Journée de jeunes analystes non commutatifs

Besançon, le 19 décembre 2018

Programme

09:00 - 09:45	**Guixiang Hong** (Wuhan University): Vector-valued Littlewood-Paley theorem for sum and difference sets
09:50 - 10:20	**Coffee break**
10:20 - 11:05	**Chao Zhang** (Universidad Autónoma de Madrid) On some properties of the differential transforms related to the fractional parabolic Poisson semigroups
11:10 - 11:55	**Haonan Zhang** (Université de Franche-Comté): Carlen-Frank-Lieb conjecture and monotonicity of α-z Rényi relative entropy
13:45 - 14:30	**Simeng Wang** (Université Paris Sud): Factoriality and type classification for q-deformed Araki-Woods algebras
14:35 - 15:20	**Sheng Yin** (Universität des Saarlandes): Free analysis: zero divisors and Atiyah properties
15:25 - 15:55	**Coffee break**
15:55 - 16:40	**Isabelle Baraquin** (Université de Franche-Comté): Random walks on finite quantum groups
16:45 - 17:30	**Xumin Wang** (Université de Franche-Comté): Fourier multipliers on some discrete groups

Abstracts

1) **Isabelle Baraquin:** Random walks on finite quantum groups

Abstract: In this talk we will study convergence of random walks, on Sekine finite quantum groups, arising from linear combination of irreducible characters. Thanks to Quantum Diaconis-Shahshahani Theory we bound the distance to the Haar state and determine the asymptotic behavior, i.e. the limit state if it exists.

2) **Guixiang Hong:** Vector-valued Littlewood-Paley theorem for sum and difference sets

Abstract: In this talk I shall recall the history of Littlewood-Paley theorem and show that the sum or difference set of finite sequences of vector-valued Littlewood-Paley sets is a still a vector-valued Littlewood-Paley set if and only if the underlying Banach space is UMD with property α-property

3) **Simeng Wang:** Factoriality and type classification for q-deformed Araki-Woods algebras

Abstract: We will study the structure of the q-deformed Araki-Woods von Neumann algebras $\Gamma_q(H_R, U_t)$ associated with a real Hilbert space H_R. We give a complete answer to the question of factoriality if $\dim(H_R) \geq 3$, and to the question of type classification if $\dim(H_R) \geq 5$. The talk is based on an ongoing work joint with Cyril Houdayer and Mateusz Wasilewski.

4) **Xumin Wang:** Fourier multipliers on some discrete groups

Abstract: In this talk we consider pointwise convergence of Fourier series in the noncommutative setting. Let G be a discrete group and $m_n : G \to \mathbb{C}$ a sequence of fonctions on G. The Fourier series associated with m_n is defined by $T_{m_n}(f) = \sum_{g\in G} m_n(g)\hat{f}(g)\lambda_g \in L_p(vN(G))$, where $vN(G)$ is the group von Neumann algebra of G. In order to get the almost uniformly convergence of $T_{m_n}(f)$ as $n \to \infty$, we first need to prove the corresponding maximal inequality:

$$\|\sup_n{}^{+} T_{m_n} f\|_p \leq C_p \|f\|_p, \quad p > 1.$$

Firstly, if G is finitely generated, we obtain this maximal inequality for a subsequence of Dirichlet multipliers in the case $2 \leq p \leq \infty$. Secondly, if G is amenable (or coamenable and compact), the maximal inequality holds for a subsequence of Féjer multipliers in the case $2 \leq p \leq \infty$. Finally, if G is equipped with a finite dimensional cocyles, we show the maximal inequality for Bochner-Riesz multipliers in case $1 < p \leq \infty$.

5) **Sheng Yin:** Free analysis: zero divisors and Atiyah properties

Abstract: In order to transfer the notion of entropy and Fisher information to the world of free probability, Voiculescu introduced certain non-commutative derivatives to define the (non-microstates) Fisher information via conjugate variables? and then the free entropy and free entropy dimension can be defined based on this Fisher information. In a recent work of Tobias Mai, Roland Speicher and Moritz Weber, they show that any polynomial in a tuple of noncommtative random variables whose free entropy dimension is maximal, has no zero divisor in the von Neumann algebra generated by this tuple. Under this assumption, a differential operator can be defined and be used to reduced the degree of polynomials, which plays a crucial role in the proof. In this talk, based on a joint work with Tobias Mai and Roland Speicher, we want to show that this idea can be generalized and applied to the matricial case, which allows us to prove the absence of zero divisors to all rational functions rather than polynomials. Beside this, our idea also leads us to some algebraic description of zero divisors for matrices in the given tuple of random variables, which reveals some new links to Atiyah properties.

6) **Chao Zhang:** On some properties of the differential transforms related to the fractional parabolic Poisson semigroups

Abstract: In this talk, we will consider the differential transforms of fractional Poisson semigroups associated to the parabolic operator $L = \partial_t - \Delta$. This kind of semigroups was first investigated by Stinga and Torrea in order to develop the regularity theory and extension problems for fractional parabolic equations. We use the vector-valued Calderón-Zygmund theorem to establish the L^p-boundedness of the differential transforms related to the fractional Poisson semigroups associated with the parabolic operator. And in the one-dimensional case, we prove the boundedness of the maximal operator related to the differential transforms. At last, we get some L^∞ behavior results of the maximal operators related to the differential transforms. This is a joint work with T. Ma and J.L. Torrea.

7) **Haonan Zhang:** Carlen-Frank-Lieb conjecture and monotonicity of α-z Rényi relative entropy

Abstract: In this talk I will use a variational method to prove a conjecture of Carlen, Frank and Lieb, which concerns the joint convexity of the the trace function

$$\Psi_{p,q,s}(A,B) = \mathrm{Tr}(B^{\frac{q}{2}}K^*A^pKB^{\frac{q}{2}})^s,$$

where $-1 \le q < 0,\ 1 \le p \le 2,\ (p,q) \ne (1,-1),\ s \ge \frac{1}{p+q}$, A and B are $N \times N$ positive semi-definite matrices and K is a fixed $N \times N$ matrix. This admits the Audenaert-Datta conjecture with $s = \frac{1}{p+q}$ as a special case. Together with other known results, we will give full range of (p,q,s) for $\Psi_{p,q,s}$ to be jointly convex/concave. As a consequence, we obtain the full range of (α, z) for α-z Rényi relative entropies to be monotone under the completely positive trace preserving maps. We will also use this method to give simple proofs for some known results on joint convexity/concavity of $\Psi_{p,q,s}$.