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The Mathematical Society of Japan

2017 Autumn Meeting

Titles and Short Summaries of the Talks

September, 2017

at Yamagata University

2017 The Mathematical Society of Japan

AUTUMN MEETING

Dates: September 11th (Mon)–14th (Thu), 2017

Venue: Yamagata University, Kojirakawa Campus
1-4-12 Kojirakawa-machi,
Yamagata-shi 990-8560 Japan

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	Featured Invited Talks 13:00–14:00								
	Invited Talks 15:15–16:15 16:30–17:30	Invited Talk 16:00–17:00	Invited Talk 14:15–15:15	Invited Talk 16:00–17:00	Invited Talk 16:40–17:40	Invited Talk 17:00–18:00	Invited Talks 15:20–16:20 16:30–17:30	Invited Talk 16:30–17:30	Invited Talk 14:15–15:15
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	MSJ Prizes Presentation (Yamagin Hall) ····· (14:45–15:20) Plenary Talks (Yamagin Hall) Autumn Prize Winner ····· (15:30–16:30) Yoshio Tsutsumi (Kyoto Univ.) ····· (16:40–17:40) Official Party (Yamagata Grand Hotel) ····· (18:00–20:00)								
13th (Wed)	Statistics and Probability 9:40–12:10	Geometry 10:00–11:40 14:20–15:45	Topology 10:00–12:00 15:30–17:30	Applied Mathematics 9:30–11:40 14:15–16:15	Found. of Math. and History of Math. 9:45–11:20 14:15–16:15	Functional Analysis 9:00–12:00 14:15–15:30	Real Analysis 9:30–12:00 14:15–15:45	Functional Equations 9:15–12:00 14:15–16:15	Algebra 9:15–11:15 14:15–16:45
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14th (Thu)			Topology 10:00–11:30	Applied Mathematics 9:30–10:30	Found. of Math. and History of Math. 9:30–11:20 14:15–16:00		Real Analysis 9:30–12:00 14:15–16:00	Functional Equations 9:00–12:00 14:15–16:15	Algebra 9:15–12:00 14:15–16:15
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Plenary Talks

September 12th (Tue) Large Hall, Yamagin Hall (Yamagata Prefectural Hall)

Autumn Prize Winner ..... (15:30–16:30)

Yoshio Tsutsumi (Kyoto Univ.) Well-posedness and smoothing effect for nonlinear dispersive equations ..... (16:40–17:40)

Summary: We consider the well-posedness and the ill-posedness in the Sobolev space of the Caucy problem for the third order nonlinear Schrödinger equation (3NLS) on the one dimensional torus. Especially, we fucus on what role the smoothing type estimates of the cubic nonlinearity play in the well-posedness issue. First, I talk about the time local well-posedness in the negative Sobolev space and the nonuniqueness of solutions without auxiliary spaces for (3NLS). Second, I talk about the ill-posedness in the Sobolev space for (3NLS) with Raman scattering term. In the latter case, I also present the result of the Cauchy-Kowalevsky type on the local unique solvability in the analytic function space. These topics show that the nonlinear interaction often yields the smoothing effect.

Featured Invited Talks

September 11th (Mon)

Conference Room I

Toshio Mikami (Tsuda Coll.) Stochastic optimal transportation problem —a generalization of probabilistic problem in E. Schrödinger's mechanics— ..... (13:00–14:00)

Summary: E. Schrödinger proposed the following problem in his 1932's paper. Suppose that there exist N particles in a subset A of 3-dimensional Euclidean space and each particle moves independently, with a given transition probability, to a different subset B of 3-dimensional Euclidean space. He tried to find the maximal probability of such events, provided the number of particles in each point in A and B are fixed. Though he did not succeed in finding the maximal probability, he obtained Euler's equation, for the variational problem above, which is called Schrödinger's functional equation. After S. Bernstein's talk in ICM 1932, E. Schrödinger's problem has been developed as the study of Bernstein process (or reciprocal process) and that of Doob's h-path process. It is also known that the problem is closely related to E. Nelson's stochastic mechanics. In this talk, we focus on our research about Schrödinger's problem and its generalization as stochastic optimal transportation problem, its application to Nelson's stochastic mechanics, Monge's problem as the zero-noise limit of stochastic optimal transportation problem and relation to mean field PDEs.

Conference Room VII

Kyoji Saito (Univ. of Tokyo) Special global functions in several complex variables ..... (13:00–14:00)

Summary: In the first half of 20th century, general frameworks for the study of functions of several complex variables have been developed by Behnke, Thullen, Cartan, Oka, Grauert and others. They clarified the conditions for a domain to be holomorphically complete and showed sufficiently many existences of global holomorphic functions on such domains. The results were crystallized to the theory of Stein manifolds, and were sheaf theoretically formulated (Theorem A and B) by Cartan and Serre.

On the other hand, new interactions in the last few decades between mathematics and physics (e.g. string theory, gauge theory, quantum field theory, etc.) gave new impetus to mathematicians to understand global analytic functions. For instance, mirror symmetry between complex geometry and symplectic geometry was first observed by physicists, and was later formulated by Konstsevich in language of categories. Inspired by Douglas' stability condition in physics, Tom Bridgeland introduced the space of stability conditions for such a triangulated category.

These spaces (of stability conditions) are complex manifolds of interest in mathematics and in physics. In examples, they are Stein manifolds, but do not seem to be classical symmetric domains. New problems appear: develop and understand global analytic functions on such spaces. The problem seems to be mirror symmetric to the construction of certain higher dimensional "automorphic forms" on the period domains which I shall describe in the lecture. Our understanding of global holomorphic functions for such domains is still quite limited, compared with the rich theory of the one variable case, where there exist strong means like Fourier analysis and Eisenstein series.

In the lecture, I will describe some aspects of these problems from the perspective of the period map theory, with which I have been engaged.

Conference Room VIII

Guest Talk from Korean Mathematical Society

Hi Jun Choe (Yonsei Univ.) Regularity condition to incompressible Navier–Stokes equations ····· (13:00–14:00)

Summary: We discuss local regularity properties of a weak solution to the Cauchy problem of the incompressible Navier–Stokes equations. We present a new regularity criterion for the weak solution u satisfying the condition that it belongs to a critical weak Lebesgue space without any smallness assumption on that scale. As an application, we conclude that there are at most a finite number of blowup points at any singular time t. The condition that the weak Lebesgue space norm of the veclocity field is bounded in time is encompassing type I singularity and significantly weaker than the end point case of the so-called Ladyzhenskaya–Prodi–Serrin condition proved by Escauriaza–Sergin–Šverák. In addition we like to roam around historical ground of the fascinating mathematical fluid questions to regularity.

September 13th (Wed)

Conference Room II

Hiroshi Ohta (Nagoya Univ.) Wander in Fukaya category ····· (13:00–14:00)

Summary: Around the early 1990's, Kenji Fukaya introduced the notion of an A_∞ category, roughly speaking, whose objects are Lagrangian submanifolds in a symplectic manifold and the morphism spaces are the Floer chain complexes equipped with A_∞ structures defined by moduli spaces of holomorphic maps form a 2-dimensional disc to the symplectic manifold with Lagrangian boundary conditions. Now it is called Fukaya category. M. Kontsevich used this category to formulate his homological mirror symmetry conjecture. In this talk I will try to give a brief introduction and discuss some aspects of the Fukaya category with emphasis on mirror symmetry. Based on my joint works with K. Fukaya, Y.-G. Oh, K. Ono, and also with M. Abouzaid.

Conference Room VI

Masaki Izumi (Kyoto Univ.) A generalization of the Dixmier–Douady theory (twisted K-theory) after Dadarlat–Pennig ····· (13:00–14:00)

Summary: The classical Dixmier–Douady theory describes the structure of continuous trace C^*-algebras in terms of the third cohomology of its spectrum. In 1989, Rosenberg formulated twisted K-theory in full generality as the K-theory of a continuous trace C^*-algebra with its spectrum homeomorphic to a prescribed space and with a prescribed third cohomology class. Since then twisted K-theory has been extensively studied, partly because its relationship with string theory was reveled in the late '90s.

On the other hand,in the Elliott program of the classification of amenable C^*-algebras, the importance of a certain class of C^*-algebra with very simple structure had been recognized among the specialists long before the formal definition as strongly self-absorbing C^*-algebras was introduced in 2007. Recently,a surprising and unexpected application of them was found by Dadalart–Pennig,who showed that the Dixmier–Douady theory can be generalized to every strongly self-absorbing C^*-algebra in that the classical Dixmier–Douady theory is for the trivial C*-algebra, the complex numbers. Moreover, a generalized cohomology theory arises from every strongly self-absorbing C^*-algebra, whose characteristic classes have higher terms beyond the third cohomology. In this talk, I will give an account of this theory for non-specialists.

