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Perturbed Dyadic Cubes for Schrödinger Operators with Potentials $\|x\|^a$ with $a \in [-2, +\infty)$ and Their Applications

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Abstract: Let $L = -\Delta + \|x\|^a$ with $a \in [-2, +\infty)$. In this talk, we introduce a new method to construct dyadic cubes that reflects the intrinsic geometry of L. Then using the quantitative geometric information of the dyadic cubes, we characterize the L^p operator norm of the Riesz potential $L^{-\alpha/2}$ for all $\alpha \in (0, 2]$ and $p \in (1, \infty)$. As applications, some quantitative spectral estimates for L are given.

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Weighted Inequalities for Variation Operators Associated with Fractional Schrödinger Semigroups

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Abstract: Let $\{e^{-tL^\alpha}\}_{t>0}$ be the fractional Schrödinger semigroup associated with $L = -\Delta + V$, where V is a non-negative potential belonging to the reverse Hölder class. In this talk, we investigate weighted boundedness properties of the associated variation operator. We establish quantitative weighted L^p estimates as well as mixed weak-type inequalities at the endpoint $p = 1$, from which the weighted weak-type (1,1) inequality follows.

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On the Relationship Between Block Spaces and Orlicz Spaces

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Abstract: Let $1 < q \le \infty$ and $v > -1$. Let (X, d, μ) be a s-Ahlfors-regular quasi-metric measure space. In this paper, we study the relationship between the block space $B_q^{0,v}(X)$ and the Orlicz-type space $L(\log^+ L)^{1+v}(X)$. More precisely, we show that the block space $B_q^{0,v}(X)$ is a strictly proper subspace of the Orlicz space $L(\log^+ L)^{1+v}(X)$ for any fixed $1 < q \le \infty$ and $v > -1$. Namely,

$$B_q^{0,v}(X) \subsetneq L(\log^+ L)^{1+v}(X),$$

which gives a confirm answer to a longstanding open problem concerning the relationship between block spaces and Orlicz-type spaces on the unit sphere $\mathbb{S}^{n-1}$. We further show that $L(\log^+ L)^{1+v}(X)$ is the smallest Orlicz-type space containing $B_q^{0,v}(X)$. We also introduce a generalized block space $\mathscr{B}_q^{0,v}(X)$ that depends only on the measure structure and show that this space is equivalent to the Orlicz space $L(\log^+ L)^{1+v}(X)$. Finally, we consider two special cases that further clarify the roles of the parameter q and the logarithmic weight.

Anisotropic Damping and L^p Estimates for a Homogeneous Cusp Oscillatory Integral Model

Chuhee Cho (Korea University)

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Abstract: We study a class of oscillatory integral operators with cusp-type singularities. To handle the degeneracy, we introduce anisotropic damping adapted to the geometry of the singularity and establish sharp L^2 decay estimates for the resulting damped operators. We then combine these with Hardy space endpoint estimates and analytic interpolation to obtain L^p estimates for the original undamped operators. This is joint work with Jin Bong Lee and Chan Woo Yang.

On Rubio de Francia's Maximal Theorem

Seheon Ham (Seoul National University)

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Abstract: In his influential 1986 paper, Rubio de Francia established L^p bounds for the maximal function generated by dilations of measures μ whose Fourier transforms $\widehat{\mu}$ satisfy a specific decay condition. In this talk, we present results that complement his work in several directions: restricted weak-type endpoint bound on the maximal function and L^p-L^q bounds on its local variant. We also investigate how Frostman's growth condition on the measure influences such maximal bounds. This talk is based on joint work with Jiwon Kah, Sanghyuk Lee, and Ji Li.

From Noncommutative Bourgain's Circular Maximal Inequality to a Local Smoothing Estimate of Wave Equation on the Generalized Moyal Plane

Guixiang Hong (Harbin Institute of Technology)

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Abstract: In this talk, I shall present a joint work with Liang Wang on local smoothing estimates on the quantum Euclidean spaces and a noncommutative analogue of Bourgain's circular maximal inequalities.

