi : G \to B(H)$ (that is $\|\pi(g)\| < C$ for every $g \in G$ and some constant C) there exists an invertible operator $S \in B(H)$ such that for every $g \in G$ the operator $S\pi(g)S^{-1}$ is unitary. It is well known that amenable groups are unitarisable. The following question is still open:
Dixmier problem: Are unitarisable groups amenable?
The significant progress was obtained by Pisier who showed that if one incorporates in Dixmier's question the fact that the similarity S can be found with $\|S\|\|S^{-1}\| \leq \|\pi\|^{\alpha}$ for some $\alpha < 3$, then the answer is affirmative. This α is called a *similarity degree* $d(G)$. It was also shown that unitarisability with $d(G) = N$ can be characterized by the existence of the complete surjection W_N:

$$W_N : \ell^1(G) \otimes_h \ldots \otimes_h \ell^1(G) \to C^*(G).$$

The proof of this fact is quite complicated and based on the theory of operator spaces. We will discuss existence of this surjection and explain in several ways why $d(G) = 1$ implies that G is finite. We will also give a new proof of the fact that amenability implies existence of the complete surjection $W_2 : \ell^1(G) \otimes_h \ell^1(G) \to C^*(G)$ using only classical definition of amenability.

Thiebout Delabie

The construction of non exact C^*-algebras.

A C^*-algebra A is said to be exact if taking the minimal tensor product with A preserves short exact sequences of C^*-algebras. A lot of C^*-algebras are exact, in fact it is quite difficult to find one that is not exact. We will have a quick look at the construction of non exact groups, which involves small cancelation theory and geometric group theory.

Jonas Wahl

Non-singular Bernoulli actions and L^2-cohomology

The study of probability preserving Bernoulli actions of discrete groups has a rich history in ergodic theory, dating back to von Neumann and Kolmogorov. However, as soon as one steps away from the probability preserving case, the results on such actions are scarce in spite of their prototypical nature. In fact, examples of Bernoulli actions of type III have only been given recently by Kosloff and Danilenko/Lemanczyk and only for the group of integers. I will present a joint article with Stefaan Vaes wherein we prove the following conjecture for almost all infinite discrete groups: An infinite discrete group admits a Bernoulli action of type III if and only if its first L^2-cohomology is non-zero.

Rahel Brugger

On property (T) for discrete measured groupoids and their von Neumann algebras

Property (T) for groups was defined by Kazhdan in 1967 to show that certain lattices are finitely generated and has since then proven to be useful in many contexts. It has been generalized to finite von Neumann algebras by A. Connes and V. Jones, to group actions and measured equivalence relations by R. Zimmer and to discrete measured groupoids which include the latter two by C. Anantharaman-Delaroche. As one can associate a finite von Neumann algebra to a discrete measured groupoid the question about connections between property (T) for a groupoid and property (T) for its von Neumann algebra arises. This is joint work with Vadim Alekseev.

Christian Bönicke

Groupoid C*-algebras via the unit space

The C^*-algebra $C_r^*(G)$ associated to an étale groupoid G via a family of left-regular representations contains a canonical abelian subalgebra: The continuous functions on the unit space of the groupoid vanishing at infinity. I will explain how, under suitable conditions on G, one can use this subalgebra to study structural properties of $C_r^*(G)$. The talk will focus on the ideal structure of $C_r^*(G)$ and a notion of paradoxical decomposition for groupoids. Combining the results in these two directions we obtain sufficient conditions for $C_r^*(G)$ to be purely infinite.

Michael Mampusti

KMS states on Cuntz-Pimsner algebras associated to Mauldin-Williams graphs

In this talk, we will first introduce Mauldin-Williams graphs, some of their properties, and present a few examples of such objects. Given a Mauldin-Williams graph $\mathscr{E}$, we present the construction by Ionescu and Watatani of a Cuntz-Pimsner algebra $\mathcal{O}(\mathscr{E})$ associated to $\mathscr{E}$. Using the canonical gauge action γ of the circle $\mathbb{T}$ on $\mathcal{O}(\mathscr{E})$ lifted to an action α of $\mathbb{R}$, we characterise the KMS_β state structure of $\mathcal{O}(\mathscr{E})$ in terms of the structure of the Mauldin-Williams graph $\mathscr{E}$, extending the work of Izumi, Kajiwara and Watatani on iterated function systems. This work forms part of my PhD thesis supervised by David Pask, Aidan Sims, and Michael Whittaker.

