Topological Dynamics and Operator Algebras
Dynamique topologique et algèbres d'opérateurs
(Org: **Thierry Giordano** (University of Ottawa) and/et **Daniel Gonçalves** (UFSC))

ALCIDES BUSS, UFSC
Groupoid actions - The symmetries of noncommutative spaces

Groupoids are powerful objects with many applications in the theory of Operator Algebras. Important examples of C^*-algebras, like rotation algebras and Cuntz algebras have canonical groupoid models, that is, they can be described in terms of a groupoid. Properties of the C^*-algebra can then be read from the underlying groupoid model.

Groupoids can also be used to describe symmetries of C^*-algebras and the aim of this talk will be to explain how this works. More specifically, we introduce a notion of "action" of one groupoid H on another groupoid G using the theory of groupoid fibrations and explain how this induces an "action" of H on the groupoid C^*-algebra $C^*(G)$. In this setting we have a transformation groupoid $G \rtimes H$ and its C*-algebra $C^*(G \rtimes H)$ can be described as a sort of "generalised crossed product" $C^*(G) \rtimes H$.

MARIA ISABEL CORTEZ, Universidad de Santiago de Chile
Strong orbit equivalence and eigenvalues

The additive group $E(X,T)$ of continuous eigenvalues of a minimal Cantor systems (X,T) is not invariant under strong orbit equivalence. Nevertheless, there are some restrictions determined by the dimension group $K^0(X,T)$ associated to (X,T). In this work we show that the quotient group $I(X,T)/E(X,T)$ (where $I(X,T) = \bigcap_{\tau \in T} \tau(K^0(X,T))$ and T is the set of traces of $K^0(X,T)$) is torsion free whenever the associated dimension group has no non trivial infinitesimal. There are some open question about realization. This is a joint work with Fabien Durand and Samuel Petite. Another work in the same direction was made by Giordano, Handelman and Hosseini.

GILLES GONÇALVES DE CASTRO, Universidade Federal de Santa Catarina
A groupoid approach to the C-algebras of labeled graphs*

The notion of C*-algebras of labelled graphs was developed by Bates and Pask. Such algebras generalize, among others, Cuntz-Krieger algebras, Exel-Laca algebras and graph algebras. The C*-algebras defined from a labelled graph contain a commutative C*-subalgebra called the diagonal subalgebra. By using Exel's framework on how to construct a C*-algebra from an inverse semigroup in this context, we can describe the spectrum of the diagonal subalgebra. The space obtained is a generalization of the boundary path space of a graph. We define a groupoid using the boundary path space of a labelled graph as the unit space in a similar way to what is done for graphs. We show that the C*-algebra of this groupoid is isomorphic to the C*-algebra defined by Bates and Pask.

DR. ADAM DOR-ON, University of Waterloo
Representations of Toeplitz-Cuntz-Krieger algebras

By a result of Glimm, we know that classifying representations of non-type-I C^*-algebras up to unitary equivalence is essentially impossible (at least with countable structures). Instead of this, one either restricts to a tractable subclass or weakens the invariant. In the theory of free semigroup algebras, the former is achieved for atomic and finitely correlated representations of Toeplitz-Cuntz algebras.

This talk is about joint work with Ken Davidson and Boyu Li, where we generalize these results to representations of Toeplitz-Cuntz-*Krieger* algebras associated to a directed graph G. We prove a classification theorem akin to that of Davidson and Pitts on atomic representations, and of Davidson, Kribs and Shpigel on finitely correlated representations. Finally, we show how a result of Trahtman from graph theory gives us a large class of directed graphs for which the free semigroupoid algebra is in fact self-adjoint.