September 14th (Thu)

Conference Room VIII

Eiji Yanagida (Tokyo Tech) Dynamics of nonlinear diffusive systems —Asymptotic stability and the butterfly effect— ····· (13:00–14:00)

Summary: It is well known that in some nonlinear diffusive systems, we can observe various interesting phenomena such as spatial pattern formation, traveling waves and complex spatio-temporal dynamics. Recently, it was revealed that some simple nonlinear diffusive systems can exhibit irregular behavior of solutions by a sort of the butterfly effect. In this talk, I will present a few examples and explain the mechanism of stabilization and destabilization.

Conference Room IX

Kentaro Nakamura (Saga Univ.) p-adic local Langlands correspondence and Iwasawa main conjecture ····· (13:00–14:00)

Summary: As a p-adic version of local Langlands correspondence, p-adic local Langlands correspondence for $\mathrm{GL}_2(\mathbb{Q}_p)$, which is a correspondence between two dimensional irreducible p-adic representations of $\mathrm{Gal}(\overline{\mathbb{Q}}_p/\mathbb{Q}_p)$ and irreducible p-adic Banach representations of $\mathrm{GL}_2(\mathbb{Q}_p)$, was recently established by Breuil, Berger–Breuil, Colmez, Kisin, Paskunas. As this correspondence also encodes information about p-adic variations of the both sides, it is expected to have many applications to some important problems in number theory concerning relationships between Galois side and automorphic (or analytic) side. For example, Kisin and Emerton independently applied it to prove Fontaine–Mazur conjecture on the modularity of two dimensional geometric odd p-adic representation of $\mathrm{Gal}(\overline{\mathbb{Q}}/\mathbb{Q})$.

In our talk, I'd like to explain these topics and the recent developments. In particular, I'd like to explain another application of p-adic local Langlands correspondence, precisely, its application to the rank two case of global and local epsilon conjectures on the functional equation of Kato's Euler systems associated to Hecke eigencuspforms.

Foundation of Mathematics and History of Mathematics

September 13th (Wed) Conference Room V

9:45–11:20

1 Shigeru Masuda (Kyoto Univ.) The solubilities in the mathematical physics by poisson ····· 15

Summary: We discuss the solubilities in the Study of Mechanics of Poisson 1833, which Poisson issued again in about 20 years after the first publications in 1811, in which he discusses statics, dynamics, the hydrostatics and the hydrodynamics, relating topics, which compose of mechanics. Poisson introduces the methods of solving mathematically the problems in mechanics, in which we have a strong interest. We discuss, in introducing these methods, how he did handle his big scope, since the year 1811, standing on the basis composed of capillary action, mechanics and heat theory, and so on, including his last conclusions of problems reserving before.

2 Shigeru Masuda (Kyoto Univ.) The hydrostatics and the hydrodynamics in a study of mechanics by poisson ····· 15

Summary: We discuss two points on the Study of Mechanics of Poisson 1833, which Poisson issued in his last period of his life of learing, in which he discusses the hydrostatics and the hydrodynamics. Previously, he discuss in the precedings (1829). We are considering this as the origin of the equations of the Navier–Stokes owing to Stokes' referring in 1859. The other point is his conjecture on the defect of the preceding proofs of exact differential. We aim to discuss his process of theoretical convergence in this arena.

3 Makoto Tamura (Osaka Sangyo Univ.) On the term "Suan," the amount of calculations, in the chapter "Fangcheng" of "Nine Chapters" ····· 15

Summary: A technical term "Suan" is used as the amount of calculations in the annotation for the problem 18 of the chapter "Fangcheng" of the "Nine Chapters on the mathematical art." However, the way of counting it has been misunderstood, so we will correct it in this talk.

4 Katsushi Waki (Yamagata Univ.)
Takuma Tsuchihashi (Meiji Univ.) Towards an automatic tagging system for image databases of Japanese mathematics (wasan) ····· 15

Summary: In recent years, construction of digital image databases from historical documents of Japanese mathematics (wasan) is progressing. Wasan researchers widely utilize these databases, for example, they search images from titles, authors and years. On the other hand, existing databases don't have enough functions such as searching from shapes or geometric elements. In this study, the authors propose a system that helps us to tag on wasan images automatically. This system can recognize geometric elements such as triangles, squares and circles from images of geometric problems in wasan documents and it can analyze relationship such as tangency of circles and number of elements from these images. Finally, it can tag each wasan image with these information automatically.

5 Ken Saito (Osaka Pref. Univ.) Editing diagrams of Book XII of Euclid's *Elements* ····· 15

Summary: The Bologna manuscript (Archiginnasio Library) of Euclid's *Elements* (Heiberg's codex b) represents a tradition of Greek text totally different from other manuscripts. Though this tradition has turned out to be closer to the original thanks to W. R. Knorr's study in 1996, very little research has been done since then. There are quite a few errors of copyist both in text and diagram. Tentative edition of diagrams (with labels added or corrected, lines suppressed or supplied) will be shown.

11:30–12:00 Mathematics History Team Meeting

14:15–16:15

6 Teruyuki Yorioka (Shizuoka Univ.) A combinatorial relationship between Aronszajn trees and other Ramsey theoretic structures 15

Summary: To approach a longstanding open problem on Todorcevic's fragments of Martin's Axiom, we present the consistent assertions with the existence of a non-special Aronszajn tree. In this talk, we explain the assertions from not only Martin's Axiom but also Proper Forcing Axiom.

7 Teruyuki Yorioka (Shizuoka Univ.) Galvin's non-productive ccc posets and Suslin tree 15

Summary: Galvin proved that, under the Continuum Hypothesis, there are two ccc posets P_0 and P_1 such that $P_0 \times P_1$ is not ccc. Roitman proved that Cohen forcing and random forcing adds such Galvin's example respectively. It is proved that it is consistent that (coherent) Suslin tree adds Galvin's example. In this talk, I will explain the motivation of this research and idea of the proof.

8 Hiroshi Sakai (Kobe Univ.) Indescribable cardinals and reflection of indescribable sets 10

Summary: We discuss relationships between Π^1_n-indescribable cardinals and the reflection of Π^1_n-indescribable sets. Among other things, we generalize the classical result of Jensen to show that in the constructible universe L, a Π^1_n-indescribable cardinal κ is Π^1_{n+1}-indescribable if and only if every Π^1_n-indescribable subset of κ reflects.

9 Makoto Kikuchi (Kobe Univ.)
Joel David Hamkins (CUNY) On the inclusion relations defined on countable models of ZFC 15

Summary: We show that the inclusion reduct of any countable model of ZFC is countable saturated. It follows that the structures arising as the inclusion relation of a countable model of ZFC are all isomorphic, and that they are exactly the countable saturated models of the theory of set-theoretic mereology: an unbounded atomic relatively complemented distributive lattice.

10 Hirotaka Kikyo (Kobe Univ.) On class $\mathbf{K}_f$ 15

Summary: Let A be a graph. Put $\delta(A) = |A| - \alpha e(A)$ where $|A|$ is the number of vertices in A and $e(A)$ the number of edges in A. Let f be an unbounded concave function on the set of all non-negative real numbers. $\mathbf{K}_f$ is the class of all graphs A such that $B \subseteq A$ implies $\delta(B) \geq f(|B|)$. There are some conditions on f that imply the free amalgamation property of $\mathbf{K}_f$. We discuss relations between those conditions, and see how some constructions work out in $\mathbf{K}_f$ under those conditions.

11 Akito Tsuboi (Univ. of Tsukuba) Graphs and automorphism groups 10

Summary: K. Eda raised a question concerning a graph structure and its automorphism groups. We don't know the exact answer to this question. But we give an affirmative answer to it under an additional model theoretic assumption.

12 Koichiro Ikeda (Hosei Univ.) A remark on Ehrenfeucht theories 15

Summary: A type $p \in S(T)$ is said to be special, if there are $a, b \models p$ such that $\mathrm{tp}(b/a)$ is isolated and non-algebraic, and $\mathrm{tp}(a/b)$ is non-isolated. I proved that a stable Ehrenfeucht theory had a special type. In this talk, I will introduce a result, which says that every Ehrenfeucht theory has a special type.

16:30–17:30 Talk Invited by Section on Foundation and History of Mathematics

Kota Takeuchi (Univ. of Tsukuba) Recent interaction between model theory and finite combinatorics

Summary: The n-dependent property is one of model theoretic dividing lines between first order theories. Recent studies of the property add evidence that model theory has a deep connection with finite combinatorics, such as hyper graph, structural Ramsey theory and Vapnik–Chervonenkis theory. In this talk it will be explained how they interact with each other.

