Invited Talks in the Morning Session

1. **Name:** Gen Nakamura

   Title: Applicable and mathematically rigorous inversion for active thermography

   Abstract: Active thermography is a typical non-destructive testing to identify anomalies inside a heat conductor by injecting heat flux using heater or flush lamp or even laser and measuring the corresponding temperature distribution on the boundary of conductor by an infrared light camera. This measurement is a non-contact and very quick measurement which can be easily repeated many times. In this talk we will give a sampling type inversion scheme combining the two methods of inversion called the linear sampling type method and dynamical probe method to identify the anomalies inside the conductor such as cavities and inclusions by one set of measurements over a time interval. We use an impulsive input which correlates to that of active thermography with injection of heat flux by laser.

2. **Name:** Panki Kim

   Title: Estimates of Dirichlet heat kernel for symmetric Markov processes

   Abstract: We consider a large class of symmetric pure jump Markov processes dominated by isotropic unimodal Lévy processes with weak scaling conditions. We first establish sharp two-sided heat kernel estimates for this processes in $C^{1,\rho}$ open sets. As a corollary of our main result, we obtain a sharp two-sided Green function and a scale invariant boundary Harnack inequality with explicit decay rates in $C^{1,\rho}$ open sets. This is a joint work with Tomasz Grzywny and Kyung-Youn Kim.

3. **Name:** Nao Hamamuki

   Title: An improved level set method based on comparison with a signed distance function

   Abstract: In the classical level set method, a slope of a solution to level set equations can be close to zero as time develops, and this prevents one from computing interfaces given as the level set of the solution. To overcome this issue we introduce an improved level set equation by adding an extra term to the original equation. Applying a comparison principle to the signed distance function to the interface, we prove that, globally in time, the slope of a viscosity solution of the initial value problem is preserved near the zero level set.

4. **Name:** Hun Hee Lee

   Title: Weak amenability problem of Fourier algebras

   Abstract: Since the work of Johnson characterizing amenability of a locally compact group G in terms of Banach algebra amenability of the convolution algebra $L_1(G)$, questions of characterizing various amenabilities of group related Banach algebras have been central theme of abstract harmonic analysis. For example, Ruan proved that operator space amenability of the Fourier algebra $A(G)$ is equivalent to the amenability of G and Forrest/Runde showed that amenability of $A(G)$ is equivalent to G being virtually abelian.
   In this talk we will focus on the weak amenability problem of Fourier algebras focusing on Lie group cases. More precisely, we will show that for a Lie group G, its Fourier algebra $A(G)$ is

weakly amenable if and only if its connected component of the identity G_e is abelian. Our main new idea is to show that for connected Lie group G, weak amenability of $A(G)$ implies that the anti-diagonal of the product group $G \times G$, is a set of local synthesis for $A(G \times G)$, which will be shown not to be possible for non-abelian G.
This talk is based on a joint work with J. Ludwig, E. Samei and N. Spronk.

Contributed Talks in the Afternoon Session

1. **Name:** Hiroaki Aikawa

   Title: Construction of a log Hölder-type domain which fails the global boundary Harnack principle

   Abstract: We illustrate the boundary Harnack principle and its parabolic counterpart, Intrinsic Ultracontractivity. We give a sharp estimate of harmonic measure for a ravine-like domain with the aid of the Helmholtz equation. By adding countably many copies such ravine-like domains to a cube, we construct a log Hölder-type domain which fails the global boundary Harnack principle.

2. **Name:** Nam-Gyu Kang

   Title: Edge scaling limits of random normal matrix processes

   Abstract: I present existence and universality of scaling limits for the eigenvalues of a random normal matrix at points on the free boundary of the spectrum associated to the radially symmetric external potential. Our approach uses Ward's equation, which is an identity satisfied by the 1-point function. This is a joint work with Yacin Ameur and Nikolai Makarov.

3. **Name:** Kyouhei Wakasa

   Title: The lifespan of solutions to semilinear damped wave equations in one space dimension

   Abstract: In this talk, we consider the initial value problem for semilinear damped wave equations in one space dimension. Wakasugi (2014) have obtained an upper bound of the lifespan for the problem only in the subcritical case. On the other hand, D'Abbicco & Lucente & Reissig (2015) showed a blow-up result in the critical case. The aim of this talk is to give an estimate of the upper bound of the lifespan in the critical case, and show the optimality of the upper bound. Moreover, we show that the critical exponent changes when the initial data are odd functions.

4. **Name:** Sun Ho Kim

   Title: Tracial state on the Thue–Morse labeled graph C^*-algebra

   Abstract: In this talk, we show that there exists a unique faithful trace on the labeled graph C^*-algebra $C^*(E_{\mathbb{Z}}, \mathcal{L}, \overline{\mathcal{E}}_{\mathbb{Z}})$ associated to the Thue–Morse sequence $(E_{\mathbb{Z}}, \mathcal{L})$. From this observation we know that $C^*(E_{\mathbb{Z}}, \mathcal{L}, \overline{\mathcal{E}}_{\mathbb{Z}})$ is not AF nor purely infinite, and hence that the class of labeled graph C^*-algebras is strictly larger than the class of graph C^*-algebras up to Morita equivalence.

5. **Name:** Kazuyuki Wada

   Title: Ground states in a charged scalar field model

   Abstract: This talk is based on a part of paper [2]. We consider a charged scalar field model which is a typical and fundamental model in quantum field theory. Under the introduction of cutoff functions in the interaction operator of the model, the Hamiltonian of the model is realized as a self-adjoint operator on a Boson Fock space. Physically the model describes an interaction of infinitely many identical charged particles and their anti-particles which obey Bose-Einstein statistics respectively. The model has the total charge operator whose eigenvalues count the charges the quantum system can have. The Hamiltonian and the total charge operator commute strongly.

This implies that the Hamiltonian is decomposed into the infinite direct sum of the eigenspaces of the total charge operator. It is an interesting problem to determine to which charge space a ground state (an eigenvector of the Hamiltonian with the lowest energy) belongs. Takaesu [1] showed that, in a model of quantum electrodynamics, a ground state belongs to the charge zero space if an interaction is sufficiently small. In this talk, we consider the same problem in the charged scalar field model. A symmetry between charged particles and their anti-particles plays an important role.

References

[1] T. Takaesu, "On the spectral analysis of quantum electrodynamics with spatial cutoffs. I", J. Math. Phys. 50, 062302, (2009).
[2] K. Wada, "Spectral analysis of a massless charged scalar field with cutoffs", to appear in Hokkaido Math. J.

6. **Name:** Min-Hee Kim

   Title: On the Pólya-Wiman properties of Differential Operators

   Abstract: Let $\phi(x) = \sum \alpha_n x^n$ be a formal power series with real coefficients, and let D denote differentiation. In this talk, we introduce a recent result which is "for every real polynomial f there is a positive integer m_0 such that $\phi(D)^m f$ has only real zeros whenever $m \geq m_0$" if and only if "$\alpha_0 = 0$ or $2\alpha_0\alpha_2 - \alpha_1^2 < 0$."