The Uncertainty Principle: Exploring Its Many Facets

Shanlin Huang (Sun Yat-sen University)

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Abstract: The uncertainty principle lies at the heart of harmonic analysis, capturing a fundamental duality between physical space and frequency space. In this talk, we examine its far-reaching implications through two distinct yet interconnected aspects: first, its role in the unique continuation and control of solutions to the heat/Schrödinger equations; second, the Heisenberg uniqueness pair—a concept proposed by Hedenmalm and Montes-Rodríguez in 2011—along with its generalizations and variants.

Global Well-Posedness of the Primitive Equations in Scaling Critical Spaces

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Abstract: We consider the primitive equations, a fundamental model for oceanic and atmospheric dynamics. Global well-posedness results for large initial data in H^1 or, more generally, in $H^{2/p,p}$ are known. The aim of this talk is to establish global well-posedness for the problem with scaling critical initial data. Specifically, for $2 < p < \infty$, we assume that the vertical average of the initial data belongs to the homogeneous Besov space $\dot{B}^{-1+2/p}_{p,\infty}(\mathbb{R}^2)$, and that its high- and low-frequency tails vanish. The vertically mean-free part of the initial data is assumed to belong to appropriate anisotropic scaling critical spaces. The key idea of the proof is to reformulate the original problem as a coupled system consisting of the two-dimensional Navier–Stokes equations and the three-dimensional nonlinear heat equation. In view of the ill-posedness results for the Navier–Stokes equations, the corresponding well-posedness result fails in the limiting case $p = \infty$.

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Strichartz Estimates for Quasi-Periodic Functions: An Arithmetic Perspective

Kotaro Inami (Southern University of Science and Technology)

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Abstract: Besicovitch quasi-periodic functions are generalizations of periodic functions. A typical example is $\sin(x) + \sin(\sqrt{2}x)$. We consider the Strichartz type estimate for the Schrödinger equation with quasi-periodic initial data. Unlike the Euclidean setting and the periodic setting, neither the dispersive estimate nor the Weyl-type bound is known. In 2025, Schippa overcame this difficulty and established Strichartz type estimates via the decoupling estimate. In this talk, we improve the Strichartz estimates on a long time interval by focusing on the arithmetic properties of frequencies.

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Global Oscillatory Integral Operators with Polynomial Phases

Minbeom Kang (Yonsei University)

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Abstract: In the local theory of Phong and Stein, sharp L^2-decay of degenerate oscillatory integral operators is governed by the Newton polygon of the Hessian P_{xy}. In this talk, we present a global extension of this theory for polynomial phases in two variables by introducing a finite family of domain-adapted Newton polygons that captures the global geometry of the real zero set of P_{xy}. This gives a global analogue of the Phong–Stein theorem, taking the quasi-homogeneous case as a model. This is joint work with Joonil Kim.

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Equivalence of Orlicz Norms via the Level Sets of Difference Quotients and Sums

Ryota Kawasumi (Gunma University)

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Abstract: In this talk, we establish a weak-type estimate for the Orlicz modular associated with difference sums in terms of the measures of their level sets. A key point of the proof is the combination of ideas from Miyadera (2023, arXiv preprint) and Křepela, Mihula, and Soria (2023). Building on this result, we introduce a weak-type Orlicz quasi-norm and show that the associated quasi-norms of difference quotients and difference sums are equivalent to the corresponding Orlicz norms. These results unify and extend previous formulas due to Gu and Yung (2021), Miyadera (2023, arXiv preprint), and Křepela, Mihula, and Soria (2023), from Lebesgue spaces and Orlicz modulars to Orlicz norms.

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Norm Convergence of Angular Fourier Coefficients

Takeshi Kawazoe (Keio University)

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Abstract: At this conference last year the following two inequalities are announced: Let f be in $L^1(\mathbb{R}^2)$ and $f(re^{i\theta}) = \sum_{n\in\mathbb{Z}}[f_n](r)e^{in\theta}$. Then

$$\sum_{n\in\mathbb{Z}} \frac{\|[f_n]\|_{L^1(\mathbb{R}_+,rdr)}}{1+|n|} \le c\|f\|_{H^1(\mathbb{R}^2)}$$

for all f in $H^1(\mathbb{R}^2)$ and

$$\sum_{n\in\mathbb{Z}} \frac{\|[f_n]\|_{H^1(\mathbb{R}_+,rdr)}}{1+|n|} \le c\|f\|_{H^1(\mathbb{R}^2)}.$$

for all f in a subspace $H^1_\flat(\mathbb{R}^2)$ of $H^1(\mathbb{R}^2)$. In this talk I give a simple alternative proof of the second inequality and try to improve it using a different method. Moreover, I extend these inequalities for $\mathbb{R}^n$ and a rank one Riemannian symmetric space.

