Titles and Abstracts

1. William Beckner, University of Texas at Austin, USA

Title: Lie Groups and Hyperbolic Symmetry – Kunze-Stein Phenomena and Riesz Potentials

Abstract: Sharp forms of Kunze-Stein phenomena on SL(2,R) are obtained by using symmetrization and Stein-Weiss potentials. A new structural proof with remarkable simplicity can be given on SL(2,R) which effectively transfers the analysis from the group to the symmetric space corresponding to a manifold with negative curvature. Relatively simple arguments are given to obtain end-point convolution inequalities on SL(2,R) that strengthen Kunze-Stein phenomena. Our methods extend to include SL(2,C), the Lorentz groups, and n-dimensional hyperbolic space through application of the Riesz-Sobolev rearrangement inequality.

2. Yanping Chen, University of Science and Technology Beijing, China

Title: Fractional Differential Operators and Rough Kernels

Abstract: We established some properties for the commutators with fractional differential operators and some function spaces.

3. Wei Ding, Nantong University, China

Title: Multi-parameter Local Hrdy Spaces

Abstract: Using muti-parameter local reproducing formula and localized discrete Littlewood-Paley-Stein theory, multi-parameter local hardy spaces $h^p(\mathbb{R}^n \times \mathbb{R}^n)$ are introduced. Moreover, we also obtain its atomic decomposition of the local Hardy spaces. This is joint work with Jiao Chen and Guozhen Lu.

4. Joonil Kim, Mathematics Department, Yonsei University, Korea

Title: Oscillatory Integrals Over Global Domains

Abstract: Given real valued polynomials P on $\mathbb{R}^2$ and unbounded domains $D \subset \mathbb{R}^2$, we consider the oscillatory integrals $I(P, D, \lambda)$ with phases λP and domains D. We establish a criterion on (P, D) to determine the convergence of these integrals and find the oscillation indices when they converges. These indices are described in terms of a generalized notion of Newton polyhedra.

5. Herbert Koch, Mathematisches Institut der Universiät Bonn, Germany

Title: A Continuous Family of Conserved Energies for NLS, mKdV and KdV

Abstract: In joint work with Daniel Tataru we construct a continuous family of conserved energies for the cubic nonlinear Schrödinger equation (NLS). The construction relies on the transmission coefficient for a Lax operator in a complex half plane, which we bound in terms of the l^2DU^2 norm (a replacement of $H^{-\frac{1}{2}}$) of the potential u.

We make use of a Hopf algebra remininscent to a similar argument in quantum field theory.

As a consequence we obtain uniform in time bounds for the H^s norm of the solution to NLS for all $s > -\frac{1}{2}$, in terms of the H^s norm of the initial data, for initial data in $H^s \cap L^2$.

The same contruction applies to modified Korteweg-de Vries (mKdV), and a modified one for the Korteweg-de Vries equation (KdV).

6. Sanghyuk Lee, Seoul National University, Korea

Title: Brascamp-Lieb Inequalities and Applications

Abstract: This talk is concerned about multilinear estimates of which usefulness in hormonic analysis has recently been proven. We will discuss the property of Brascamp-Lieb constants and as applications we obtain multilinear Fourier restriction, Kakeya-type estimates, and nonlinear variants of the Brascamp-Lieb inequality. This talk is based on a joint work with Jon Bennett, Neal Bez, and Taryn Flock.

7. Junfeng Li, Beijing Normal University, China

Title: Well-Posedness of the KP Initial Data Problems

Abstract: In this talk, I will survey the progress on the well-posedness of KP initial data problems. During the progress, the Galilean invariant takes an important role. It helps to understand the interactions of the KP waves.

8. Guozhen Lu, Wayne State University, USA

Title: Hormander Type Theorem on Multi-parameter Hardy Spaces for Multi-parameter Fourier Multipliers with Optimal Smoothness

Abstract: The main purpose of this talk is to report some recent works on Hormander-Mihlin type theorem on multi-parameter Hardy spaces H^p for multi-parameter Fourier multipliers. Our goal is to establish the boundedness of multi-parameter Fourier multipliers from multi-parameter Hardy spaces to Hardy spaces with optimal smoothness assumptions on the multi-paremeter multipliers. Our theorem sharpens those boundedness results from Hardy spaces to Lebesgue spaces on bi-parameter Fourier multipliers by R. Fefferman and K. Lin, L.K. Chen, etc. This is joint work with Jiao Chen.