September 14th (Thu) Conference Room V

9:30–11:20

13 Takashi Oyabu ♭ ZF;: S ========> $\mathbb{R}$, and other 5 talks ····· 5

Summary: (1) ZF;: S ========> $\mathbb{R}$
We discuss the possibility of the construction of math. From the standpoint of the axiomatic set theory: introduction of the numbers and the construction of geometry and math.
(2) Poincaré conjectures
$G == G'$ :: homotopy equivalent ==> $G == G'$: group isomorphic;; compact Lie groups:: $M = G/K$: homotopy equivalent =====> $M == G/K$: homeomorphic:
(3) Taniyama–Simura conjecture
Elliptic curves are modular and automorphic functions field == modular functions field :::=== Taniyama Simura conjecture:
(4) Lie group, Group-manifold
$G == G'$: homotopy equivalent ==→ $G == G'$: group isomorphic: == $G == G'$: not group isomorphic ===→ $G == G'$: not homotopy equivalence :/: This shows that Co-equivalene ==→ C1-equivalence- → Cr-equivalence ::: Hilbert 5th problem:
(5) Algebraic curve
Riemann surface :: algebraic curve: abelian differential :: abelian integral construction of Jacobi variety; Abel–Jacobi map:::
(6) Construction
Construction from axiomatic set theory is discussed::: Numbers::geometry:;math. Constructions:

14 Saburou Saitoh * History, logic, results and impacts of the division by zero 1/0=0 ····· 15
(Gunma Univ.*/Inst. of Reproducing Kernels)

Summary: In this talk, we would like to present about the simple history, basic logical background, main results and impacts to mathematics and human beings of the division by zero.

15 Saburou Saitoh ♭ Relations of 0 and ∞ ····· 15
(Gunma Univ.*/Inst. of Reproducing Kernels)
Okumura Hiroshi (Yamato Univ.)
Tsutomu Matsuura (Gunma Univ.)

Summary: In this talk, as the representation of the point at infinity on the Riemann sphere by the zero z = 0, we will show some delicate geometric relations between 0 and infinity which show a strong discontinuity at the point of infinity on the Riemann sphere:

16 Takahiro Seki (Niigata Univ.) A semilattice semantics in relevant logics ····· 15

Summary: Semilattice semantics has been considered in relevant logics. In this semantics, completeness for implicational fragment of familiar relevant logics **R** and **E** can be proved but cannot for full **R** and **E**. In this talk, we consider semantics in which completeness of weaker relevant logics (and their neighbours) can be proved.

17 Kyohei Yokomizo (Nihon Univ.) Reducts of a hypersequent calculus characterized by the class of all totally ordered Kripke frames ····· 15

Summary: It is known that there are two hypersequent calculi, **GLCW** and **GLC**, characterized by the class of all totally ordered Kripke frames (equivalent to Dummett's **LC**). However, it is also known that **GLCW** is strictly weaker than **GLC** if part of the propositional logical symbols, $\rightarrow$, $\wedge$, $\vee$ and $\neg$, are restricted. We correct a mistake of the proof of cut-elimination theorem of the hypersequent calculi obtained by restricting the logical symbols of **GLCW** claimed by Avron. Also, we generalize **GLCW** for all $n \geq 1$ by Jankov's characteristic formula.

18 Kenetsu Fujita (Gunma Univ.) A formal system of reduction paths · 15

Summary: We introduce a formal system of reduction paths, based on which paths can be generated from a quiver by means of three operators. Next, we define reduction rules on paths and then show that the rules on paths are terminating and confluent, so that we can obtain normal paths. Following this, linearly ordered quivers Q' and Q" can be generated by the path operators from a quiver Q called the Dynkin diagram of type An, such that the constructed Q' and Q" provide witness on behalf of the Church–Rosser property for Q.

19 Ryo Kashima (Tokyo Tech) On first order predicate logic with second order function symbols · · · · 15
Kazuki Nakamura (Tokyo Tech)

Summary: We introduce second order function symbols into first order predicate logic. Syntax and semantics are naturally defined. The equality axioms are extended, and the completeness theorem is proved.

11:30–12:00 Research Section Assembly

14:15–16:00

20 Taishi Kurahashi (Kisarazu Nat. Coll. of Tech.) On extensions and generalizations of the first incompleteness theorem · 15

Summary: We prove that for each $n \geq 0$, if the set of all theorems $\mathrm{Th}(T)$ of a consistent theory T is Π_{n+1}-definable, then there exists a true Π_n sentence which is not provable in T. This improves Jeroslow's extension and Hájek's generalization of the first incompleteness theorem.

21 Taishi Kurahashi (Kisarazu Nat. Coll. of Tech.) Arithmetical soundness and completeness for Sacchetti's logics · · · · · · · 15

Summary: We prove that for every recursively axiomatized consistent extension T of Peano Arithmetic and $n \geq 1$, there exists a Σ_2 numeration $\tau(v)$ of T such that whose provability logic is exactly Sacchetti's logic $\mathsf{K} + \Box(\Box^n p \to p) \to \Box p$. This settles Sacchetti's problem.

22 Satoru Kuroda (Gunma Pref. Women's Univ.) Bounded arithmetic and forcing · 15

Summary: We will reformulate the forcing construction by Takeuti and Yasumoto by two-sort bounded arithmetic. As a result, we can construct models for various complexity classes below PTIME. We will also give an alternative proofs of some theorems in Takeuti–Yasumoto's paper. Finally, we will discuss some open problems.

23 Kazuyuki Tanaka (Tohoku Univ.) Infinite games and pushdown ω-languages · 15
Wenjuan Li (Tohoku Univ.)

Summary: This research is part of a project to answer "how hard is it to show that an infinite game is determined?" In terms of the foundational program "Reverse Mathematics", the strength of determinacy is measured by the complexity of a winning strategy required by the determinacy of a given game. In this talk, we will discuss infinite games whose winning sets are defined by deterministic 2-stack visibly pushdown automata (2DVPA), nondeterministic pushdown automata (NPDA) and some others with various acceptance.

24 Hayato Takahashi (Random Data Lab.) Bayesian definition of random sequences with respect to conditional probabilities · · · · · 15

Summary: We review the recent progress on the definition of random set with respect to conditional probabilities and a generalization of van Lambalgen theorem (Takahashi 2006, 2008, 2009, 2011). In addition we generalize Kjos Hanssen theorem (2010) when the consistency of the posterior distributions holds. We propose a definition of random sequences with respect to conditional probabilities as the section of the Martin–Löf random set at the random parameters and argue the validity of the definition from the Bayesian statistical point of view.

25 Kohtaro Tadaki (Chubu Univ.) An application of the principle of typicality to quantum information processing: A refinement of the BB84 QKD protocol · · · · · 15

Summary: The notion of probability plays a crucial role in quantum mechanics. It appears as the Born rule. In modern mathematics which describes quantum mechanics, however, probability theory means nothing other than measure theory, and therefore any operational characterization of the notion of probability is still missing in quantum mechanics. In our former works, based on the toolkit of algorithmic randomness, we presented an alternative rule to the Born rule for specifying the property of results of measurements in an operational way. In this talk, we make an application of our framework to the BB84 quantum key distribution protocol in order to demonstrate how properly our framework works in practical problems in quantum mechanics.

16:15–17:15 Talk Invited by Section on Foundation and History of Mathematics

Yosuke Sato (Tokyo Univ. of Sci.) On quantifier elimination algorithm and current situation of its computation

Algebra

September 11th (Mon) Conference Room IX

9:15–11:45

1 Hirotsugu Wayama (Tohoku Univ.) Interpolation of Arakawa–Kaneko-type multiple zeta functions ····· 10
Yasuo Ohno (Tohoku Univ.)

Summary: We introduce a kind of generalization of multiple zeta function to interpolate Arakawa–Kaneko and Kaneko–Tsumura multiple zeta functions. We show that the function is closely related to polynomials called t-MZVs, which interpolates multiple zeta and zeta-star values, and that its values at non-positive integers can be written as polynomials whose coefficients are linear combinations of multi-poly-Bernoulli numbers.

2 Hirotsugu Wayama (Tohoku Univ.) On a family of relations among t-MZVs ····· 10

Summary: The families of Le–Murakami relations of multiple zeta values and Aoki–Ohno relations of multiple zeta-star values are not equivalent with each other. In this talk, we present new $\mathbb{Q}$-linear relations among t-MZVs which interpolate Le–Murakami and Aoki–Ohno relations of height 1. In our proof, two different expressions of the value of the interpolated function between Arakawa–Kaneko and Kaneko–Tsumura multiple zeta functions, introduced by Ohno and the speaker, are used.

3 Ryota Umezawa (Nagoya Univ.) On an analog of Arakawa–Kaneko zeta function and a certain relation of related multiple zeta values ····· 10

Summary: In this talk, we discuss the function defined by Ito and prove some relations of multiple series, which can be regarded as a generalization of Mordell–Tornheim multiple zeta values.

4 Kenta Endo (Nagoya Univ.) Real zeros of Hurwitz zeta-functions in the interval $(0,1)$ ····· 10
Yuta Suzuki (Nagoya Univ.)

