# The 11th East Asian conference in Harmonic Analysis and Applications

Date: August 15 (Thur.) - 19 (Mon.), 2024
Place: 5th floor of International Science Innovation Building (No. 69), Kyoto University Access

## – – –Abstracts– – –

### Plenary talks: 50 min.

- Guozhen Lu, (University of Connecticut),
  Date: 15th 10:00 - 10:50, (This is an **Online** talk.)
  - Title: *Fractional GJMS operators on hyperbolic spaces and Sharp fractional Hardy-Sobolev-Maz'ya inequalities.*
  - Abstract: GJMS operators have played an important role in conformal geometry. While the GJMS operators of integer order are explicitly known on the hyperbolic space, the explicit formula of the fractional order GJMS operators have remained open. Using the scattering theory and Helgason-Fourier analysis, we will find the explicit formulas of such operators. Sharp fractional order Poincaré-Sobolev and Hardy-Maz'ya-Sobolev inequalities with best constants will be established as applications. This is joint work with Q. Yang.
- Doowon Koh, (Chungbuk National University),
  Date: 15th 16:10 - 17:00.
  - Title: *Restriction estimates over finite fields and their applications to certain combinatorial problems.*
  - Abstract: In 2004, Mochkenhaupt and Tao initially studied the Fourier restriction problems for various algebraic varieties over finite fields. The purpose of this talk is to address some connections between those problems and combinatorial problems over finite fields. First, we review the restriction problems for algebraic varieties over finite fields. Second, we introduce the following three combinatorial problems over finite fields: the Erdös-Falconer distance problem, the point-plane incidence problem, and the orthogonal projection problem over finite fields. Finally, we address how results on those problems are deduced from the finite field restriction estimates for algebraic varieties such as spheres and cones.

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- Koichi Taniguchi, (Shizuoka University),
  Date: 16th 10:00 - 10:50.
  - Title: *On characterization of boundedness of composition operators on Besov spaces.*
  - Abstract: We consider the boundedness of composition operators on Besov spaces $B^s_{p,q}$. While the boundedness has been studied for the lower order case $0 < s < 1$, there are few results for the higher order case $s > 1$. In this talk, we discuss the boundedness for inhomogeneous Besov spaces on one dimensional Euclidean space in the higher order case and provide its necessary and sufficient conditions. The key point of the proof is to reveal a relation between the composition operators and

pointwise multiplication operators of Besov spaces, where the characterizations of the pointwise multipliers are effectively used. This talk is based on a joint work with Isao Ishikawa (Ehime University) and Masahiro Ikeda (RIKEN / Keio University).

- Xiangxing Tao, (Zhejiang University of Science and Technology), Date: 16th 16:10 - 17:00.
  - Title: *On the $Tb$ theorem for some singular integral operators over space of homogeneous type.*
  - Abstract: We will discuss and establish the $Tb$ theorems for the boundedness of the Calderón-Zygmund singular integral operator with non-convolution kernel on these new inhomogeneous Besov and Triebel-Lizorkin spaces. We will also introduce the $T1$ theorem for generalized non-standard singular integrals with product kernels associated to mixed homogeneities, which extends those non-standard convolution singular integrals introduced by Phong and Stein. This is a joint work with Y. Han, S. Krantz, T. Zheng, etc.

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- Ji Li, (Macquarie University), Date: 18th 10:00 - 10:50.
  - Title: *Schatten properties of Riesz transform commutator in the two weight setting.*
  - Abstract: Schatten class estimates of the commutator of Riesz transform in $\mathbb{R}^n$ link to the quantised derivative of A. Connes. A general setting for quantised calculus is a spectral triple $(\mathcal{A}, \mathcal{H}, D)$, which consists of a Hilbert space $\mathcal{H}$, a pre-$C^*$-algebra $\mathcal{A}$, represented faithfully on $\mathcal{H}$ and a self-adjoint operator $D$ acting on $\mathcal{H}$ such that every $a \in A$ maps the domain of $D$ into itself and the commutator $[D, a] = Da - aD$ extends from the domain of $D$ to a bounded linear endomorphism of $\mathcal{H}$. Here, the quantised differential $đa$ of $a \in \mathcal{A}$ is defined to be the bounded operator $\mathrm{i}[\mathrm{sgn}(D), a]$, $\mathrm{i}^2 = -1$. We provide full characterisation of the Schatten properties of $[M_b, R_j]$, the commutator of the $j$-th Riesz transform on $\mathbb{R}^n$ with symbol $b$ ($M_b f(x) := b(x)f(x)$), in the two weight setting. The approach is not depending on the Euclidean structure or Fourier, and hence it can be applied to other settings. This talk is based on my recent work joint with Michael Lacey, Brett Wick and Liangchuan Wu.