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Local Smoothing and Maximal Estimates for Codimension Two Averages in $\mathbb{R}^4$

Hyerim Ko (Jeonbuk National University)

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Abstract: This talk concerns averaging operators associated with dilations of two-dimensional surfaces in $\mathbb{R}^4$. We study local smoothing and L^p-improving estimates for these operators, and show that the boundedness range for the associated maximal averages depends on the curvature structure of the underlying surface. In particular, we compare two model nondegenerate surfaces whose Hessian matrices have different rank properties, leading to different sharp L^p-improving ranges. This is joint work with Seheon Ham.

Weak $(1, 1)$ Estimates for Maximal Truncated Rough Singular Integral Operators

Xudong Lai (Harbin Institute of Technology)

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Abstract: In their seminal work (Amer. J. Math. 78: 289-309, 1956), Calderón and Zygmund introduced the maximal truncated rough singular integral operator and established its L^p-boundedness for $1 < p < \infty$. However, the endpoint case $p = 1$ remained an open problem. In this talk, we show our recent result which resolves this problem. More precisely, we prove that the maximal truncated rough singular integral operator is of weak type $(1, 1)$.

Directional Maximal Operators in the Plane

Juyoung Lee (KIAS)

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Abstract: This talk investigates the Lebesgue boundedness of planar directional maximal operators. Building on earlier work, Bateman's asserted dichotomy linked boundedness to finite-order lacunarity of the slope set. Recent work identified a gap and produced counterexamples, showing that the previous characterization cannot hold as stated. We provide a rigorous resolution under an adjusted notion of admissible finite-order lacunarity.

Endpoint Estimates for the Fractal Circular Maximal Function and Related Local Smoothing

Sanghyuk Lee (Seoul National University)

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Abstract: Sharp L^p-L^q estimates for maximal functions over fractal dilation sets have recently been obtained for the spherical and circular cases, except at certain endpoints. In this talk, we establish the missing endpoint estimates for the fractal circular maximal function. We also study related L^p-L^q local smoothing estimates for the wave operator over fractal dilation sets and extend the range of exponents for which optimal bounds hold.

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Sharp Convolution Bounds under Frostman and Fourier Decay Conditions on Measures

Sungchul Lee (Seoul National University)

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Abstract: A classical result of Littman and Strichartz determines the sharp L^p-improving range for convolution with surface measure on the sphere. Motivated by this, we consider measures μ on $\mathbb{R}^d$ satisfying an α-Frostman bound and Fourier decay of order $\beta/2$, and study the sharp L^p-L^q boundedness range for the convolution operator $f \mapsto \mu * f$. The characterization splits according to whether $\alpha \geq \beta$ or $\alpha < \beta$. This is joint work with Sanghyuk Lee.

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L^p-Estimates for Maximal Averages along Mixed Homogeneous Polynomial Hypersurfaces in $\mathbb{R}^3$ Passing through the Origin

Wenjuan Li (Northwestern Polytechnical University)

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Abstract: In this paper, we study L^p-estimates for maximal averaging operators $\mathcal{M}$ along hypersurfaces S in $\mathbb{R}^3$ which are the graph of a mixed homogeneous polynomial Φ. These surfaces pass through the origin, so that the usual transversality condition is not satisfied. As main result, we determine the critical Lebesgue exponent p_c such that $\mathcal{M}$ is L^p-bounded for every $p > p_c$. This is a joint work with Stefan Buschenhenke, Huiju Wang and Detlef Müller.

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Classification of Critical Schrödinger System with p-Laplacian

Zhao Liu (Jiangxi Science and Technology Normal University)

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Abstract: In this talk, we discuss critical Schrödinger system with p-Laplacian, we establish regularity and the sharp estimates on asymptotic behaviors for any positive solution. Then, we prove that all positive solutions are radially symmetric and strictly decreasing about some point. Moreover, we obtain the uniqueness and complete classification of positive solution.