Summary: Let $0 < a \leq 1, s \in \mathbb{C}$, and $\zeta(s,a)$ be the Hurwitz zeta-function. Recently, T. Nakamura showed that $\zeta(\sigma,a)$ does not vanish for any $0 < \sigma < 1$ if and only if $1/2 \leq a \leq 1$. In this talk, we show that $\zeta(\sigma,a)$ has precisely one zero in the interval $(0,1)$ if $0 < a < 1/2$. Moreover, we reveal the asymptotic behavior of this unique zero with respect to a.

5 Satoshi Kawamura (Tohoku Univ.) Analytic properties of higher Mahler measures and zeta Mahler measures ····· 10

Summary: Higher Mahler measures (HMM) and zeta Mahler measures (ZMM) are two kinds of generalization of classical Mahler measures, which were introduced by N. Kurokawa, M. Lalín and H. Ochiai and by H. Akatsuka, respectively. In this talk, we present a formula for limiting values of HMM and an analytic continuation of ZMM.

6 Yohei Tachiya (Hirosaki Univ.) Algebraic independence results for the values of the theta function ··· 10

Summary: The theta function is given by the series $\theta_3(\tau) := \sum_{n=-\infty}^{\infty} e^{i\pi n^2\tau}$, which converges for τ in the complex upper half-plane $\mathbb{H}$. In this talk we give algebraic independence results for the values of $\theta_3(\tau)$. For example, the three values $\theta_3(\tau)$, $\theta_3(n\tau)$, and $D\theta_3(\tau)$ are algebraically independent over $\mathbb{Q}$ for any $\tau \in \mathbb{H}$ such that $q = e^{i\pi\tau}$ is an algebraic number, where $n \geq 2$ is an integer and $D := (\pi i)^{-1} d/d\tau$ is a differential operator. This is a joint work with Carsten Elsner.

7 Iwao Kimura (Univ. of Toyama) Note of zeros of modular forms on Fricke groups ····· 10

Summary: We give a sufficient condition for zeros of certain modular forms on Fricke groups of level 2 or 3.

8 Yuichi Sakai (Kyushu Univ.) Kiyokazu Nagatomo (Osaka Univ.) Modular forms of certain fractional weights and modular linear differential equations 10

Summary: A modular linear differential equation is one of tools to see the relation between elliptic modular forms and characters of specific vertex operator algebras (VOAs). In this talk, we give the relation between modular forms of certain fractional weights and characters of minimal models (the simple Virasoro VOA). Furthermore, we also give the order of a modular linear differential equation which has such modular forms as solutions.

9 Hirotaka Kodama (Kogakuin Univ.) On certain vector valued Siegel modular forms of type $(k, 2)$ over $\mathbb{Z}_{(p)}$ 10

Summary: We will give the generators of the $M_*^{even}(\Gamma_2)$-module of vector-valued Siegel modular forms of type $(k, 2)$ over $\mathbb{Z}_{(p)}$. This gives an example of the positive solution to more general problem whether the module of vector-valued modular forms of arbitrary degree is finitely generated over the ring of modular forms for $\mathbb{Z}_{(p)}$.

10 Yumiko Hironaka (Waseda Univ.) Spherical functions on the space of quaternion hermitian forms 10

Summary: We define typical spherical functions $\omega(x; s)$ on the space X_n of quaternion hermitian forms over a p-adic field of size n, by Poisson transform of certain relative invariants on X_n. They can be regarded as generating functions of local densities of integral representations of quaternion hermitian forms. We study functional equations of $\omega(x; s)$ with respect to S_n acting on $s \in \mathbb{C}^n$, and give an explicit formula of $\omega(x; s)$ by the method that the author gave in a general context. The situation is similar to the space of sesquilinear forms, but the main term of the explicit formula is written by a series of symmetric Laurent polynomial of different type from usual Hall–Littlewood polynomials.

11 Takehiro Hasegawa (Shiga Univ.) Explicit formula of a supersingular polynomial for rank-2 Drinfeld modules 10

Summary: Rank-2 Drinfeld modules are a function-field analogue of elliptic curves. It is natural to investigate similarities and differences between rank-2 Drinfeld modules and elliptic curves. An explicit formula of a supersingular polynomial for elliptic curves was given by Max Deuring. We show an explicit formula of a supersingular polynomial for rank-2 Drinfeld modules.

12 Tabane Yashiro (Tokyo Denki Univ.) Discrete tomography for the point sequence generated by the adjacent terms of a sequence 10

Summary: Tomography is the field that reconstruct a three-dimensional object from its two-dimensional cuts. Let f be a function on $\mathbb{Z}^n$, and w be a finite subset of $\mathbb{Z}^n$. Discrete tomography reconstructs the function f from the data $f_{w+p} = \sum_{x \in w+p} f(x), p \in \mathbb{Z}^n$. This problem is proved by F. Hazama to be described completely by the zero locus of a certain polynomial in n variable associated with w. The purpose of this talk is to apply his result to the zero-sum arrays when the window w has the form $w = (s_0, s_1), (s_1, s_2), \cdots, (s_{n-2}, s_{n-1}), (s_{n-1}, s_0)$, where $s_i \in \mathbb{Z} (0 \leq i \leq n-1)$. Furthermore we describe the way how one can find the rational zero-sum arrays for w.

13 Shigeru Iitaka (Gakushuin Univ.*) On subperfect numbers 10

Summary: Given an integer m and an odd prime, if the following equality $\overline{P}\sigma(a) = Pa - m$
is satisfied then any natural number a is said to be subperfect number with base P, translation parameter m.

14:15–15:15 Talk Invited by Algebra Section

Hajime Kaneko (Univ. of Tsukuba) Recent developments in uniform distribution theory: digital expansion of integers and real numbers

Summary: In this talk, we discuss the uniformity property of the digits of special sequences: base-b expansion of smooth numbers and beta expansion of real numbers, where b is an integer greater than 1. In particular, we investigate asymptotic behavior of the number of nonzero digits as partial results of uniformity property.
For a real number $x \geq 2$, we call a positive integer n x-smooth if every prime factor of n is at most x. It is believed that the digits $0, 1, 2$ in the ternary expansion of 2-smooth numbers, namely, integers of the form 2^m $(m = 0, 1, 2, \ldots)$, are uniform. However, this conjecture is unsolved. We introduce recent results for the uniformity property of the digits of general smooth numbers. In particular, we consider a problem on the number of nonzero digits suggested by Bugeaud.
Next, we consider the uniformity property of the digits in the beta expansion of real numbers. Beta expansion of real numbers is a generalization of base-b expansion of real numbers, which plays an important role in dynamical systems. A real number having uniform digits in its beta expansion is called a normal number. It is difficult to show the normality of a given real number. In this talk, we introduce recent results on the normality of the beta expansion of algebraic numbers. In particular, we consider the number of nonzero digits as partial results of normality.

15:30–16:50

14 Wataru Takeda (Kyoto Univ.) The subconvexity problem for relatively r-prime lattice points ····· 10

Summary: Let K be a number field and let $\mathcal{O}_K$ be its ring of integers. We regard an m-tuple of ideals of $\mathcal{O}_K$ as a lattice point in K^m. We say that a lattice point $(\mathfrak{a}_1, \mathfrak{a}_2, \ldots, \mathfrak{a}_m)$ is relatively r-prime, if there exists no prime ideal $\mathfrak{p}$ such that $\mathfrak{a}_1, \mathfrak{a}_2, \ldots, \mathfrak{a}_m \subset \mathfrak{p}^r$.
We study the distribution of relatively r-prime lattice points in K^m with their components having norm less than x. We show some results for abelian extensions or extensions with small degree by using the subconvexity bounds of Dedekind zeta functions on the critical line.

15 Genki Shibukawa (Osaka Univ.) Cubic Pell's equations associated with the simplest cubic fields ····· 10

Summary: We introduce a cubic analogue of the Pell's equations associated with the simplest cubic fields and write down all integer solutions of this system explicitly by using special values of complete symmetric polynomials.

16 Masamitsu Shimakura (Tokyo Univ. of Sci.) Ramification in Kummer extensions arising from algebraic tori ····· 10

Summary: We describe the ramification in cyclic extensions arising from the Kummer theory of the Weil restriction of the multiplicative group. This generalizes the classical theorem by Hecke describing the ramification of Kummer extensions.

17 Toru Komatsu (Tokyo Univ. of Sci.) On an infinite family of pairs of imaginary quadratic fields with divisibility of class numbers ····· 10

Summary: Let n and m be natural numbers greater than one. In this talk we construct an infinite family of imaginary quadratic fields $\mathbb{Q}(\sqrt{D})$ such that both $\mathbb{Q}(\sqrt{D})$ and $\mathbb{Q}(\sqrt{mD})$ have ideal classes of order n.