CARLA FARSI, University of Colorado
Semibranching function systems, representations, wavelets, and spectral triples for k-graphs

In joint work with Gillaspy, Kang, and Packer, we generalized the definition of semibranching function systems from directed graphs to finite higher-rank graphs (k-graphs). This enabled us to construct a wavelet-type orthogonal decomposition on the infinite path space of the k-graph. In subsequent joint work with Gillaspy, Julien, Kang, and Packer, we show that this wavelet decomposition is closely tied to the Cantor set spectral triples introduced by Pearson and Bellissard. In particular, we show that the Farsi-Gillaspy-Kang-Packer wavelet decomposition agrees with the decomposition as eigenspaces of the Laplace-Beltrami operators of the Pearson-Bellissard spectral triples. To do this, we recast the Cantor set spectral triples in the k-graph set-up by using the infinite path space of the k-graph as our Cantor set. Moreover, in joint work in progress with Gillaspy, Jorgensen, Kang, and Packer, we also study monic, atomic, and permutative representations for finite k-graphs associated to k-graph semibranching function systems, thus generalizing results on representations of Cuntz algebras to the k-graphs set-up.

ELIZABETH GILLASPY, WWU-Münster and University of Montana
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. This is joint work in progress with Carla Farsi, Sooran Kang, Nadia Larsen, and Judy Packer.

DANIEL GONÇALVES, UFSC - Universidade Federal de Santa Catarina
Infinite alphabet edge shift spaces via ultragraphs and their C-algebras*

We will start the talk with an overview of (one-sided) shift spaces over infinite alphabets. Then we will explain the notion of ultragraphs, with generalize directed graphs, and use these combinatorial objects to define a notion of (one-sided) edge shift spaces (which, coincides with the edge shift space of a graph). We then go on to show that these shift spaces have some nice properties, as metrizability and basis of compact open sets. To finalize we examine shift morphisms between these shift spaces: we give an idea how to show that if two (possibly infinite) ultragraphs have edge shifts that are conjugate, via a conjugacy that preserves length, then the associated ultragraph C*-algebras are isomorphic.

BENJAMIN ITZÁ-ORTÍZ, Hidalgo State Autonomous University
The isomorphism class of mapping tori on simple Banach algebras

We prove that two mapping tori associated to two automorphisms of simple unital Banach algebras are isomorphic if and only if the automorphisms are flip conjugate

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DAVID KERR, Texas A&M University
Almost finiteness and $\mathcal{Z}$-stability

I will introduce a notion of almost finiteness for group actions on compact spaces as an analogue of both hyperfiniteness in the measure-preserving setting and of $\mathcal{Z}$-stability in the C*-algebraic setting. This generalizes Matui's concept of the same name from the zero-dimensional context and is related to dynamical comparison in the same way that $\mathcal{Z}$-stability is related to strict comparison in the context of the Toms-Winter conjecture. Moreover, for free minimal actions of countably infinite groups on compact metrizable spaces the property of almost finiteness implies that the crossed product is $\mathcal{Z}$-stable, which leads to new examples of classifiable crossed products.

HUI LI, University of Windsor
On The Products of Two Odometers

Xin Li introduced the notion of the full semigroup C^*-algebra associated to each left cancellative semigroup. Later, Brownlowe-Ramagge-Robertson-Whittaker defined a quotient C^*-algebra of the full semigroup C^*-algebra, which is called the boundary quotient C^*-algebra. On the other hand, the odometer (or the adding machine) is a very important example of self-similar actions. The semigroups of products of 2 odometers, constructed by Brownlowe-Ramagge-Robertson-Whittaker, are generalizations of odometers in certain aspect. However, the boundary quotient C^*-algebra of a product of 2 odometers were not well understood. In this talk I will firstly write down the explicit relations of the generators for the boundary quotient C^*-algebra of a product of 2 odometers. Then for any product of 2 odometers I will construct a regular topological 2-graph associated to it, such that the boundary quotient C^*-algebra of the product of 2 odometers is isomorphic to the topological 2-graph C^*-algebra. This identification allows us to provide conditions under which the boundary quotient C^*-algebra of the product of 2 odometers is nuclear, simple, and purely infinite. This is joint work with Dilian Yang.

