

Operator Algebras: Matricial Approximations

Titles and Abstracts

Operator Algebras: Approximation, Rigidity and Dynamics
26–30 October 2026 • Institut Henri Poincaré, Paris

Talks are listed in schedule order. All times are local to Paris.
TBA indicates a title or abstract that has not yet been supplied.

Monday, 26 October

Gilles Pisier

10:00–10:45

Operator space theory with maximally bounded (m.b.) maps

Abstract. We illustrate with some examples rooted in operator spaces and operator algebras how one can develop the theory of maximally bounded (m.b.) maps or m.b. homomorphisms in parallel with that of c.b. maps. While c.b. maps preserve the minimal tensor product up to the c.b. norm, m.b. maps analogously preserve the maximal one up to the m.b. norm. As an illustration, we prove that the following properties of a von Neumann algebra M are equivalent:

1. For any C^* -algebra A , all c.b. homomorphisms $u: A \rightarrow M$ are m.b.
2. $M = M_1 \oplus M_2$, with M_1 injective and M_2 finite.

Ben Hayes

11:15–12:00

On generators for W^* -bundles

Abstract. I will speak on work which did not use LLMs at any stage. In it, we give an explicit example of a W^* -bundle M over a compact, metrizable space K , which has each fiber M_p a II_1 -factor with separable predual, and which satisfies the following negation of the generator problem: given any finite family $a_1, \dots, a_n \in M$ of continuous sections, there is a $p \in K$ (depending upon that family) so that $a_{1,p}, \dots, a_{n,p}$ do not generate M_p as a von Neumann algebra. More generally, if N is a sub-bundle of M with the property that each fiber is hyperfinite, or has a Cartan, or is generated by two commuting diffuse subalgebras, or has diffuse central sequence algebra, or is generated by a single sequential commutation orbit, then given any finite family $a_1, \dots, a_n \in M$ of continuous sections, there is a $p \in K$ (depending upon that family) so that $a_{1,p}, \dots, a_{n,p}$ together with N_p do not generate M_p . We discuss implications for the generator problem for von Neumann algebras: e.g., there is no “continuous” way to take countably many generators for a tracial von Neumann algebra with separable predual and produce a single generator, at least if such a procedure works for all von Neumann algebras simultaneously.

Monday, 26 October (continued)

Javier Parcet

14:00–14:45

A new inequality for Schur multipliers

Abstract. Let (X, d) be a tree equipped with its graph metric and call $M: X \times X \rightarrow \mathbb{C}$ radial when $M(x, y) = m(d(x, y))$ for some $m: \mathbb{N} \rightarrow \mathbb{C}$. The Schur multiplier $S_M: A \mapsto (M(x, y)A_{x,y})$ acts on $X \times X$ matrices by entrywise multiplication and we will show for $1 < p < \infty$ that

$$\|S_M: S_p(X) \rightarrow S_p(X)\|_{\text{cb}} \lesssim \frac{p^4}{(p-1)^2} \|T_m: L_p(\mathbb{T}) \rightarrow L_p(\mathbb{T})\|_{\text{cb}}.$$

In other words, the cb-norm of the radial Schur multiplier S_M is controlled by the cb-norm of the corresponding Fourier multiplier on the torus. In fact this becomes a norm equivalence for unbounded trees. We will give a simple proof of this rather unexpected result and explore consequences. The proof relies on a clean connection with Pisier/Xu’s 1997 martingale inequality. The applications include the solution to a problem dating back to the work of Neuwirth/Ricard in 2011 on the so-called Fourier-Schur transference. If time permits, we will also explain its relation to the free ball multiplier problem and to Lafforgue/de la Salle’s Schur approximation property. Based on joint work with A. González-Pérez, J. Pérez García and S. Wang.