18 Akiko Ito * (Tokyo Univ. of Information Sci.) On the indivisibility of the class numbers and the Iwasawa λ-invariants of real quadratic fields (II) ····· 10

Summary: In this talk, concerning Greenberg's conjecture, we will show the existence of certain infinite families of real quadratic fields whose Iwasawa λ-invariant of the cyclotomic $\mathbb{Z}_p$-extension is equal to 0.

19 Kazuhito Kozuka (Miyakonojo Nat. Coll. of Tech.) * On power sums attached to Dirichlet characters for the integer points in certain rational polytopes and multiple Dedekind sums ····· 10

Summary: In this talk, for certain rational polytopes, we consider power sums attached to Dirichlet characters for the integer points. The main result is expressed by making use of generalized multiple Dedekind sums attached to Dirichlet characters.

20 Makoto Minamide (Yamaguchi Univ.) * On representations for error terms related to the derivatives for some Dirichlet series ····· 10
Jun Furuya (Hamamatsu Univ. School of Medicine)
Yoshio Tanigawa

Summary: We study an error term in a certain divisor problem related to the derivatives of the Riemann zeta-function. In particular, we obtain an analogue of Chowla–Walum formula in an error term of an asymptotic formula for $\sum_{n\leq x}\sum_{d|n} d^a(\log n)^k(\log n/d)^l$. Moreover we get an upper bound for the error term.

September 12th (Tue) Conference Room IX

9:15–12:00

21 Mitsuhiro Miyazaki (Kyoto Univ. of Edu.) * On the almost Gorenstein property of Hibi rings ····· 15

Summary: We state a criterion of when a Hibi ring is non-Gorenstein and almost Gorenstein in terms of the combinatorial structure of the poset which defines the Hibi ring.

22 Kazunori Matsuda (Osaka Univ.) * Normality of twinned order polytopes ····· 15

Summary: I proved that the twinned order polytope associated with partially ordered sets P and Q is normal if P and Q have a common linear extension (joint work with Takayuki Hibi (Osaka University)). In this talk, I generalize this theorem.

23 Akiyoshi Tsuchiya (Osaka Univ.) Gorenstein simplices with a given δ-polynomial ····· 15
Takayuki Hibi (Osaka Univ.)
Koutarou Yoshida (Osaka Univ.)

Summary: It is fashionable among the study on convex polytopes to classify the lattice polytopes with a given δ-polynomial. As a basic challenges toward the classification problem, we achieve the study on classifying lattice simplices with a given δ-polynomial of the form $1 + t^{k+1} + \cdots + t^{(v-1)(k+1)}$, where $k \geq 0$ and $v > 0$ are integers. The lattice polytope with the above δ-polynomial is necessarily Gorenstein. A complete classification is already known, when v is prime. In this talk, we will give a complete classification when v is either p^2 or pq, where p and q are prime integers with $p \neq q$.

24 Hirotaka Higashidaira (Meiji Univ.) On sequentially generalized Cohen–Macaulay simplicial complexes and bipartite graphs ····· 15

Summary: Let K be a field, and let S be the polynomial ring in n variables over K. Let Δ be a simplicial complex with n vertices and H be a bipartite graph with n vertices. We denote by I_Δ the Stanley–Reisner ideal of Δ and by $I(H)$ the edge ideal of H. In 2003, N. T. Cuong and L. T. Nhan introduced the notion of sequentially generalized Cohen–Macaulay (seq. gen. CM for short) rings. In this talk, we investigate conditions of Δ when S/I_Δ is a seq. gen. CM ring. We see that S/I_Δ is a seq. gen. CM ring if all pure skeletons of Δ are generalized Cohen–Macaulay. As an application, we give examples of a bipartite graph H such that $S/I(H)$ is a seq. gen. CM ring.

25 Yuta Kambe (Saitama Univ.) Construction of the moduli space of reduced Gröbner bases ····· 15

Summary: A reduced Gröbner basis of an ideal I gives a flat deformation from I to its initial ideal. Therefore, when we give a monomial ideal J and its minimal generator $\mathscr{C}$, we are interested in the moduli space of reduced Gröbner bases whose set of leading monomials is $\mathscr{C}$. In this seminar, we show that there exists such a moduli space as a scheme or an ind-scheme, and we give its relation with the Hilbert scheme and a characterization of its singularity.

26 Ken-ichi Yoshida (Nihon Univ.) Strong Rees property for powers of the maximal ideal ····· 15
Kei-ichi Watanabe (Nihon Univ.)

Summary: We introduce the notion of the strong Rees property (SRP) for $\mathfrak{m}$-primary ideals of a Noetherian local ring and prove that any power of the maximal ideal $\mathfrak{m}$ has its property if the associated graded ring G of m satisfies depth G is greater than 1. As its application, we characterize two-dimensional excellent normal local domains so that $\mathfrak{m}$ is a p_g-ideal, which is related to Takahashi–Dao's question.

27 Tsutomu Nakamura (Okayama Univ.) Localization and colocalization in derived categories of commutative
Yuji Yoshino (Okayama Univ.) Noetherian rings ····· 15

Summary: Let R be a commutative Noetherian ring. The notion of localization (resp. colocalization) functors in the derived cateogry $D(R)$ is a natural generalization of left (resp. right) derived functors of completion (resp. section) functors. In this talk, we report several results about localization and colocalization functors. As an application, we can show that Grothendieck type vanishing theorem holds for colocalization functors. Moreover, by using localization functors, it is possible to give a simple proof of a classical theorem due to Raynaud and Gruson, which states that the projective dimension of a flat R-module is at most the Krull dimension of R.

28 Hiroki Matsui (Nagoya Univ.) Some topological structures of the Balmer spectra of right bounded
derived categories of commutative noetherian rings ····· 15

Summary: By virtue of Balmer's celebrated theorem, the classification of thick tensor ideals of a tensor triangulated category $\mathcal{T}$ is equivalent to the topological structure of its Balmer spectrum $\mathsf{Spc}\mathcal{T}$. Motivated by this theorem, we discuss connectedness and noetherianity of the Balmer spectrum of a right bounded derived category of finitely generated modules over a commutative ring.

29 Haruhisa Nakajima * (J. F. Oberlin Univ.) Liftings of pseudo-reflection groups on invariant subrings of Krull domains of algebraic subtori under actions of reductive groups ····· 10

Summary: Pseudo-reflections of linear representations of groups can be extended to the affine group actions on Krull domains over an algebraically closed field K. Let G be an affine algebraic group over K with a reductive identity component G^0 acting regularly on a Krull K-domain R. Let T be an algebraic closed subtorus of G and suppose that $\mathcal{Q}(R)^T = \mathcal{Q}(R^T)$ of quotient fields. We will show: If G is the centralizer of T in G, then the pseudo-reflections of the action of G on R^T can be lifted to those on R. This seems to be the best possible result for the lifting of pseudo-reflections on the invariant ring of R of a normal connected subgroup to those on R.

13:00–14:00 Talk Invited by Algebra Section

Satoshi Murai (Osaka Univ.) Algebraic and combinatorial duality of triangulated manifolds

Summary: The numbers of faces of a triangulated manifold satisfy a certain symmetry, which is known as Klee's Dehn–Sommerville equations. In this talk, I will show that Klee's Dehn–Sommerville equations can be algebraically explained as the Matlis duality of certain quotients of Stanley–Reisner rings using Goto's work on Buchsbaum rings.

September 13th (Wed) Conference Room IX

9:15–11:15

30 Ayako Itaba (Tokyo Univ. of Sci.) Finiteness condition (Fg) for a self-injective special biserial algebra obtained by a circular quiver with double arrows ····· 10

Summary: Let K be an algebraically closed field. For a positive integer s, we consider a self-injective special biserial algebra Λ_s obtained by a circular quiver with s vertices and $2s$ arrows. This algebra Λ_s is a Koszul self-injective special biserial algebra for $s \geq 1$, but is not a weakly symmetric algebra for $s \geq 3$. Our purpose in this talk is to show that, for $s \geq 3$, Λ_s satisfies the fineiteness condition (Fg) introduced by Erdmann–Holloway–Taillefer–Snashall–Solberg.

31 Mayu Tsukamoto (Osaka City Univ.) Strongly quasi-hereditary algebras and rejective subcategories ····· 10

Summary: Ringel introduced a special class of quasi-hereditary algebras called right-strongly quasi-hereditary algebras, motivated by Iyama's finiteness theorem of representation dimensions of artin algebras. In this talk, we give characterizations of these algebras in terms of heredity chains and right rejective subcategories. As an application, we prove that any artin algebra of global dimension at most two is always right-strongly quasi-hereditary.