- Jinmyoung Seok, (Seoul National University), Date: 18th 15:20 - 16:10.
  - Title: *Quantum and classical models of stars and their consistency.*
  - Abstract: In this talk, I introduce two kinds of mathematical models of stars, one is described in quantum regime and the other is in classical regime. The former is formulated as a minimizer of Hartree-Fock energy subject to the mass. Similarly, the latter is formulated as a minimizer of Vlasov-Poisson energy subject to the mass. My interest lies in the consistency of them via the semi-classical limit. The Lieb-Thirring inequality and Weyl's law applied in a variational setting play prominent roles for the proof.

- Yutaka Terasawa, (Nagoya University), Date: 18th 16:30 - 17:20.
  - Title: *Asymptotic behavior of solutions to elliptic equations in 2D exterior domains.*

– Abstract: We study the asymptotic behavior of solutions to some class of linear second order elliptic equations in exterior domains. In particular, under the assumption that the solution belongs to the Lorentz space $L^{p,q}$ or the weak Lebesgue space $L^{p,\infty}$ and with certain conditions on the coefficients of the equation, we give a natural and almost sharp pointwise estimate of the solution at spatial infinity. The proof is based on the argument by Korobkov–Pileckas–Russo ('19), in which the decay property of the solution to the vorticity equation of the two-dimensional Navier–Stokes equations was studied. This talk is based on a joint work with Hideo Kozono (Waseda University/ Tohoku University) and Yuta Wakasugi (Hiroshima University).

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- Toru Nogayama, (Tokyo University of Science),
  Date: 19th 10:00 - 10:50.
  - Title: *Weighted maximal inequalities for local Bourgain–Morrey spaces.*
  - Abstract: In this talk, we consider the boundedness of the Hardy–Littlewood maximal operator on weighted local Bourgain–Morrey spaces. The function spaces which we call " Bourgain-Morrey spaces " were introduced by Bourgain. He used this space to refine the Strichartz estimate. The Bourgain–Morrey space is applied to various partial differential equations. There are some types of weighted (Bourgain-) Morrey spaces. We concentrate on the Samko type and the Komori–Shirai type. In particular, we consider the case of the power weight $|\cdot|^\beta$, ($\beta \in \mathbb{R}$) and give the range of the parameter $\beta$ for which the maximal operator is bounded on each space.
- Hongquan Li, (Fudan University),
  Date: 19th 16:10 - 17:00.
  - Title: *Centered Hardy-Littlewood Maximal Functions on H-Type Groups Revisited.*
  - Abstract: Using the method of stationary phase, we obtain the uniform asymptotic behavior of the Poisson kernel, associated to the canonical sub-Laplacian as well as the full Laplacian, on Heisenberg-type groups $\mathbb{H}(2n, m)$. We prove that there exists a constant $C > 0$, independent of $(n, m)$, such that $\|M_K\|_{L^1 \to L^{1,\infty}} \leq C\, n$, where $M_K$ denotes the centered Hardy-Littlewood maximal operator defined by the Korányi norm. While for $M = M_{CC}$ or $M_R$, the corresponding operator related to the canonical sub-Riemannian and Riemannian distance respectively, we obtain $\|M\|_{L^1 \to L^{1,\infty}} \leq C\,(3/2)^{\frac{m}{2}}\, n$. In particular, we provide an affirmative answer to the question left open in Li-Qian TAMS 14' by means of a much simpler method. Besides, these bounds are perfectly matched with the associated Green function. Furthermore, the $(3/2)^{\frac{m}{2}}\, n$ order bound remains uniformly valid, whenever the canonical Sub-Riemannian or Riemannian distance are replaced by a large class of Carnot-Carathéodory distances. This a work with Cheng Bi and Ye Zhang.

Talks: 30 min.