Adriana Fernández Quero

15:15–16:00

A class of II_1 factors without non-trivial crossed product decompositions

Abstract. The crossed product is a fundamental construction of II_1 factors, and a natural question is whether every separable II_1 factor arises from a noncommutative dynamical system in this way. I will discuss joint work with A. Ioana and H. Tan in which we construct the first separable II_1 factors that cannot be decomposed as $B \rtimes_{\sigma} G$, for any trace-preserving action of any countable infinite group G on a tracial von Neumann algebra B . Our approach relies on a rigidity phenomenon for embeddings. If time allows, I will also discuss some ongoing work with H. Tan.

Michael Brannan

16:15–17:00

Unital channels, NC convexity, and operator spaces associated to free unitary quantum groups

Abstract. The Birkhoff–von Neumann theorem tells us that any bistochastic matrix can be decomposed into a convex combination of permutation matrices. Since bistochastic matrices are precisely the unital classical information channels, it is natural to ask about the convex structure of unital quantum channels acting on M_n . I’ll discuss various attempts at formulating a quantum channel version of the Birkhoff–von Neumann theorem, including our recent attempt based on noncommutative (NC) convexity: is every unital channel on M_n an NC convex combination of quantum automorphisms of M_n ? We will exhibit examples which show that the answer to this question is no in general, and relate them to the notion of a factorizable channel studied by Anantharaman-Delaroche, Haagerup, Musat, and others. We will also connect this result to the natural problem of determining the structure of the operator space spanned by the generators of the free unitary quantum groups. This is joint work with Jason Crann and Alec Gow.

Tuesday, 27 October

Andreas Thom

10:00–10:45

Approximation properties of discrete groups

Abstract. I want to report on the recent developments that eventually led to the construction of a non-hyperlinear group. The story starts with OpenAI’s construction of a non-sofic group based on previous work of Kun and myself. The method was extended and put in context in subsequent joint work with Kun in a way that could be generalized to the setting of unitary approximations and reduced to the centralizer problem; a question about a concrete description of the relative commutant of an ultraproduct representation of a Kazhdan group. Eventually, in joint work with Alekseev and Liu, based on another major input from AI, we could settle the centralizer problem.

Cécilia Lancien

11:15–12:00

Quantum expanders - Random constructions & Applications

Abstract. The goal of the talk will be to understand what quantum expanders are, what they are useful for, and how they can be constructed. We will first recall the definition of classical expander graphs, and explain how quantum analogues of these objects can be defined. We will then show that, both classically and quantumly, random constructions typically provide examples of optimal expanders. In the quantum case, such a result is derived from a spectral analysis for random matrix models with a tensor product structure (which turn out to satisfy strong concentration inequalities, despite their dependencies and non-homogeneities). If time allows, we will also present implications in terms of typical decay of correlations in 1D many-body quantum systems with local interactions. The talk will be based mostly on the following works: arXiv:1906.11682 (with David Pérez-García), arXiv:2302.07772 (with Pierre Youssef) and arXiv:2409.17971.

Alon Dogon

14:00–14:45

Polynomial Hilbert–Schmidt stability for the lamplighter

Abstract. I will talk about joint work with Thomas Vidick, showing that the lamplighter group is Hilbert–Schmidt stable with polynomial rate and radius. This shows that for arbitrarily many projections conjugate by a unitary evolution, if polynomially many almost commute, then they can be corrected to nearby conjugated commuting projections. The proof method involves a new notion of approximately invariant measures, as well as an application of local algorithms and an efficient marker lemma from Borel combinatorics.

Tuesday, 27 October (continued)

David Jekel

15:15–16:00

Matrix approximations and noncommutative optimal transport

Abstract. Optimal transport theory has become an essential part of our understanding of probability measures; in particular, it carries a notion of Wasserstein distance $W_2(\mu, \nu)$ which represents the smallest possible L^2 distance of random variables X and Y with distributions μ and ν , or the “total work” needed to transform μ into ν . There are numerous noncommutative analogs of Wasserstein distance, arising from noncommutative Lipschitz norms, quantum channels, or distances between unitary or automorphism orbits. I will discuss the relationship between noncommutative optimal transport and optimal transport for random matrix models, and in particular the problem of finding the correct noncommutative distance to capture the large- n behavior of Gibbs-like $n \times n$ multi-matrix models. This is more challenging than it first appears, but there does exist a version of noncommutative Wasserstein distance that fits coherently with free entropy and random matrix models.