32 Michio Yoshiwaki (Shizuoka Univ. / Osaka City Univ.)
Hideto Asashiba (Shizuoka Univ.)
Mayumi Kimura
Ken Nakashima (Shizuoka Univ.)
On isomorphisms of generalized multifold extensions of algebras without nonzero oriented cycles ····· 10

Summary: Let A be an algebra over an algebraically closed field $\Bbbk$ with a basic set A_0 of primitive idempotents, which we regard as a $\Bbbk$-category with the object set A_0. We denote by $\hat{A}$ the repetitive category of A, whose object set is given by $\{x^{[i]} = (x, i) \mid x \in A_0, i \in \mathbb{Z}\}$ with the Nakayama automorphism ν of $\hat{A}$ sending $x^{[i]}$ to $x^{[i+1]}$. We set $A^{[0]}$ to be the full subcategory of $\hat{A}$ consisting of objects $x^{[0]}$ with $x \in A_0$, and $1^{[0]} \colon A \to \hat{A}$ the embedding sending x to $x^{[0]}$ for all $x \in A_0$.
Let $n \in \mathbb{Z}$. Then we show that an algebra of the form $\hat{A}/\langle\phi\rangle$, where ϕ is an automorphism of $\hat{A}$ such that $\phi(A^{[0]}) = A^{[n]}$ is isomorphic to an algebra of the form $\hat{A}/\langle\widehat{\phi_0}\nu_A^n\rangle$, where $\widehat{\phi_0}$ is an automorphism of $\hat{A}$ naturally induced from $\phi_0 := (1^{[0]})^{-1}\phi\nu_A^{-n}1^{[0]}$ if $eAe = \Bbbk$ for all $e \in A_0$.

33 Yasuaki Ogawa (Nagoya Univ.) Auslander–Reiten duality and recollements ····· 10

Summary: Let k be a commutative field. For a given finite dimensional k-algebra, it is known that an idempotent induces a recollement of module categories. In this talk, we generalize this construction for a Krull–Schmidt k-linear category equipped with a nice duality. As an application, we provide another proof of Auslander–Reiten duality.

34 Tomohiro Itagaki (Tokyo Univ. of Sci.) Symmetric Hochschild extension algebras and normalized 2-cocycles ·· 10

Summary: In this talk, we give a sufficient condition related to 2-cocycles for Hochschild extension algebras of bound quiver algebras by the standard duality module to be symmetric.

35 Hideyuki Koie (Tokyo Univ. of Sci.)
Tomohiro Itagaki (Tokyo Univ. of Sci.)
Katsunori Sanada (Tokyo Univ. of Sci.)
The ordinary quivers of Hochschild extension algebras for self-injective Nakayama algebras ····· 10

Summary: Let T be a Hochschild extension algebra of a finite dimensional algebra A over a field K by the standard duality A-bimodule $\mathrm{Hom}_K(A, K)$. We determine the ordinary quiver of T if A is a self-injective Nakayama algebra by means of the $\mathbb{N}$-graded 2nd Hochschild homology group $HH_2(A)$ in the sense of Sköldberg.

36 Tsunekazu Nishinaka (Univ. of Hyogo) On primitivity of group algebras ····· 10

Summary: In my talk, we introduce a certain condition satisfied many infinite groups and show that the group algebra KG of a group G satisfying the condition is primitive for any field K.

37 Shigeto Kawata (Nagoya City Univ.) On vertices of indecomposable modules over group rings ····· 10

Summary: Let $\mathcal{O}$ be a complete discrete valuation ring of characteristic zero with residue class field $k = \mathcal{O}/\pi\mathcal{O}$ of characteristic $p > 0$. Let $\mathcal{O}G$ be the group ring of a finite group G over $\mathcal{O}$. Suppose that P is a p-subgroup of G and Q ($\neq \{1_G\}$) is a proper normal subgroup of P. We show that there exists an indecomposable $\mathcal{O}G$-lattice X with vertex P such that all vertices of the direct summands of a kG-module $X/\pi X$ are contained in Q.

38 Takao Hayami (Hokkai-Gakuen Univ.) * Hochschild cohomology ring of the integral group ring of a split metacyclic group ····· 10

Summary: We will determine the ring structure of the Hochschild cohomology $HH^*(\mathbb{Z}G)$ of the integral group ring of a split metacyclic group G of order 8ℓ for arbitrary integer $\ell \geq 2$ by giving the precise description of the integral cohomology ring $H^*(G, \mathbb{Z})$.

39 Fuminori Tasaka (Nat. Inst. of Tech., Tsuruoka Coll.) ♭ The number of simple modules in a block with Klein four hyperfocal subgroup ····· 10

Summary: A 2-block of a finite group having a Klein four hyperfocal subgroup has the same number of irreducible Brauer characters as the corresponding 2-block of the normalizer of the hyperfocal subgroup.

11:30–12:00 Research Section Assembly

14:15–16:45

40 Takao Komatsu (Wuhan Univ.) Incomplete Fubini numbers associated with determinants ····· 10

Summary: We study some properties of incomplete (restricted and associated) Fubini numbers. In particular, they have the natural extensions of the original Fubini numbers in the sense of determinants. We also introduce modified incomplete (restricted and associated) Bernoulli and Cauchy numbers and study characteristic properties.

41 Mitsushi Fujimoto (Fukuoka Univ. of Edu.) Loop generators and factorization problem in $mn-1$ puzzle groups ····· 10

Summary: We introduce *the loop generators* corresponding to rotary operations in the $mn-1$ puzzle. They are very useful to solve the $mn-1$ puzzle and suitable to explain algorithms to solve it because the number of them is just $m-1$ and the rotary operation is easy to manipulate. We show that God's number for the 8 puzzle in the loop generators is 16, and an experimental result using a factorization algorithm for 547 test instances of the 15 puzzle is reported. The result teaches us that the length of the solution by the loop generators is not long compared with optimal solutions using single-tile moves.

42 Hiroyasu Takeda (Hokkaido Univ.), Mutsumi Saito (Hokkaido Univ.) Confluent hypergeometric systems associated with principal nilpotent p-tuples ····· 10

Summary: Kimura and Takano introduced confluent hypergeometric systems associated with centralizers of regular elements of $\mathfrak{gl}(n, \mathbb{C})$. We introduce hypergeometric systems associated with principal nilpotent p-tuples and show to deform integrands of solutions of this systems to that of Aomoto–Gel'fand systems.

43 Hidetaka Kitayama (Wakayama Univ.) Rationality problem for purely monomial group actions ····· 10

Summary: Let K be a field, n be a natural number and G be a finite subgroup of $GL(n; \mathbb{Z})$. In this talk, we will consider the rationality problem for purely monomial group actions, which asks whether the fixed field $K(x_1, \ldots, x_n)^G$ under the purely monomial action of G is rational over K.

44 Daisuke Suyama (Hokkaido Univ.) Michele Torielli (Hokkaido Univ.) Shuhei Tsujie (Hokkaido Univ.) The freeness of the Weyl subarrangements of type B and signed graphs 10

Summary: A Weyl arrangement is the hyperplane arrangement defined by a root system. R. P. Stanley gave a characterization of the freeness of the Weyl subarrangements of type A in terms of simple graphs. The Weyl subarrangements of type B can be represented by signed graphs. Any characterization of the freeness of them has not been known. However, characterizations of the freeness for a few restricted classes are known. In this talk, we give a characterization of the freeness and supersolvability of the Weyl subarrangements of type B under certain assumption.

45 Yugen Takegahara (Muroran Inst. of Tech.) Fumihito Oda (Kinki Univ.) Tomoyuki Yoshida (Hokusei Gakuen Univ.) Lefschetz invariants and Young characters for representations of the Coxeter groups of type B 10

Summary: Let B_n be the Coxeter group of type B. In 1978, L. Geissinger and D. Kinch presented the concept of Young subgroups of B_n and showed that there exists a $\mathbb{Z}$-basis of the character ring $R(B_n)$ of B_n consisting of Young characters, which forces $R(B_n)$ to be isomorphic to the partial Burnside ring $\Omega(B_n, \widehat{\mathcal{U}}_n)$ relative to the set $\widehat{\mathcal{U}}_n$ of Young subgroups of B_n. The linear $\mathbb{C}$-characters of B_n are identified with reduced Lefschetz invariants which are units of $\Omega(B_n, \widehat{\mathcal{U}}_n)$.

46 Ken Saito (Tohoku Univ.) A classification of codes constructed from simple graphs 10

Summary: Let us denote a finite field with 4 elements by $\mathbb{F}_4$. We will introduce an additive code over $\mathbb{F}_4$ of length n defined by an additive subgroup of $\mathbb{F}_4^n$. It is known that every self-dual additive code can be represented by the adjacency matrix of a simple undirected graph. Danielsen and Parker (2006) classified all self-dual additive codes over $\mathbb{F}_4$ for lengths up to 12 by using graphs on up to 12 vertices. In this talk, we give a classification of codes having the largest minimum weight among the constructed additive codes from some graphs.