- Satoshi Masaki, (Hokkaido University),
  Date: 15th 11:10 - 11:40.
  - Title: *Small data scattering for NLS with a homogeneous nonlinearity in the weighted space.*
  - Abstract: In this talk, we consider the nonlinear Schrödinger equation with a general homogeneous nonlinearity in one and two dimensions. It is shown by Kato (1994) that, when the power of the nonlinearity is bigger than the Strauss exponent, the small data global well-posedness and scattering are established for a wide class of homogeneous nonlinearity using the exotic Strichartz estimates. On the other hand, when the degree is less than the Strauss exponent, these properties are not always guaranteed. Affirmative results are known for the case where the nonlinearity is gauge-invariant. However, GWP fails even for small data in certain classes of nonlinearity. We identify a class of nonlinearities, including non-gauge-invariant ones, for which small data GWP and scattering hold in the standard weighted space.
- Ye Zhang, (Okinawa Institute of Science and Technology),
  Date: 15th 11:10 - 11:40.
  - Title: *Loomis-Whitney inequalities on Heisenberg groups.*
  - Abstract: In this talk I will first recall some basic results about Brascamp-Lieb inequalities on Euclidean spaces. Then I will present some recent progress of nonlinear Brascamp-Lieb inequalities. Finally, by the equivalence between the Brascamp-Lieb inequality and the subadditivity of the entropy, I will deduce the Loomis-Whitney inequality on higher dimensional Heisenberg groups based on the one on the first Heisenberg group.
- Kiyeon Lee, (KAIST),
  Date: 15th 12:00 - 12:30.
  - Title: *The global dynamics for the Maxwell-Dirac system.*
  - Abstract: In this talk, we study the $(1+3)$ dimensional massive Maxwell-Dirac system in the context of global existence and asymptotic behavior of solutions under the Lorenz gauge condition, as well as the modified and linear scattering phenomena for the Dirac spinor and the electromagnetic potential, respectively. The primary ingredients of this talk are a vector fields energy method combined with a detailed analysis of the space-time resonance argument. This approach allows us to establish decay estimates and energy bounds crucial for proving the main theorems. Especially, we provide the explicit phase correction arising from the strong nonlinear resonances.
- Takeshi Kawazoe, (Keio University),
  Date: 15th 12:00 - 12:30.
  - Title: *On Hardy spaces on Riemannian symmetric spaces of rank one.*
  - Abstract: Let $G/K$ be a Riemannian symmetric space and $K/M$ the boundary of $G/K$. As an analogue of the classical case, for $h \in L^p(K/M)$, $1 \leq p < \infty$, the Poisson transform $P_\lambda h(ka)$ has a boundary value and $\lim_{a\to\infty} \phi_\lambda(a)^{-1} P_\lambda h(ka) = h(k)$. The

Hardy space $\mathcal{H}^p_\lambda(G/K)$ can be defined as the space of analytic functions on $G/K$ satisfying $\Delta H = \chi(\Delta)H$ and

$$\sup_{a\in A} \phi_{\Re\lambda}(a)^{-1}\Big(\int_K |H(ka)|^p dk\Big)^{\frac{1}{p}} < \infty.$$

On $K/M$, $\mathcal{H}^p_\lambda(K/M)$ is defined as the space of the boundary values (see [1], [2], [3]). On the other hand we can also define a real Hardy space on $H^p(G/K)$ by using a radial maximal operator. Originally, these spaces are independent objects and have no known relationships. In this talk, let $G = SU(1,1)$; $G/K = D = \{|z| < 1\}$ and $K/M = \partial D = \mathbb{T}$. We shall consider a modified Poisson transform $\mathcal{P}_\lambda h(ka) = \phi_\lambda(a^*)^{-1} P_\lambda h(ka^*)$ for $h \in \mathcal{H}^1_\lambda(K/M)$. Then we show that for $F \in H^1(G/K)$,

$$\|F *_{K/M} \mathcal{P}_\lambda h\|_{H^1(G/K)} \le c\|F\|_{H^1(G/K)}\|h\|_{\mathcal{H}^1_\lambda(K/M)}.$$

[1] E. P. van den Ban and H. Schlichtkrull, Asymptotic expansions and boundary values of eigenfunctions on a Riemannian symmetric spaces, J. Reine Angrew. Math. 380 (1987), 108-165.

[2] H. L. Michelson, Fatou theorems for eigenfunctions of the invariant differential operators on symmetric spaces, Hans. Amer. Math. Soc. 177 (1973), 257-274.