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Maximal Inequalities on Weighted Local Bourgain–Morrey Spaces for General Weights

Toru Nogayama (Tokyo University of Science)

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Abstract: In this talk, we study the boundedness of the Hardy–Littlewood maximal operator on weighted local Bourgain–Morrey spaces. In particular, by considering the power weight of the form $x^\alpha (\alpha \in \mathbb{R})$, we recover known results. This is a joint work with Naoya Hatano (University of Osaka).

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Weighted Generalized Triebel–Lizorkin–Morrey Spaces with Local Weights

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Abstract: We introduce a local weighted theory for the weighted generalized Triebel–Lizorkin–Morrey spaces $\mathcal{E}^s_{\mathcal{M}^\varphi_q,r}(w)$ with local weights w. In this talk, we focus in particular on the weight assumptions needed to prove the boundedness of the local Hardy–Littlewood maximal operator M_{loc} and the corresponding vector-valued Fefferman–Stein inequalities. For the boundedness of M_{loc} on $\mathcal{M}^\varphi_q(w)$, the local Muckenhoupt condition $w \in A^{\mathrm{loc}}_q$ has to be supplemented by a further condition describing how w interacts with φ on local cubes. For the vector-valued inequalities, an additional summability-type condition is needed to control the interaction between w and φ. We report on these weight conditions and their role in the local Triebel–Lizorkin–Morrey theory.

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Double Hilbert Transforms along Polynomial Surfaces: A Comparison between $\mathbb{R}^3$ and $\mathbb{H}^1$

Jeongtae Oh (Seoul National University)

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Abstract: In $\mathbb{R}^3$, it is well known that the L^p boundedness of double Hilbert transforms along polynomial surfaces is characterized by algebraic properties of the underlying polynomials $P(t_1, t_2)$. In the Heisenberg group $\mathbb{H}^1$, with locally truncated kernels, L^p boundedness holds for all polynomial surfaces, in contrast to the Euclidean case. In this talk, we explain that the situation changes for the global kernel: the conditions for boundedness differ from those in the local case, and we give examples where boundedness fails because terms from the Heisenberg group structure no longer play a role. This is based on joint work with Joonil Kim and Hyunwoo Jeon.

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Maximal Averages and Non-Transversality

Sewook Oh (GIST)

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Abstract: Stein's spherical maximal function can be generalized to maximal averages over general hypersurfaces. Although this topic has been extensively studied, many problems still remain open. In this talk, I will present L^p estimates for maximal averages associated to hypersurfaces, with particular emphasis on the role of non-transversality.

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Long-Time Solvability and Asymptotics for the 3D Rotating MHD Equations

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Abstract: We consider the initial value problem for the 3D incompressible rotating MHD equations around a constant magnetic field. We prove the long-time existence and uniqueness of solutions for small viscosity coefficient and high rotating speed. Moreover, we investigate the asymptotic behavior of solutions in the limit of vanishing viscosity and fast rotation, and show that the velocity and magnetic field converge to the zero vector and the solution to the linear heat equation, respectively. We also derive the rates of these convergences in some space-time norm.

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Elliptic Mixed Boundary Problems in MD

Zhuoping Ruan (Nanjing University)

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Abstract: Elliptic mixed boundary problems, and the closely related elliptic transmission problems, have played an important part in the analysis of partial differential equations since the 1950s. An example is the Zaremba problem where, for the Laplace operator in a bounded domain, one has the Dirichlet condition at one part of the boundary and the Neumann condition at the remaining part.