NICK ORMES, University of Denver
Speedups of Topological Systems

We define a speedup of a topological dynamical system $T: X \to X$ to be another topological system of the form $x \mapsto T^{p(x)}(x)$ for some function $p: X \to \mathbb{N}$. The speedup relation is an analog of one studied in the measurable category by Arnoux-Ornstein-Weiss and others. In this talk the speaker will discuss characterizations of topological speedups for minimal actions of a Cantor set, under various assumptions on the function p. These characterizations are closely related the orbit equivalence results of Giordano-Putnam-Skau and in fact make use of the same unital ordered group invariants. Like orbit equivalence, the speedup relation looks different when different restrictions are placed on p, e.g. bounded, or continuous except at one point, and the speaker will discuss recent results in each setting.

MICHAEL SCHRAUDNER, CMM - Universidad de Chile
Automorphism groups of subshifts through group extensions

(joint work with Ville Salo) We will show a way to study automorphism groups of general countable subshifts via group extensions giving – in many examples – explicit descriptions of those groups. As a consequence of this technique we are able to prove that the automorphism group of every countable subshift over an (elementary) amenable group will again be (elementary) amenable. If time permits we will give examples of (non-transitive) sofic $\mathbb{Z}$-shifts whose automorphism groups are isomorphic to an extension of the automorphism group of a full shift by Thomson's group V.

MARCELO SOBOTTKA, Federal University of Santa Catarina - Brazil
The Curtis-Hedlund-Lyndon Theorem for generalized sliding block codes between Ott-Tomforde-Willis shift spaces

The generalized sliding blocks were proposed as an alternative definition for sliding block codes between shift spaces. Such a definition coincides with the usual definition in the case that shift space is defined over a finite alphabet, but they encompass a larger class of maps when the alphabet is infinite. In any case, generalized sliding block codes are maps with local rules.

The Ott-Tomforde-Willis shift spaces were proposed as a compactification of one-sided shift spaces over infinite alphabets, taken with an eye towards C*-algebra applications. Roughly, an Ott-Tomforde-Willis shift space is a type of "multi-point compactification" that is obtained by adding finite sequences to the original displacement space.

In this talk we will prove Curtis-Hedlund-Lyndon theorem for Ott-Tomforde-Willis shift spaces, finding sufficient and necessary conditions under which the class of generalized sliding block codes coincides with the class of continuous shift-commuting maps.

This is a joint work with D. Gonçalves (UFSC-Brazil) and C. Starling (uOttawa-Canada).

CHARLES STARLING, Carleton University
Bratteli-Vershik models for partial actions of $\mathbb{Z}$

Herman, Putnam, and Skau proved that given a Cantor minimal system (X, f) one can construct a simple ordered Bratteli diagram with unique max and min paths whose Vershik map is conjugate to (X, f). They also proved that any two diagrams constructed from (X, f) are equivalent. Of course there are simple ordered Bratteli diagrams which do not have unique max and min paths, and here the Vershik map is still a minimal homeomorphism between open subsets of the path space. We prove the converse of this statement, that given a minimal homeomorphism h: U –¿ V between open proper subsets of the Cantor set, there exists an ordered Bratteli diagram whose Vershik map is conjugate to h, and that any two such diagrams are equivalent. This is joint work with Thierry Giordano and Daniel Gonçalves.

RUFUS WILLET, University of Hawaii at Manoa
Cartans and rigidity for uniform Roe algebras

Uniform Roe algebras are C*-algebras associated to (discrete) metric spaces. They can also be thought of as the C*-algebras of certain étale groupoids, and as such have a natural Cartan subalgebra. I'll discuss uniqueness of this Cartan, and some corresponding rigidity results for the associated uniform Roe algebras: these imply in particular that the space can in some sense be recovered from the algebra. This is based on joint work with Jan Spakula, and with Stuart White.