[3] Salem Ben Saïd, T. Oshima, N. Shimeno, Fatou's theorems and Hardy-type spaces for eigenfunctions of the invariant differential operators on symmetric spaces, Intern. Math. Research Notice, 16 (2003), 915-931.

- Naoya Hatano, (Chuo University),
  Date: 15th 14:30 - 15:00.
  - Title: *Boundedness of composition operators from Lorentz spaces to Orlicz spaces.*
  - Abstract: The boundedness (continuity) of composition operators from some function space to another one is significant, though there are few results about this problem. Thus, in this talk, we introduce necessary and sufficient conditions on the boundedness of composition operators from Lorentz spaces to Orlicz spaces. We emphasize that the measure spaces associated with the Lorentz space may be different from those associated with the Orlicz spaces. Moreover we give some examples and counterexamples of the composed mappings in the conditions.
- Jun Cao, (Zhejiang University of Technology),
  Date: 15th 14:30 - 15:00.
  - Title: *On the relative-boundedness of Schrödinger operators.*
  - Abstract: Relative boundedness is a fundamental property appearing in the study of Schrödinger operators. From the perspective of perturbation theory, it can extend many desirable properties of the Laplace operator (such as self-adjointness and spectral information) to Schrödinger operators, by assuming the potential engergy sufficiently small. In this report, we motivate the study of relative boundedness from the heat kernel estimate for Schrödinger operators. We primarily focus on three types of relative boundedness and their respective characterizations. Additionally, we discuss how these characterizations are connected to harmonic analysis tools such as capacity, Carleson measures, sparse control, and inverse Hölder classes.
- Lu Chen, (Beijing Institute of Technology),
  Date: 15th 15:20 - 15:50.
  - Title: *Some new progress on quantitative stability of geometric inequality.*

– Abstract: In this talk, we will first introduce the sharp geometric inequality and their stability. Then we present recent progress on the quantitative stability for Hardy-Littlewood-Sobolev (HLS) inequality, fractional Sobolev inequality and trace Sobolev inequality. Finally, we also will discuss the optimal asymptotic lower bound for stability of HLS , fractional Sobolev inequality and Log Sobolev inequality on the sphere. This talk is based on the joint work with Prof. Lu from Connecticut University and Prof. Tang from Beijing Normal University.

- In-Jee Jeong, (Seoul National University),
  Date: 15th 15:20 - 15:50.
  - Title: *Degenerate dispersive equations and wave packets.*
  - Abstract: Degenerate dispersive PDEs appear in various areas of physics. Unlike their non-degenerate counterparts, wellposedness for those is a very subtle issue. This issue can be understood in terms of high frequency wave packets, which are roughly speaking highly oscillatory Gaussian-like approximate solutions. We explain main ideas that go into the construction of wavepackets, and how to interpret consequences for wellposedness.

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- Yanping Chen, (University of Science and Technology Beijing),
  Date: 16th 11:10 - 11:40.
  - Title: *An extension of Calderón-Zygmund type singular integral with non-smooth kernel.*
  - Abstract: This talk is concerned with a kind of singular integrals which can be viewed as an extension of the classical Calderón-Zygmund type singular integral. This kind of singular integrals appears in the SQG equation.
- Sukjung Hwang, (Chungbuk National University),
  Date: 16th 11:10 - 11:40.
  - Title: *Nonlinear diffusion equation with a divergence form of drift.*
  - Abstract: In this talk, we introduce recent results of the porous medium (PME) and fast diffusion equation (FDE) with a divergence form of drifts that can apply to certain reaction-diffusion equations including the Keller-Segel model. One of the main ingredients is understanding appropriate functional classes of drifts determined by nonlinear diffusion and initial data.
- Yohei Tsutsui, (Kyoto University),
  Date: 16th 12:00 - 12:30.
  - Title: *Two-weight inequality for the heat flow and solvability of Hardy-Hénon parabolic equation.*
  - Abstract: We provide two-weight inequalities for the heat flow on the whole space by applying the sparse domination and a result by Fackler-Hytönen. Then, we consider the local and global existence of solutions to Hardy-Hénon parabolic equation, which has a potential belonging to a Muckenhoupt class.
- Maochun Zhu, (Nanjing University of Science and Technology),
  Date: 16th 12:00 - 12:30.