We work on a compact manifold X with non-empty boundary Y, $\dim X \geq 3$. Let Z be a hypersurface in Y that divides Y into two parts, $Y \setminus Z = Y_+ \sqcup Y_-$. We then study elliptic pseudodifferential problems of the form

$$\begin{cases} Au = f & \text{in } X \setminus Y, \\ T_+ u = g_+ & \text{in } Y_+, \\ T_- u = g_- & \text{in } Y_-, \end{cases} \tag{1}$$

with f, g_+, g_- given. Here, $A = a(x, D)$ is an elliptic pseudodifferential operator that satisfies the transmission property with respect to Y and $T_\pm$ are boundary conditions at $Y_\pm \sqcup Z$ such that $(A, T_\pm)$ is elliptic. It is known that, in general, there is at most a finite interval (s_1, s_2) with the property that problem (1) with $u \in H^s(X)$, corresponding assumptions on f, g_+, g_-, and $s \in (s_1, s_2)$ is Fredholm. In general, one has to add conditions of trace or potential type at Z in order to obtain the Fredholm property (where the number of conditions to be added depends on s).

Boundary reduction leads to a transmission problem in Y, with interface Z, where the resulting pseudodifferential operator $\widetilde{A}$ in $Y \setminus Z$ is edge-degenerate with respect to Z. (The operator $\widetilde{A}$ is cone-degenerate with respect to Z if $\dim X = 2$. This yields an entirely different theory.)

We introduce Sobolev spaces $H_P^{s,\delta}(X, Z)$ with asymptotics (instead of the Sobolev spaces $H^s(X)$), where functions $u = u(x)$ in $H_P^{s,\delta}(X, Z) \subset H^s_{\mathrm{loc}}(X \setminus Z)$ possess conormal asymptotic expansions of type P as $x \to Z$ (δ is a conormal order that needs to be fixed in advance). These asymptotics of type P are generated by the triplet (A, T_+, T_-). In that scale of function spaces, we have the Fredholm property for all $s > s_0$ (the lower bound s_0 is needed because of the trace conditions $T_\pm$), and also elliptic regularity holds.

To this end, we construct a calculus for pseudodifferential operators in $X \setminus Y$ that satisfy the transmission condition with respect to $Y \setminus Z$ and that are edge-degenerate with respect to Z such that problem (1) (with conditions of trace or potential type added at Z as necessary, but independently of s) possesses a parametrix within the calculus.

Joint work with Ingo Witt (University of Göttingen, Germany).

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Dispersive Decay for Solutions to the Scaling-Critical Nonlinear Schrödinger Equation

Manli Song (Northwestern Polytechnical University)

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Abstract: In this talk, we establish pointwise-in-time dispersive decay for solutions to the $\dot{H}^{s_c}$-critical nonlinear Schrödinger equation. The proof primarily relies on Strichartz estimates and Bernstein inequalities in Lorentz spaces, embedding properties of Lorentz spaces, Littlewood-Paley decomposition arguments and an optimization method by Fan et al. [Math. Z. **311**(1), Paper No. 21, 16pp (2025)].

Compactness of Multilinear Commutators on Morrey Spaces

Daiki Takesako (Chuo university)

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Abstract: We study the compactness of multilinear commutators generated by BMO functions and the fractional integral operator on Morrey spaces. It is known that if one of the symbols belongs to VMO, then the corresponding multilinear commutator is compact between suitable Morrey spaces. In this talk, we improve this compactness result by showing that the multilinear commutator is compact from the Morrey space into the tilde-closed Morrey space $\widetilde{M}^s_t(\mathbb{R}^n)$. The proof is based on the decomposition of the tilde-closed subspace of Morrey spaces together with estimates for multilinear commutators associated with fractional integral operators. This approach provides a better understanding of the structure of compact commutators on Morrey spaces and extends previous compactness results. We also briefly discuss an analogous result for singular integral operators.

Asymptotic Behavior of Global Solutions for Hardy–Hénon Parabolic Equations

Koichi Taniguchi (Shizuoka University)

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Abstract: In this talk, we consider the Cauchy problem for Hardy-Hénon parabolic equations, which are semilinear heat equations with the singular potential (Hardy type) or the increasing potential (Hénon type) in the nonlinear term. We study the asymptotic behavior of global solutions and show that the solution converges asymptotically either to a linear solution or to a nonlinear self-similar solution, depending on the decay rate of the initial data at spatial infinity. We also show that, for complex-valued initial data, more complicated asymptotic behavior appears, depending on the balance between the decay rates of the real and imaginary parts. This talk is based on joint work with Noboru Chikami (Nagoya Institute of Technology), Masahiro Ikeda (University of Osaka / RIKEN), and Slim Tayachi (University of Tunis El Manar).