9. Michael Ruzhansky, Imperial College, UK

Title: Multiplier Theorems on Lie Groups

Abstract: In this lecture we will review recent results on Fourier and spectral multipliers on compact, nilpotent, and general locally compact groups.

10. Brian Street, University of Wisconsin-Madison, USA

Title: The Frobenius Theorem: From Geometry to Analysis

Abstract: We present a quantitative version of the classical Frobenius theorem from differential geometry. This theorem can be seen as providing scaling maps which can be used to study a range of problems in analysis. We present two such applications: a theory of singular Radon transforms (joint with E. M. Stein) and a theory of multi-parameter singular integrals which has applications to PDEs and several complex variables.

11. Mitsuru Sugimoto, Graduate School of Mathematics, Nagoya University, Japan

Title: Optimal Trace Theorems and a Related PDE Problem

Abstract: Our purpose is to study the optimal constants and extremising functions for classical trace theorems. This problem is closely related to investigating optimal Katos smoothing estimates, which states that we have an extra gain of regularity for solutions to Cauchy problem of Schrödinger equations by taking an integral mean in the time variable. Rather less is known about the optimal constants and their extremisers for trace theorems and smoothing estimates except for Simons work in 1992 which treats only restricted cases. We provide an explicit formula and new observations in a general setting. The talk is based on joint work with Neal Bez (Saitama University) and other collaborators.

12. Hanli Tang, Beijing Normal University, China

Title: The Improved Moser-Trudinger Inequality to Any Domain Satisfying the Poincaré Inequality.

Abstract: In this talk, we first set up the Lions' lemma to any domain satisfying the Poincaré inequality. Then we establish some improved Moser-Trudinger inequality. At last, we prove the existence of the extremal function for this inequality.

13. Baoxiang Wang, School of Mathematical Sciences, Peking University, China

Title: Local Well-Posedness for the Derivative Nonlinear
Schrödinger equations in subcritical modulation spaces

Abstract: Considering the Cauchy problem for the derivative nonlinear Schrödinger equation (DNLS)

$$\mathrm{i}u_t + \partial_{xx}^2 u = \mathrm{i}\mu\partial_x(|u|^2 u), \quad u(0,x) = u_0(x),$$

we will show its local well-posedness in modulation spaces $M_{2,p}^{1/2}(\mathbb{R})$ $(2 \le p < \infty)$. It is known that DNLS has a critical Sobolev space $H^{1/2}$ so that it is locally well-posed (ill-posed) in H^s if $s \ge 1/2$ $(s < 1/2)$. On the other hand, its scaling critical space is L^2, which means that there is a gap between L^2 and $H^{1/2}$ for the local well-posedness of DNLS. Noticing that that $M_{2,p}^{1/2} \subset B_{2,p}^{1/p}$ is a sharp embedding and $B_{2,\infty}^0$ has the same regularity as L^2, our result contains all of the subcritical cases in $M_{2,p}^{1/2}$. This is a joint work with S. M. Guo and X. F. Ren.

14. Meng Wang, Zhejiang University, China

Title: Integral Restriction for Bilinear Operators

Abstract: We consider the integral domain restriction operator T_Ω for certain bilinear operator T. We obtain that if (s, p_1, p_2) satisfies $\frac{1}{p_1} + \frac{1}{p_2} \geq \frac{2}{\min\{1,s\}}$ and $\|T\|_{L^{p_1}\times L^{p_2}\to L^s} < \infty$, then $\|T_\Omega\|_{L^{p_1}\times L^{p_2}\to L^s} < \infty$. For some special domain Ω, this property holds for triplet (s, p_1, p_2) satisfying $\frac{1}{p_1} + \frac{1}{p_2} > \frac{1}{\min\{1,s\}}$.

15. Silei Wang, Zhejiang University, China

Title: Hausddorff Operators on Hardy Spaces

Abstract: (1). The boundedness on Hardy space $H^1(\mathbb{R})$ of the following Hausdorff operator

$$\mathcal{H}_\phi(f)(x) = (\mathcal{H}f)(x) := \int \frac{1}{|t|} f(\frac{x}{t})\phi(t)dt,$$

was first proved in [1] by using Hilbert transforms and complex analysis. In this note, a direct and simple proof is given.

(2). The following problem was raised in [2] (Problem 3): If $(\mathcal{H}_\phi)(f)(x)$ for an integral f is in $H^1(\mathbb{R})$, then f is necessarily in $H^1(\mathbb{R})$. If not, a counterexample should be given. We give a negative answer in this note.