– Title: *Existence of ground state solutions for nonlinear PDEs with exponential critical growth involving the constant and trapping potentials.*

– Abstract: In this talk we will present our recent work concerning the existence of ground state solutions for nonlinear PDEs with exponential critical growth involving the constant and trapping potentials. Assume that the nonlinearity $f(t)$ has critical exponential growth at infinity which is given by the Adams inequalities, that is, there exists some $\alpha_0 > 0$ such that

$$\lim_{t\to\infty} \frac{f(t)}{e^{\alpha t^2}} = \begin{cases} 0, & \text{if } \alpha > \alpha_0, \\ +\infty, & \text{if } \alpha < \alpha_0, \end{cases}$$

we prove the existence of ground state solutions for bi-harmonic equations

$$\Delta^2 u + V(x)u = f(u) \quad \text{in } \mathbb{R}^4$$

when $V(x)$ is the constant potentials or trapping potential:

$$0 < \gamma < \inf_{x\in\mathbb{R}^4} V(x) < \lim_{|x|\to\infty} V(x) = \tau.$$

Furthermore, we discuss existence of ground state solutions for sub-Laplacian Schröodinger equation with exponential critical growth which is given by the Trudinger-Moser inequalities on the the $n$-dimensional Heisenberg group $H_n$,

$$-div_H(|\nabla_H u|^{Q-2}\nabla_H u) + V(x)u = f(u) \quad \text{in } H_n.$$

when $V(x)$ is the constant potentials or trapping potential. This part of the talk is based on joint work with Guozhen Lu and Lu Chen.

- Chu-Hee Cho, (Seoul National University),
  Date: 16th 14:30 - 15:00.

  – Title: *Bourgain's counterexample in the sequential convergence problem for the Schrödinger equation.*

  – Abstract: We study the problem of pointwise convergence for the Schrödinger operator on $\mathbb{R}^n$ along time sequences. We show that the sharp counterexample to the sequential Schrödinger maximal estimate given recently by Li, Wang and Yan based in the construction by Luc and Rogers can also be achieved with the construction of Bourgain, and we extend it to the fractal setting. This talk is based on the joint work with Daniel Eceizabarrena.

- Kotaro Inami, (Nagoya University),
  Date: 16th 14:30 - 15:00.

  – Title: *Local $L^p$ smoothing estimates for Schrödinger equations in modulation spaces.*

  – Abstract: The local smoothing estimate for Schrödinger equations in modulation spaces is first introduced by Schippa(2022). Schippa proved it via $\ell^2$ decoupling inequality. We show a new local smoothing estimate in modulation spaces in one-dimensional cases using the Córdoba-Fefferman type $L^4$ reverse square function estimate.

- Naoto Shida, (Nagoya University),
  Date: 16th 15:20 - 15:50.

  – Title: *Bilinear oscillatory Fourier multipliers.*

– Abstract: In this talk, we consider bilinear Fourier multipliers that contain some oscillatory factors. In particular, we consider the boundedness of these operators between Lebesgue spaces including endpoint cases. Our results improve Bergfeldt, Rodriguez-Lopez, Rule and Staubach's results for the case of bilinear Fourier multiplier operators. This talk is based on a joint work with Tomoya Kato, Akihiko Miyachi and Naohito Tomita.

- Changkeun Oh, (Seoul National University),
  Date: 16th 15:20 - 15:50.
  - Title: *On the small cap decoupling for the moment curve in* $\mathbb{R}^3$.
  - Abstract: In this talk, I'll introduce exponential sum estimates, and present recent work on the small cap decoupling for the moment curve in $\mathbb{R}^3$. This is joint work with Dominique Maldague.