Mikael Rørdam

16:15–17:00

On the OpenAI counterexample to Kaplansky’s quasitrace conjecture

Abstract. One of the 377 papers recently released by OpenAI gives a counterexample to Kaplansky’s conjecture that AW^* -factors of type II_1 must be von Neumann algebras, or, equivalently, that all 2-quasitraces on C^* -algebras must be traces. It is shown in the paper that the universal (unital) C^* -algebra B generated by 24 elements $x_1, \dots, x_{24}$ satisfying

$$\sum_{j=1}^{24} x_j^* x_j = 1 \quad \text{and} \quad \sum_{j=1}^{24} x_j x_j^* \leq \frac{2}{3} 1$$

is not stably properly infinite. Hence B admits a 2-quasitrace but no tracial state. In this talk, I will explain the background of the problem and at least some of the ideas behind the proof.

Wednesday, 28 October

Michael Magee

09:30–10:15

Title: TBA*Abstract:* TBA**Greg Patchell**

10:45–11:30

Applications of the universality of the Cuntz–Pimsner algebras and relative selflessness

Abstract. In the late 1990s and 2000s, Shlyakhtenko and others (such as Fowler–Muhly–Raeburn and Brown–Ozawa) studied the Cuntz–Pimsner algebras, describing a powerful universality: embeddings of the Cuntz–Pimsner algebras can be detected by verifying only finite-length relations. Notably, Cuntz–Pimsner algebras typically embody some level of free independence; for example, they are often reduced free products. The universality of the Cuntz–Pimsner algebras has been used to great success recently, including a robust approach to proving selflessness by Ozawa; progress on strong convergence phenomena in hyperbolic 3-manifold (and other) groups (e.g., Gao–Kunnawalkam Elayavalli–Patchell–Manzoor and Magee–Roig–Sanchis–Thomas); a generalization of the Skoufranis–Pisier free exactness theorem by Gao–Kunnawalkam Elayavalli; and a very general notion of relative selflessness introduced in joint work with Gao, Junge, Kunnawalkam Elayavalli, and Robert.

Michael Chapman

11:30–12:15

Using quantum information to find a non-cosofic surjunctive IRS

Abstract. A group is said to be surjunctive if every cellular automaton on it which is injective is also surjective. Gromov’s result, which proved that sofic groups are surjunctive, was the catalyst for the study of this class. There are recent constructions of non-sofic groups, and even a claimed surjunctive non-sofic group. Nevertheless, we discuss a year-old result of ours (joint with Lewis Bowen) that proves the existence of a non-cosofic IRS which is surjunctive using the MIP* machinery. In the talk we will define all relevant notions (IRS, cellular automaton, surjunctivity, non-local games, etc.) and describe our proof.

Thursday, 29 October

Dimitri Shlyakhtenko

10:00–10:45

On the von Neumann algebras of Fuchsian groups

Abstract. We show that von Neumann algebras of fundamental groups of closed orientable surfaces of genus $g \geq 2$ are free group factors on $2g - 1$ generators. The key technical ingredient involves a proof that the element w given by the group commutator of the two generators of a free group is freely complemented in the group factor. Combined with previous results, we conclude that for an arbitrary finitely generated torsion-free non-elementary discrete subgroup $\Gamma \subset \mathrm{PSL}_2(\mathbb{R})$, $L(\Gamma)$ is a free group factor, settling a conjecture of de la Harpe and Voiculescu.