Elizabeth Gillaspy

Generalized gauge actions, KMS states, and Hausdorff dimension for higher-rank graphs

Inspired by work of McNamara, Exel-Laca, and Ionescu-Kumjian, we study generalized gauge actions for strongly connected higher-rank graphs (k-graphs). In our setting the generalized gauge action arises from a weight functor on the k-graph Λ combined with a real parameter β. We show that the same data also gives rise to a metric on the infinite path space Λ^∞ of our k-graph, and that the Hausdorff measure of the associated metric space is

intimately related to the KMS states for the original generalized gauge action.

Mayuko Yamashita

Coarse index theory of complete Riemannian manifolds

The classical Atiyah-Singer index theorem allows us to calculate the index of Dirac operators in terms of characteristic classes, on compact even-dimensional Riemannian manifolds. Using coarse (equivariant) C^*-algebras and the six-term exact sequence in operator K-theory, we get the analytic surgery exact sequence and it gives a framework for index theory of complete, non-compact Riemannian manifolds. In this talk, I will explain its construction and its relations with topological problems, such as positive scalar curvature problems and the Novikov conjecture.

Shintaro Nishikawa

On the Lifting of the Dirac Elements in the Higson-Kasparov Theorem

I will talk about the Baum-Connes Conjecture for a-T-menable groups, *i.e.* the Higson-Kasparov theorem. At the equivariant E-theory level or in terms of asymptotic morphisms, this theorem can be viewed as an equivariant generalization of the infinite dimensional Bott Periodicity; and the proof goes almost straightforwardly. When we deal with the equivariant KK-theory, however, some technical issues arise. Although these technicalities were resolved in the paper by Higson and Kasparov, it might be perhaps better to digest what is true at the end of the day. I will describe one of the ways of simply viewing this technical part of the Higson-Kasparov theorem.

Sanaz Pooya

Explicit Baum-Connes assembly map for $F \wr F_n$ Part II: K-theory of $C_R^*(F \wr F_N)$

Consider the wreath product $F \wr F_N$ of a finite group F with the free group F_n. In the first part of our talk, we described the topological side of the assembly map. In the second part, we compute the analytical side that is the K-theory of $C_r^*(F \wr F_N)$ and we present the basis for K-groups.

Having the two sides in hand, comparison via the assembly map provides us with an isomorphism which sends generators to generators. Therefore the Baum-Connes conjecture is proved directly and elementarily for $F \wr F_n$. Note that due to Higson-Kasparov, the conjecture holds (abstractly) for this class of groups. Our aim is to understand this isomorphism more explicitly.

Kang Li

The orbit method for the Baum-Connes conjecture

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 certain Levi-decomposable linear algebraic groups over local fields of positive characteristic along the same idea. One of these groups is 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 Kazhdan's property (T), which is an obstacle to prove the Baum-Connes conjecture. This is a joint work with Siegfried Echterhoff and Ryszard Nest.

Hung-Chang Liao

On uniform Roe algebras of locally finite groups

To every countable discrete group one can associate a C*-algebra, called the *uniform Roe algebra*, which reflects many large-scale geometric properties of the group. A group is called *locally finite* if all of its finitely generated subgroups are finite. These are precisely the groups which are zero dimensional in the large-scale sense. In this talk, we will discuss the structure and K-theory of uniform Roe algebras associated to locally finite groups. The talk is based on a joint work with Kang Li.

Michał Banacki

Quantum symmetry groups - the case of noncommutative tori.

After the notion of a quantum group had been introduced it became clear that this scheme could provide us with the new insight into the meaning of symmetry in the context of noncommutative mathematics. An interesting approach to this topic was presented by Banica and Skalski in their paper on quantum symmetry groups of C*-algebras equipped with orthogonal filtrations.