Conformally Invariant Inequalities and Related Brezis–Nirenberg Type Problems on Hyperbolic Space

Chunxia Tao (Beijing Technology and Business University)

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Abstract: In this talk, we discuss conformally invariant inequalities on hyperbolic space and their applications to Brezis–Nirenberg type problems. We first study higher-order Hardy–Sobolev–Maz'ya inequalities through their equivalent Poincaré–Sobolev inequalities involving GJMS operators. By combining a dual variational framework for minimizing sequences, a concentration–compactness principle for radial functions, Helgason–Fourier analysis, and the Riesz rearrangement inequality on hyperbolic space, we establish the existence and symmetry of extremal functions and obtain positive solutions to the higher-order critical Brezis–Nirenberg problem. We then consider an integral Brezis–Nirenberg-type problem associated with the Hardy–Littlewood–Sobolev inequality on bounded hyperbolic domains. Using hyperbolic dilations, a new family of bump functions, and a subcritical approximation method, we prove existence and nonexistence results for the corresponding integral equations.

Existence and Nonlocal-to-Local Convergence for Singular, Anisotropic Nonlocal Cahn–Hilliard Equations

Yutaka Terasawa (Nagoya University)

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Abstract: We study the nonlocal-to-local convergence for a nonlocal Cahn-Hilliard equation with anisotropic and singular kernels. In particular, we show convergence of weak solutions of the nonlocal Cahn-Hilliard equation to weak solutions of a corresponding anisotropic Cahn-Hilliard equation for suitable subsequences. Moreover, we show existence of weak solutions for the nonlocal equation under a condition, which guarantees existence of weak solutions for suitably localized or singular kernels. Nonlocal-to-Local convergence of weak solutions for the correspondingNavier-Stokes-Cahn-Hilliard equations is also obtained. This work is a joint work with Helmut Abels (Regensburg University).

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Another Proof of Alvino's Embedding via Medians

Yohei Tsutsui (Kyoto University)

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Abstract: The median of a function on Euclidean space was introduced by F. John in 1965 and can be regarded as a kind of average. It is well-known that the set of all medians of a function forms a closed interval. With the aid of a result due to Poelhuis and Torchinsky (2012), we can see that the endpoints of this closed interval are given by two distinct rearrangements. Strömberg (1979) introduced a maximal operator via medians instead of integral averages. After reviewing some properties of this operator, we give a short proof of Alvino's embedding $L^{n/(n-1),1} \to BV$ via medians for non-negative functions.

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Some Recent Progress on Mass-Subcritical Nonlinear Schrödinger Equations

Yifei Wu (Nanjing Normal University)

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Abstract: This talk will center on our recent research devoted to mass-subcritical defocusing nonlinear Schrödinger equations. We will mainly concentrate on two core theoretical properties of the model: global well-posedness and scattering behavior, with particular emphasis on the modified scattering mechanism that emerges in this mass-subcritical setting.

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Liouville-Type Theorems for the Stationary Non-Newtonian Fluids

Minsuk Yang (Yonsei University)

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Abstract: We introduce Liouville-type theorems for stationary non-Newtonian fluids. Additionally, we illustrate the growth rate of the spherical averages of the velocity field and present an iteration method.

Uniform Estimates for Bilinear Fractional Integrals along Polynomials

Haixia Yu (Shantou University)

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Abstract: In this talk, for a polynomial P of degree d given by

$$P(t) := a_d t^d + a_{d-1} t^{d-1} + \cdots + a_1 t$$

where $d \geq 1$ is a positive integer and $a_d, \cdots, a_1 \in \mathbb{R}$ with $a_d \neq 0$, we discuss some uniform $L^p \times L^q \to L^r$ estimates for the bilinear fractional integral $H_{\alpha,P}$ along the polynomial P, where

$$H_{\alpha,P}(f,g)(x) := \int_0^\infty f(x-t)g(x-P(t))\frac{dt}{t^{1-\alpha}}$$

with $\alpha \in (0,1)$. In addition, this result is sharp except for some borderline cases. This work is joint with Bowen Liu and Zengjian Lou.