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- Motofumi Aoki, (Kyoto University),
  Date: 18th 11:10 - 11:40.
  - Title: *On the ill-posedness for compressible Navier–Stokes equations in three dimensions.*
  - Abstract: In this talk, we consider the Cauchy problem for the compressible Navier–Stokes equations describing the motion of an ideal gas. The Cauchy problem has been considered in the scaling critical spaces of the homogeneous Besov spaces. In the two-dimensional case, Iwabuchi-Ogawa showed the ill-posedness of the Cauchy problem for the equations. In the three-dimensional case, Chikami-Danchin showed the unique solvability when the exponent $p$ is less than 3, and Chen-Miao-Zhang demonstrated the ill-posedness when the exponent $p$ is greater than 3. However, it has been unknown whether or not it is well-posed when $p = 3$. We show that the Cauchy problem is ill-posed by constructing a sequence of initial data, proving that the solution map is discontinuous. This talk is based on a joint work with Professor Tsukasa Iwabuchi (Tohoku University).
- Kangwei Li (Tianjin University),
  Date: 18th 11:10 - 11:40.
  - Title: *Endpoint multilinear restricted weak type extrapolation theorem.*
  - Abstract: In this talk I will present a generalization to the context of multilinear Muckenhoupt classes of the endpoint extrapolation theorem on restricted weights due to Carro, Grafakos and Soria.
- Liguang Liu, (Renmin University of China),
  Date: 18th 12:00 - 12:30.
  - Title: *Heat Kernel Constructions on Metric Measure Spaces.*
  - Abstract: We will talk about a new method of constructing stochastic complete stable-like heat kernels on general metric measure spaces satisfying the volume doubling and reverse volume doubling conditions. This is based on our recent works jointed with J. Cao, A. Grigor'yan and E. Hu.
- Ryota Kawasumi, (Kobe Gakuin University),
  Date: 18th 12:00 - 12:30.

- Title: *Pointwise convergence using deep neural networks or the Fourier series theory.*
- Abstract: In this talk, we consider pointwise convergence for the indicator function. We use two methods: (i) Fourier series cases and (ii) deep neural network cases. First, we introduce Fourier series and diverges for Kuratsubo (2010). Next, we define a specific deep neural network and prove pointwise convergence in the neural network. To show pointwise convergence in the neural network, we use the gradient descent method. This is a joint work with Tsuyoshi Yoneda(Hitotsubashi Univ.).

- Qingying Xue, (Beijing Normal University),
  Date: 18th 14:30 - 15:00.
  - Title: *On the boundedness of Calderón commutators.*
  - Abstract: It is well known that the Calderón's commutator plays an important role in Harmonic analysis. In this talk, I will briefly review its developmental history and present some of our recent results, particularly the endpoint weak-type estimates for its maximal operator. This is a joint work with Guoen Hu, Xiangxing Tao and Xudong Lai.

- Kwan Woo, (UNIST),
  Date: 18th 14:30 - 15:00.
  - Title: *Fabes-Stroock Approach to Elliptic Equations with Singular Drift.*
  - Abstract: The Alexandrov-Bakel'man-Pucci (ABP) estimate is one of the most pivotal tools in the regularity theory of fully nonlinear elliptic equations. The ABP estimate was originally formulated independently by Aleksandrov (1960) and Bakel'man (1961), and its importance was re-discovered by Pucci (1966). (The essential idea was already presented by Aleksandrov in 1958.) Since then, the ABP estimate has been refined and generalized in various ways. Notably, Fabes and Stroock (1984) proved higher integrability of Green's function when the drift term is zero, allowing for a refined version of the ABP estimate. In this regard, Krylov (2021) proved a Fabes-Stroock type ABP estimate even in the presence of singular drifts, by means of probability theory. In this talk, we will briefly review the ABP estimate and introduce the Fabes-Stroock type approach for Green's functions and the refined ABP estimate. This is a joint work with Pilgyu Jung (SKKU).

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- Taiki Takeuchi, (Kyoto University),
  Date: 19th 11:10 - 11:40.
  - Title: *The Lorentz-Chemin-Lerner space and its characterizations.*
  - Abstract: In this talk we define the Lorentz-Chemin-Lerner spaces, where the classical Chemin-Lerner spaces were initially introduced by Chemin and Lerner (1995) to analyze the Navier-Stokes system. We first summarize our motivation from the space-time estimates for the heat semigroup shown by Kozono and Shimizu (2019), and then we compare them with the corresponding estimates in the Lorentz-Chemin-Lerner spaces. As our main results of this talk, we show that the Lorentz-Chemin-Lerner spaces may be characterized as the real interpolation spaces of the classical Chemin-Lerner spaces.