In this talk we shall recall the basic notions related to the theory of compact quantum groups (in the sense of Woronowicz) and we will discuss necessary conditions for a quantum group to act on the noncommutative n-torus $\mathbb{T}^n_\theta$ in a filtration preserving way. As a result, we will construct a family of compact quantum groups $\mathbb{G}^n_\theta = (A^n_\theta, \Delta)$ such that (for each θ) $\mathbb{G}^n_\theta$ is the final object in the category of all compact quantum groups acting on $\mathbb{T}^n_\theta$ in a filtration preserving way. We shall describe the structure of the underlying C*-algebra A^n_θ and we will comment on the representation theory of $\mathbb{G}^n_\theta$. Joint work with Marcin Marciniak.

Fatemeh Khosravi

Integrable actions and quantum subgroups

I will present some results relating the concept of an integrable action of a locally compact quantum group to the notion of a closed quantum subgroup. Using results about the canonical implementation of an action of a locally compact quantum group, I will show that closed quantum subgroups yield integrable actions. Moreover, I will show that subgroups which are closed in the weaker sense, so-called Woronowicz closed subgroups, but still have an integrable associated action, are closed in the stronger sense. I will also present certain characterizations of compact subgroups and open subgroups in terms of integrability. Finally, I will introduce definitions for the kernel and (the closure of) the image of a homomorphism of quantum groups, and the kernel of a quantum-group action. The talk is based on joint work with Paweł Kasprzak and Piotr Sołtan.

Andrea Vaccaro

Trace spaces of Counterexamples to Naimark's Problem

A counterexample to Naimark's problem is a C^*-algebra with only one irreducible representation up to unitary equivalence which is not isomorphic to the algebra of compact operators (on any Hilbert space). In the 2004 paper "Consistency of a counterexample to Naimark's problem", Akemann and Weaver showed how to produce, with a construction by transfinite recursion which assumed Jensen's diamond principle, a wide family of such counterexamples. We analyze the trace spaces of these counterexamples, studying how to modify Akemann and Weaver' work in order to get trace spaces with specific properties, and how these properties depend on the algebra the construction is started with.

Camila Fabre Sehnem

A bicategorical interpretation for Cuntz-Pimsner algebras

The bicategory of functors from $(\mathbb{N},+)$ to the correspondence bicategory gives rise to a bicategory whose objects are correspondences over C^*-algebras. In this talk, I will define a new bicategory, in which objects are given by triples $(A,\mathscr{E},J)$, where $\mathscr{E}$ is a correspondence over A and J is an ideal acting by compact operators on $\mathscr{E}$. This new bicategory contains a reflective subbicategory and we will show that, up to adjoint equivalence between functors, the left biadjoint to its inclusion is determined by the relative Cuntz-Pimsner algebra associated to correspondences.

Joan Bosa

The Dynamical Cuntz semigroup

In this talk we will discuss how the Cuntz semigroup of a crossed product $(C(X) \rtimes G)$, where X is the Cantor set and G is a "nice" group, looks like. To this end, we will focus on the study of the elements in $\mathrm{Cu}(C(X) \rtimes G)$ that come from functions $f \in C(X)$.

	Monday	Tuesday	Wednesday	Thursday	Friday
08:00 - 08:25	Registration				
08:30 - 08:55		Coffee	Coffee		Coffee
09:00 - 09:25	Juschenko	Yu	Juschenko		Yu
09:30 - 09:55					
10:00 - 10:25	Break	Break	Break	Coffee	Break
10:30 - 10:55	Matsuoka	Krogager	Gerasimova	Yamashita	Vaccaro
11:00 - 11:25	Arici	Deprez	Delabie	Nishikawa	Sehnem
11:30 - 11:55	Sharifi	Evington	Wahl	Pooya	Bosa
12:00 - 12:25	Lunch	Sawada	Lunch	Lunch	Lunch
12:30 - 12:55		Excursions and lunch			
13:00 - 13:25					
13:30 - 13:55	Yu		Yu	Juschenko	Juschenko
14:00 - 14:25					
14:30 - 14:55	Coffee		Coffee	Coffee	
15:00 - 15:25	Ramirez-Solano		Brugger	Li	
15:30 - 15:55	Hamblin		Bönicke	Liao	
16:00 - 16:25	Break		Break	Break	
16:30 - 16:55	Castillejos		Mampusti	Banacki	
17:00 - 17:25	Forough		Gillaspy	Khosravi	
17:30 - 17:55	Gabe				
	Reception (with pizza and beer)		Dinner		