47 Koji Chinen (Kinki Univ.) Construction of divisible formal weight enumerators 10

Summary: Formal weight enumerators were introduced by M. Ozeki in 1997. In this talk, we propose an algorithm for the search of similar polynomials and show some examples.

48 Koji Chinen (Kinki Univ.) Construction of an extremal polynomial not satisfying the Riemann hypothesis 10

Summary: Zeta functions for codes were introduced by I. Duursma in 1999 and were generalized to other invariant polynomials by the present author. One of the famous problems is whether extremal weight enumerators satisfy the Riemann hypothesis. In this talk, we give an example of an extremal invariant polynomial (not being related to a code) not satisfying the Riemann hypothesis.

49 Toshiyuki Abe (Ehime Univ.) Ching Hung Lam (Academia Sinica) Hiromichi Yamada (Hitotsubashi Univ./Academia Sinica) $\mathbb{Z}_p$-orbifold constructions of the Moonshine vertex operator algebra ... 10

Summary: Let $V^\natural$ be the Moonshine vertex operator algebra which is a holomorphic vertex operator algebra of central charge 24 whose full automorphism group is the Monster simple group. We prove that for primes $p = 3, 5, 7, 13$, $V^\natural$ is constructed from the Leech lattice vertex operator algebra by a $\mathbb{Z}_p$-orbifold construction.

50 Taiki Shibata (Okayama Univ. of Sci.) On twisted algebraic loop groups and affine Kac–Moody groups ····· 10

Summary: Untwisted/twisted affine Lie algebras are well understood and have a lot of applications not only in mathematics but also in theoretical physics. On the other hand, infinite-dimensional "Lie groups" constructed from given affine Lie algebras (á la C. Chevalley), which we shall call affine Kac–Moody groups, seems to be less understood. D. Peterson and V. Kac (1983) mentioned and Y. Chen (1996) proved that an untwisted affine Kac–Moody group can be realized as a central extension of an algebraic loop group.
In this talk, we generalize the result to all twisted cases. This is a joint work with J. Morita (University of Tsukuba) and A. Pianzola (University of Alberta).

17:00–18:00 Talk Invited by Algebra Section

Ryosuke Kodera (Kyoto Univ.) Quantized Coulomb branches of Jordan quiver gauge theories and cyclotomic rational Cherednik algebras

Summary: Braverman–Finkelberg–Nakajima gave a mathematically rigorous definition of the Coulomb branches of $3d$ $\mathcal{N}=4$ supersymmetric gauge theories. They are certain Poisson affine algebraic varieties and admit natural quantizations. In this talk we consider the quantized Coulomb branches associated with quiver gauge theories of Jordan type. We prove that they are isomorphic to the spherical parts of cyclotomic rational Cherednik algebras. This is a joint work with Hiraku Nakajima.

September 14th (Thu) Conference Room IX

9:15–12:00

51 Tomohiro Iwami (Kyushu Inst. of Tech.)* Compactification of ceratin Picard-torsors as a variant of Boot-Strap type theorem ····· 15

Summary: We study a compacification of quotient spaces by groupooid by the associated equivalent etale cohomology. As a corollary, we give certain type of a rigid Pic-torsor which appears in the studies of unirationality of supersingular K3 surfaces or the related moduli spaces by Ekedahl–Hyland–Shepherd–Barron, or Liedtke.

52 Takanori Nagamine (Niigata Univ.) On automorphisms and coordinates in polynomial rings ····· 15

Summary: In this talk, we will explain some properties of coordinates in polynomial rings by introducing some concepts which are weaker than coordinates. In particular, in the polynomial ring in two variables over an algebraically closed field of characteristic zero, we show some relations between polynomials and their fibers on an affine plane.

53 Shigeru Kuroda (Tokyo Metro. Univ.) Non-finitely generated polynomial subrings and birational modifications of $\mathbf{G}_a$-actions ····· 15

Summary: Let k be a field of characteristic zero, R a finitely generated k-domain with field of fractions $K \neq R$, and $K[\mathbf{x}] = K[x_1, \ldots, x_n]$ the polynomial ring in n variables over K. In this talk, we discuss non-finite generation of the R-algebras $B \cap R[\mathbf{x}]$ for K-subalgebras B of $K[\mathbf{x}]$. This problem is closely related to Hilbert's fourteenth problem and its generalization by Zariski. One of our results implies that, if $n \geq 3$, then every non-trivial $\mathbf{G}_a$-action on the affine n-space over R can be 'converted' into a $\mathbf{G}_a$-action on the affine $(n+1)$-space over R with non-finitely generated invariant ring.

54 Shusuke Otabe (Tohoku Univ.) On a purely inseparable analogue of the Abhyankar Conjecture for affine curves ····· 15

Summary: Let U be an affine smooth curve defined over an algebraically closed field of positive characteristic. The Abhyankar Conjecture (proved by Raynaud and Harbater in 1994) describes the set of finite quotients of Grothendieck's étale fundamental group of U. In this talk, I will consider a purely inseparable analogue of this problem, formulated in terms of Nori's profinite fundamental group scheme. I will give a partial answer to it.

55 Takahiko Furuya (Meikai Univ.) Maximal rigid objects in an orbit category arising from a tube ····· 15
Masashi Yamauchi (Meikai Univ.)

Summary: In this talk, we introduce the notion of stable k-rigid objects in a triangulated category for $k \geq 1$. We then describe some properties of stable k-rigid objects in a higher cluster tube. As a main result, we completely determine the structures of stable 2-rigid objects in a higher cluster tube.

56 Takayuki Uchiba (Waseda Univ.) Gluing stability conditions on derived category of coherent sheaves on geometric ruled surfaces ····· 15

Summary: We give a explicit description of gluing stability conditions on geometric ruled surfaces by introducing gluing perversity. Moreover, we describe a destabilizing wall of skyscraper sheaves on ruled surfaces by deformation of stability conditions glued from $\widetilde{GL^+}(2,\mathbb{R})$-translates of the standard stability condition on the base curve.

57 Kotaro Kawatani (Osaka Univ.) Pure sheaves and Kleinian singularities ····· 15

Summary: Ishii–Uehara classifies pure sheaves on the fundamental cycle of the Kleinian singularity A_n. The classification is an analogue of Grothendieck's classification of vector bundles on projective lines. We study the classification of pure sheaves on the other Kleinian singularities.

58 Ryou Nishimura (Saitama Univ.) A smooth projective plane curve of degree d whose automorphism group has order d^2 ····· 15

Summary: A smooth projective plane curve which satisfies the inequality $|\mathrm{Aut}(C)| > d^2$ is well known. In this talk, we consider a smooth projective plane curve which satisfies the equality $|\mathrm{Aut}(C)| = d^2$.

59 Takanori Ayano (Osaka City Univ.) Victor Matveevich Buchstaber (Steklov Inst. of Math.) The field of meromorphic functions on sigma divisor of genus 3 hyperelliptic curve and its application to dynamical system ····· 15

Summary: The field of meromorphic functions on the sigma divisor of a hyperelliptic genus 3 curve is described in terms of the gradient of its sigma function. Solutions of corresponding families of polynomial dynamical systems in $\mathbb{C}^4$ with two polynomial integrals are constructed as an application. These systems were introduced in the work of V. M. Buchstaber and A. V. Mikhailov on the base of commuting vector fields on the symmetric products of algebraic curves.

14:15–16:15

60 Makoto Enokizono (Osaka Univ.) Slope equality for plane curve fibrations ····· 15

Summary: A fibered surface whose general fiber is a smooth plane curve is called a plane curve fibration. In this talk, I will show that relative invariants for plane curve fibrations can be localized at a finite number of fiber germs and a certain equality between local invariants, which is called a slope equality, holds for these fibrations. As a corollary, we can define a local signature for plane curve fibrations.

61 Makoto Enokizono (Osaka Univ.) Durfee-type inequality for hypersurface surface singularities ····· 10

Summary: In 1978, A. H. Durfee conjectured that for a hypersurface surface singularity, six times its geometric genus does not exceed its Milnor number, which is nowadays called Durfee's strong conjecture. In this talk, I will show that an inequality among invariants of hypersurface surface singularities holds and then Durfee's strong conjecture is true for such a singlarity with non-negative topological Euler number of the exceptional set of the minimal resolution. For the proof, we use the method of invariants of plane curve fibrations.

62 Hirokazu Nasu (Tokai Univ.) Obstructions to deforming curves on a prime Fano threefold ····· 15

Summary: We prove that for every smooth prime Fano threefold V, the Hilbert scheme of smooth connected curves on V contains a generically non-reduced irreducible component of Mumford type.

63 Taku Suzuki (Waseda Univ.) Higher order minimal families of rational curves on Fano manifolds 15

Summary: In this talk, we introduce higher order minimal families H of rational curves associated to Fano manifolds X. We show that H is also a Fano manifold if the Chern characters of X satisfy some positivity conditions. We also provide a sufficient condition for Fano manifolds to be covered by higher rational manifolds.

