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 of the talks on 18th – – –

Plenary talks: 50 min.

- 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).

Talks: 30 min.

- 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.

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- 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.).

– – –Lunch break – ––

- 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).