

Harmonic Analysis Day

Wuhan University - 2013.08.08

This day is organized within the program “**Summer Working Seminar on Noncommutative Analysis**” held in Wuhan University from 15 July to 15 August, and is entirely devoted to classical/noncommutative harmonic analysis. Below are the schedule and the titles/abstracts of the talks.

09:00 - 09:50 **Yao Xiaohua**, Huazhong Normal University

10:00 - 10:50 **Mei Tao**, Wayne State University

11:00 - 11:50 **Wang Hua**, Huazhong Normal University

14:30 - 15:20 **Chen Zeqian**, Wuhan Institute of Physics and Mathematics

15:30 - 16:20 **Deng Qingquan**, Huazhong Normal University

16:30 - 17:20 **Yang qixiang**, Wuhan University

Chen Zeqian: Atomic decomposition of real-variable type for Bergman spaces in the complex ball

Abstract: In this paper, we show that every (weighted) Bergman space $\mathcal{A}_\alpha^p(\mathbb{B}_n)$ in the complex ball admits an atomic decomposition of real-variable type for any $0 < p \leq 1$ and $\alpha > -1$. More precisely, for each $f \in \mathcal{A}_\alpha^p(\mathbb{B}_n)$ there exist a sequence of real-variable $(p, \infty)_\alpha$ -atoms a_k and a scalar sequence $\{\lambda_k\}$ with $\sum_k |\lambda_k|^p < \infty$ such that $f = \sum_k \lambda_k P_\alpha(a_k)$, where P_α is the Bergman projection from $L_\alpha^2(\mathbb{B}_n)$ onto $\mathcal{A}_\alpha^2(\mathbb{B}_n)$. The proof is constructive, and our construction is based on some sharp estimates about Bergman metric and Bergman kernel functions in \mathbb{B}_n .

Deng Qingquan: Characterizations of Hardy spaces associated to elliptic operators

Abstract: In this talk, we will address a theory of Hardy space $H_L^1(\mathbb{R}^n)$ associated with L , where L is a higher order divergence form elliptic operator with complex bounded measurable coefficients. The authors set up a molecular Hardy space $H_L^1(\mathbb{R}^n)$ and give its characterizations by area integrals related to the semigroups e^{-tL} and $e^{-t\sqrt{L}}$, respectively. As some applications, authors give the (H_L^1, L^1) boundedness of Riesz transforms, vertical square and vertical maximal functions associated with the operator L .

Mei Tao: On Calderón-Zygmund extrapolation theory associated with semigroups of operators

Abstract: In the classical analysis, Calderón-Zygmund extrapolation theory says that a type of singular integral operators (called Calderón-Zygmund SIO) is automatically bounded on L_p for all $1 < p < \infty$ if it is bounded on L_2 . The theory heavily relies on the comfortable metric/geometric properties of Euclidean spaces (more generally homogeneous spaces).

Recent joint works with Junge and Parcet aim to finding an analogue of this theory in an abstract setting. In this talk, I'd introduce a possible approach (joint with Junge, Parcet) to an abstract Calderón-Zygmund extrapolation theory by considering "metric" constructed from markov semigroups.

Wang Hua: L^p - L^q estimates of resolvents for the elliptic differential operators on compact manifold

Abstract: Let P be an elliptic differential operator of order $2m$ defined on a compact manifold. In this talk, we will address the L^p - L^q uniform Sobolev estimates of resolvent $(z - P)^{-1}$ under some natural assumptions on principle symbol $P(x, \xi)$. For Laplace-Beltrami operator Δ_M , the problem recently was discussed deeply for a special pair (p, q) by Ferreira-Kenig-Salo and Bourgain-Shao-Sogge-Yao, for general pairs by Shao-Yao.

Yang qixiang: Hölder inequality and Navier-Stokes equations

Abstract: In this talk, we establish the global existence and uniqueness of a mild solution of the so-called fractional Navier-Stokes equations with small data in the critical Besov-Q space which not only covers most of the existing old spaces but also produces many new spaces. Our main skills are to use wavelets to transform the problem on Navier-Stokes equations to the study of Hölder inequality.

Yao Xiaohua: Some studies related to the Schrödinger type operators

Abstract: Let $P(D)$ be a nonnegative homogeneous differential operator of order $2m$ and V be some nonnegative measurable potential. In this talk, we will address two problems related to Schrödinger type operator $H = P(D) + V$. One is that the consistence of the maximal and minimal forms associated with some nonnegative self-adjoint operator H by KLMN theorem. Another is to study the pointwise Gaussian bounds for the heat semi-group e^{-tH} . In the second case (i.e. $m = 1$), the answers to the problems are well-known due to T. Kato, B. Simon et al. However, for higher order (i.e. $m > 1$), the situations have some different favors due to the loss of positivity of $e^{-tP(D)}$. Here, we will discuss some recent results based on co-works with Q. Deng and Y. Ding.