2023 泛函分析及空间理论天元暑期研讨班

Concentration day:
young researchers on noncommutative analysis II

August 3, 2023 Zheng Xin Building, Room 21

9:00-11:30

Some Recent Progress of Operator-Valued Hardy Spaces on Space of Homogeneous Type

***Wenhua WANG*（王文华）** Wuhan University

In this talk, we will introduce some recent progress of the theory of operator-valued Hardy spaces on space of homogeneous type. The theory of Hardy spaces is a young research topic in noncommutative analysis, and there remain lots of challenging problem. This is joint work with Dr. Zhijie Fan and Prof. Guixiang Hong.

Campanato spaces via semigroups on semifinite von Neumann algebras

***Yuanyuan JING*（景圆圆）** Wuhan University

In this paper, we improve the results in the previous work done by the first and two named authors on Campanato spaces via quantum Markov semigroups on finite von Neumann algebras. We consider a more general case when the trace is semifinite and obtain the coincidence of the row and column spaces Campanato spaces for all $\alpha > 0$. Moreover, we investigated the self-improving property of Campanato spaces even for all $\alpha > 0$. Our proof is purely algebraic and does not even require any further conditions for semigroups. All of the arguments mentioned above can be applied in the (semi-)commutative case. This is joint work with Prof. Guixiang Hong and Dr. Ping Li.

Noncommutative discrete spherical maximal inequalities

***Cheng CHEN*（陈诚）** Sun Yat-sen University

Based on his famous work on spherical maximal inequalities on $\mathbb{R}^d$, combining sampling theory and number theory, Stein and his coauthors proved an discrete analogue (in the setting of $\mathbb{Z}^d$) of his spherical maximal theorem for $d \geq 5$ and $p > \frac{d}{d-2}$ (Ann. Math., 2002). In this talk, I shall recall briefly the history and present our noncommutative version of this famous result. This is based on a joint work with Guixiang Hong.

14:30-17:30

Boole and Bohr meet Pauli

Haonan ZHANG（张浩楠） University of South Carolina

A fundamental problem from computational learning theory is to well-reconstruct an unknown function on the discrete hypercubes. One classical result of this problem for the random query model is the low-degree algorithm of Linial, Mansour and Nisan in 1993. This was improved exponentially by Eskenazis and Ivanisvili in 2022 using a family of polynomial inequalities going back to Littlewood in 1930. Recently, quantum analogs of such polynomial inequalities were conjectured by Rouzé, Wirth and Zhang (2022). This conjecture was resolved by Huang, Chen and Preskill (2022) without knowing it when studying learning problems of quantum dynamics. In this talk, I will discuss another proof of this conjecture that is simpler and gives better estimates. As an application, it allows us to recover the low-degree algorithm of Eskenazis and Ivanisvili in the quantum setting. This is based on arXiv:2210.14468, joint work with Alexander Volberg (MSU).

John-Nirenberg inequalities for noncommutative column BMO and Lipschitz martingales

Congbian MA（马聪变） Xinxiang University

We continue the study of John-Nirenberg theorems for BMO/Lipschitz spaces in the noncommutative martingale setting. As conjectured from the classical case, a desired noncommutative "stopping time" argument was discovered to obtain the distribution function inequality form of John-Nirenberg theorem. This not only provides another approach without using duality and interpolation to the results for spaces bmo c (M) and Λc β (M), but also allows us to find the desired version of John-Nirenberg inequalities for spaces BMOc (M) and Lc β (M).

Schatten class and principal symbol on Carnot groups

Fulin YANG（杨福林） Harbin Institute of Technology

In the first part, we give a full characterisation of Schatten property for general Calderón-Zygmund singular integral commutators on Carnot groups. In the second part, the principal symbol on Carnot groups will be established by introducing Riesz transforms to replace the pseudo-differential operators of order 0. Moreover, we will investigate some properties of quasi-Riesz transforms and then we obtain the equivariance of the principal symbol under Heisenberg diffeomorphisms.