Andrew Marks

11:15–12:00

The recursive compression method for proving undecidability results

Abstract. We describe a general recursive compression lemma that abstracts the technique used to prove undecidability by Fitzsimons, Ji, Vidick, and Yuen (and subsequently refined by Ji, Natarajan, Vidick, Wright, and Yuen, and then further by Lin). We show that the halting problem is polynomial-time reducible to an r.e. language if and only if there is a recursive compression for that language. We explain how the idea of recursive compression was also used independently in mathematics in 2010 by Durand, Romashchenko, and Chen to give a new proof that the Wang tiling problem is undecidable. We give several other examples of recursive compression and explain how certain proofs in the literature can be viewed through this lens. We also describe some generalizations of the lemma that can prove hardness at arbitrarily high levels of the arithmetical hierarchy.

This is joint work with Seyed Sajjad Nezhadi and Henry Yuen.

Tatiana Shulman

14:00–14:45

Cones, homotopies, and asymptotic lifting

Abstract. First I will talk about cone C^* -algebras. We will discuss their properties: some known (e.g., quasidiagonality and quasidiagonality of amenable traces) and some new. Then we will discuss homotopy invariance of several C^* -algebraic properties.

Aareyan Manzoor

15:15–16:00

Title: TBA*Abstract:* TBA**Jesse Peterson**

16:15–17:00

On ultraproduct approximations and property (T) factors

Abstract. Finite factors are said to be elementarily equivalent if they have isomorphic ultrapowers. We'll discuss how deformation/rigidity techniques, which have been so successful in distinguishing factors up to isomorphism, can be adapted in the ultraproduct setting to give examples of nonelementarily equivalent factors. This allows us to answer several open problems from the model theory of II_1 factors, e.g., we show that the group von Neumann algebras $L(\mathbb{F}_2)$ and $L(\mathrm{SL}_3(\mathbb{Z}))$ are not elementarily equivalent, and we also show that $L(\mathbb{F}_2)$ is not pseudomatricial.

Friday, 30 October

Éric Ricard

10:00–10:45

Riesz-Schur transform

Abstract. We introduce a kind of Riesz transforms on Schatten classes. They turn out to be efficient tools to get results on Schur multipliers. As an illustration, we will explain how to recover the Hörmander–Mikhlin theorem on Fourier multipliers on L^p with an almost Hilbertian proof. This is joint work with Adrián González-Pérez, Javier Parcet and Jorge Pérez García.

Jorge Garza-Vargas

11:15–12:00

Finite free entropy inequalities

Abstract. Free probability is a theory about infinite-dimensional operators, whereas geometry of polynomials is a theory about (commutative) polynomials of fixed degree. Finite free probability draws a bridge between these two seemingly disjointed fields by interpreting classical convolutions between polynomials as the finite analog of free convolutions. In this work we study the natural finite analogs of Voiculescu’s notions of free entropy and free Fisher information, and, for these, we establish the corresponding entropy power and Stam’s inequalities from classical information theory. Our inequalities may be interpreted as potential-theoretic inequalities about the dynamics of the zeroes of real-rooted polynomials under the action of differential operators.

William Slofstra

14:00–14:45

Compression procedures for $\ast$ -algebras

Abstract. Compression of nonlocal games is a key concept from the proof of the $\text{MIP}^* = \text{RE}$ theorem. A compression procedure takes a nonlocal game as input, and outputs a smaller nonlocal game with some of the same properties. In this talk, I’ll explain how this concept can be translated to $\ast$ -algebras, and give some applications of having a compression procedure.

Narutaka Ozawa

15:15–16:00

Uniform amenability at infinity

Abstract. We introduce the notion of uniform exactness, or uniform amenability at infinity, for discrete groups and prove it for a wide class of groups containing free groups and their limit groups. This shows a novel strong convergence phenomenon: any convergent sequence of such groups in the space of marked groups converges strongly in the operator algebraic sense. In particular, convergence of the spectral radius formula is uniform over probability measures on such groups whose supports have a fixed cardinality. The proof is by realizing the ultrapower $F^{\mathcal{U}}$ of the Cayley graph of the finitely generated free group as a $\mathbb{Z}^{\mathcal{U}}$ -tree and studying definable functions on $F^{\mathcal{U}}$ via the tree compactification and countable Borel orbit equivalence relations.