- Jinsol Seo, (KIAS),
  Date: 19th 11:10 - 11:40.
  - Title: *$L^p$ theory for the Poisson equation in non-smooth domains.*

– Abstract: The Poisson equation ($\Delta u = f$) is one of the most fundamental and classical PDEs, and its $L^p$ theory is important for the regularity of solutions. In this presentation, we introduce a general $L^p$ unique solvability result for the Poisson equation in non-smooth domains, together with its applications based on a relation between the Hardy inequality, superharmonic functions, and various domain conditions. We consider the local harmonic measure decay condition, the exterior cone condition, convex domains, the exterior Reifenberg condition, and domains whose Aikawa codimensions are larger than 2.

- Sewook Oh, (KIAS),
Date: 19th 12:00 - 12:30.

  – Title: *Semiclassical $L^p$ quasimode restriction estimates in two dimensions.*

  – Abstract: For measuring possible concentrations of the eigenfunctions of the Laplace operator on a manifold, Burq-Gerard-Tzvetkov studied $L^p$ norm of the restrictions of the eigenfunctions to submanifolds. They proved sharp $L^p$ estimates restricted to the geodesic or a curve having nonvanishing geodesic curvature. Later, Tacy and Hassel-Tacy generalized their results to a semiclassical setting. In this talk, I will talk about sharp $L^p$ quasimode estimates restricted to a curve which is not geodesic and has vanishing geodesic curvature. We observe that $L^p$ quasimode estimates restricted to a curve is determined by the contact order of curve and the geodesics.

- Xiaohua Yao, (Central China Normal University),
Date: 19th 12:00 - 12:30.

  – Title: *$L^p$ estimates related to Scattering theory.*

  – Abstract: In this talk, I firstly review classical scattering theory for Schrödinger operator $-\Delta + V$, including limiting absorption principle, the existence and asymptotic complete of wave operators in the context of $L^2$. Such the theory also works well for higher order Schrödinger operator $P(D) + V$, including particularly polyharmonic operator $(-\Delta)^m$, with $m \geq 2$. Secondly, we will report some recent works on $L^p$ estimates of higher order wave operators generated by $(-\Delta)^m + V$. These are joint-works with Haruya Mizutani and Zijun Wan.

- Jeongtae Oh, (Yonsei University),
Date: 19th 14:30 - 15:00.

  – Title: *Some remarks on spherical maximal operator on Heisenberg group.*

  – Abstract: In this talk, we start by discussing the maximal operators associated to dilates of codimension two spheres in the Heisenberg group, as introduced by Nevo and Thangavelu. We present several historical results related to the operator. Additionally, we introduce the Lacunary Elliptic Maximal Operator on the Heisenberg group and explain the motivation of this work. This is joint work with Joonil Kim.

- Hiroki Ohyama, (Kyoto University),
Date: 19th 14:30 - 15:00.

  – Title: *Fast rotation limit for the magnetohydrodynamics equations in a 3D layer.*

  – Abstract: We consider the initial value problem for the incompressible magnetohydrodynamics system with the Coriolis force in a three-dimensional infinite layer. We prove the unique existence of global solutions for initial data in the scaling invariant space when the speed of rotation is sufficiently high. Moreover, we show that its global solution converges to that of the coupled system of the 2D incompressible

magnetohydrodynamics equations and the 3D induction equations as the rotation speed tends to infinity. This is based on a joint work with Keiji Yoneda.

- Jungang Li, (University of Science and Technology of China), Date: 19th 15:20 - 15:50.
  - Title: *Sobolev type and Moser type inequalities on hyperbolic spaces and applications.*
  - Abstract: The hyperbolic space is one of the most important space forms other than the Euclidean spaces. Sharp geometric inequalities, together with related PDE problems on hyperbolic spaces, used to be studied in a more Euclidean manner. With the help of Helgason-Fourier analysis, a direct approach was initiated by Lu and Yang in their work about Hardy-Sobolev-Maz'ya inequalities. In this talk, I will first report some recent progress on sharp geometric inequalities on hyperbolic spaces. As applications, I will introduce how these results help to the study of some nonlinear PDEs', including the existence and classification of solutions.
- Yehyun Kwon, (Changwon National University), Date: 19th 15:20 - 15:50. (This is an **Online** talk.)
  - Title: *Estimates for spherical harmonic projection and unique continuation for the Schröodinger operators.*
  - Abstract: In this talk, we obtain sharp $L^p$-$L^q$ estimates for the difference between spherical harmonic projection and deduce strong unique continuation properties for the fourth order Schrödinger operators with critical singular potentials.