(3). A more deeper problem motivated by (2) is naturally posed: If $\mathcal{H}_\phi(f)(x)$ for integral f and ϕ is in $H^1(\mathbb{R})$, then is it true that either f or ϕ must be in $H^1(\mathbb{R})$? A positive answer is given.

References

[1] E. Lyfyand and F. Morlicz, The Hausdorff operator is bounded on the real Hardy space $H^1(\mathbb{R})$, Proc. Amer. Math. Soc. 128(2000), 1391-1396.

[2] E. Lyfyand, Open problems on Hausdorff operators, Comples analysis and potential theory, Proc. of the conference sattlite to ICM 2006, Istanbul, Turkey, 2006, 280-284.

16. Xing Wang, Wayne State University, USA

Title: Pointwise Cnvergence of Solutions to Schrödinger Equation on Manifold

Abstract: Let (M_n, g) be a compact Riemannian manifold boundary. We prove that the solution to free Schrödinger equation on (M_n, g) converges pointwisely to its initial data, which is assumed to be in some Sobolev space $H^\alpha(M)$.

17. Xiaohua Yao, Central China Normal University, China

Title: The L^p-Limiting Absorption Principle for Schrödinger Operator and Applications to Spectral Multipliers

Abstract: In this talk I will mainly address the L^p limiting absorption principle for Schrodinger operator $H = -\Delta + V$ and applications to sharp spectral multiplier associated with H. Furthermore, I also consider general elliptic operator $P(D) + V$ and fractional operator $(-\Delta)^\alpha + V$ for any $\alpha > 0$. We should emphasize that the uniform Sobolev estimates of Δ, $P(D)$ and $(-\Delta)^\alpha$ will play fundamental roles in potential cases, which proof are closely related to Fourier analysis.

18. Lu Zhang, University of Binghamton, USA

Title: L^p Estimates for Some Pseudo-differential Operators

Abstract: We study the Hölder's type L^p estimates for a class of pseudo-differential operators in one and bi-parameter setting. Such operators include some trilinear pseudo-differential differential operators with symbols as products of two Hömander class $BS^0_{1,0}$ functions defined on lower dimensions, and also a bi-parameter bilinear Calderón-Vaillancourt theorem, where the symbols are taken from the bi-parameter Hömander class $BBS^m_{0,0}$.

19. Maochun Zhu, Jiangsu University, China

Title: Sharpened Trudinger-Moser Inequalities in the Euclidean Spaces and Concentration-Compactness Principle on the Heisenberg Group

Abstract: In this talk, I will report two recent works on the well-known Trudinger-Moser inequalities. The first one is a sharp Trudinger-Moser type inequality involving L^n norm in $\mathbb{R}^n$: let $W^{1,n}(\mathbb{R}^n)$ be the standard Sobolev space and $\|\cdot\|_n$ the L^n norm. We derive a sharpened Trudinger-Moser inequality:

$$\sup_{\|u\|_{W^{1,n}(\mathbb{R}^n)}=1} \int_{\mathbb{R}^n} \Phi\left(\alpha_n |u|^{\frac{n}{n-1}} \left(1+\alpha \|u\|_n^n\right)^{\frac{1}{n-1}}\right) dx < +\infty$$

where $\Phi(t) = e^t - \sum_{j=0}^{n-2} \frac{t^j}{j!}$, for any $0 \leq \alpha < 1$, and the supremum is infinity for all $\alpha \geq 1$. Moreover, we prove the supremum is attained when α is small enough. The proof is based on the method of blow-up analysis of solutions to PDEs.

The second one is about the concentration-compactness principle of P.L.Lions on the setting of Heisenberg groups $\mathbb{H}^n$: Let $\mathbb{H}^n = \mathbb{C}^n \times \mathbb{R}$ be the n-dimensional Heisenberg group, $Q = 2n+2$ be the homogeneous dimension of $\mathbb{H}^n$. We extend the well-known concentration-compactness principle of P.L. Lions to the setting of Heisenberg groups $\mathbb{H}^n$; Furthermore, we obtain the corresponding concentration-compactness principle for the Sobolev space $HW^{1,Q}(\mathbb{H}^n)$. Our result extends the sharp Trudinger-Moser inequality by Cohn and Lu (2001) for domains of finite measure on $\mathbb{H}^n$ and the corresponding one by Lam and Lu (2012) for domains in $\mathbb{H}^n$ of infinite measure. These are joint works with Prof. G. Lu.