64 Katsuhiko Okumura (Waseda Univ.) The Classification of SNC log symplectic structures on blow-up of projective spaces 15

Summary: A log symplectic structure is a generically symplectic Poisson structure with a reduced degeneracy divisor. The hypothesis that a Poisson structure is generically symplectic ensures that degeneracy locus become a divisor and then it is an anti-canonical divisor. Thus the diversity of generically symplectic Poisson structures measures positivity of anti-canonical class in some sense. The past few years, classification of log symplectic structures on higher-dimensional Fano varieties attracts considerable attention in this view point. In this talk, I will explain classifications of log symplectic structures with simple normal crossing degeneracy divisor on blowing-up of projective spaces along a linear subspace and give two new examples.

65 Yohosuke Matsuzawa (Univ. of Tokyo) On the dynamical and arithmetic degrees of self-maps of algebraic varieties 15

Summary: For a dominant rational self-map of an algebraic variety, one can define an invariant, called (first) dynamical degree, which measures the asymptotic behavior of the iterates of the map. On the other hand, when the variety is defined over a number field, one can associate to an orbit an invariant using Weil height function, called arithmetic degree, which measures the arithmetic complexity of the orbit. Kawaguchi and Silverman conjectured that the first dynamical degree and the arithmetic degree of a Zariski dense orbit coincide. We show that the arithmetic degree is less than or equals to the dynamical degree. We also prove that the conjecture is true for endomorphisms on surfaces. This is partially joint work with Kaoru Sano and Takahiro Shibata.

66 Nobuhiro Higuchi (Yokohama Nat. Univ.) Classification of boundary components of central streams in the two slopes case 15

Summary: We classify the boundary components of the central stream for a Newton polygon consisting of two slopes, where one slope is less than 1/2 and the other slope is greater than 1/2. By our method, we can enumerate boundary components much faster than the enumeration by using the criterion obtained by Moonen–Wedhorn. Moreover, this method is expected to have many applications. Central streams and boundary components are described in terms of truncated Dieudonné modules of level one (abbreviated as DM_1's). To study specializations of DM_1's, we introduce a combinatorial tool which plays an important role in our proof.

16:30–17:30 Talk Invited by Algebra Section

Shigeki Matsutani (Sasebo Nat. Coll. of Tech.)

Elastica of Euler–Bernoulli and its generalization: from sprout of elliptic functions to reconstruction of Abelian function theory

Summary: Elastica is an ideal thin elastic rod. Jacob Bernoulli proposed the elastica problem 1691: to determine every shape of elastica in a plane mathematically. To solve the problem, Jacob, Daniel Bernoulli and Euler discovered mathematical facts related to the lemniscate integral, the elastic energy (the oldest harmonic map), variational method, elliptic integrals, the moduli of elliptic curves. Finally Euler completely solved the problem 1744.

As its generalization, I have been studying the statistical mechanics of elasitca to find the shape of DNA. Mathematically it means to investigate the geometrical structure of the loop space with the energy. It turned out that the structure is determined by the modified KdV flows and hyperelliptic functions including their moduli.

However, the hyperelliptic function theory is not sufficient to describe the generalized elastica problem whereas the shape of original elasitca is completely described by elliptic function theory. Thus I have been also studying a reconstruction of the Abelian function theory for decades with coauthors.

In this talk, after I will show the history of elastica (including its relation to lemniscate) and its generalization, I mention the recent progress of the reconstruction of the Abelian function theory and its application to the generalization of elastica.

Geometry

September 11th (Mon) Conference Room II

9:30–11:40

1 Hokuto Konno (Univ. of Tokyo) Positive scalar curvature and Seiberg–Witten invariants of tuples of diffeomorphisms · · · · · 15

Summary: We construct several invariants of tuples of commutative diffeomorphisms on a 4-manifold using the Seiberg–Witten theory for families. They are generalizations of Ruberman's invariants of diffeomorphisms on a 4-manifold using 1-parameter gauge theory. We also give an application to the spaces of positive scalar curvature metrics for 4-manifolds which cannot be studied using Ruberman's original invariant.

2 Masayuki Aino (Nagoya Univ.)♭ Riemannian invariants that characterize rotational symmetries of the standard sphere · · · · · 15

Summary: Inspired by the Lichnerowicz–Obata theorem for the first eigenvalue of the Laplacian, we define a new family of invariants $\{\Omega_k(g)\}$ for closed Riemannian manifolds. The value of $\Omega_k(g)$ sharply reflects the spherical part of the manifold. Indeed, $\Omega_1(g)$ and $\Omega_2(g)$ characterize the standard sphere.

3 Masahiro Morimoto (Osaka City Univ.) The heat operator of a transversally elliptic operator · · · · · 15

Summary: Let G be a connected compact Lie group. A G-invariant differential operator on a compact G-manifold is said to be transversally elliptic if it is elliptic in the directions transversal to the G-orbits. In this talk we study the heat operator of a transversally elliptic operator. After we review the spectral properties of a transversally elliptic operator, we define and investigate the character, that is a distribution on G generalizing the trace of the heat operator to the G-equivariant case.

4 Tatsuki Seto (Nagoya Univ.) A cyclic cocycle and relative index theorems on partitioned manifolds · · · · · 15

Summary: In this talk, we extend Roe's cyclic 1-cocycle to relative settings. We also state two relative index theorems for partitioned manifolds by using its cyclic cocycle, which are generalizations of index theorems on partitioned manifolds. One of these theorems is a variant of [arXiv:1411.6090, Theorem 3.3].

5 Shinya Akagawa (Osaka Univ.)♭ Vanishing theorems of L^2-cohomology groups on regular convex cones with the Cheng–Yau metrics · · · · · 15

Summary: An open convex cone $\Omega \subset \mathbb{R}^n$ is said to be regular if Ω does not contain any full straight lines. We obtain vanishing theorems of L^2-cohomology groups $L^2H^{p,q}_{\bar{\partial}}(\Omega, g)$ on a regular convex cone $\Omega \subset \mathbb{R}^n$ with the Cheng–Yau metric g for $p+q > n$ or $p > q$.

6 Masato Arai (Yamagata Univ.)
Kurando Baba (Tokyo Univ. of Sci.) Special Lagrangian submanifolds and cohomogeneity one actions on the complex projective space · · · · · 15

Summary: We give examples of cohomogeneity one special Lagrangian submanifolds in the cotangent bundle over the complex projective space, whose Calabi–Yau structure was given by Stenzel. For each example, we describe the condition of special Lagrangian as an ordinary differential equation. Our method is based on a moment map technique and the classification of cohomogeneity one actions on the complex projective space due to Takagi.

7 Kotaro Kawai (Gakushuin Univ.), Hông Vân Lê (CAS), Lorenz Schwachhöfer (TU Dortmund) — Frölicher–Nijenhuis cohomology on G_2- and Spin(7)-manifolds ····· 15

Summary: We show that a parallel differential form Ψ of even degree on a Riemannian manifold allows to define a natural differential both on $\Omega^*(M)$ and $\Omega^*(M, TM)$, defined via the Frölicher–Nijenhuis bracket. For instance, on a Kähler manifold, these operators are the complex differential and the Dolbeault differential, respectively. We investigate this construction when taking the differential w.r.t. the canonical parallel 4-form on a G_2- and Spin(7)-manifold, respectively. We calculate the cohomology groups of $\Omega^*(M)$ and give a partial description of the cohomology of $\Omega^*(M, TM)$.

8 Masaya Kawamura (Nat. Inst. of Tech., Kochi Coll.) — Parabolic flows on almost complex manifolds ····· 15

Summary: We define two parabolic flows on almost complex manifolds, which coincide with the pluriclosed flow and the Hermitian curvature flow respectively on complex manifolds. We study the relationship between these parabolic evolution equations on a compact almost Hermitian manifold.

14:20–15:45

9 Hikaru Yamamoto (Tokyo Univ. of Sci.) — Mirror correspondence between special Lagrangian submanifolds and deformed Hermitian Yang–Mills connections ····· 15

Summary: Leung, Yau and Zaslow defined deformed Hermitian Yang–Mills connections and gave a formal way to convert special Lagrangian submanifolds in X to deformed Hermitian Yang–Mills connections on W. In their paper, two conditions were assumed for simplicity. One is that X and W are actually lattice quotients of tangent and cotangent bundle of some common open subset B in $\mathbb{R}^m$. Another is that each Lagrangian submanifold can be written as a graph of a section of $X \to B$. In this talk, a way to glue their argument on a tropical manifold will be explained and a mild condition for Lagrangians will be mentioned.

10 Satoshi Nakamura (Tohoku Univ.) — Generalized Kähler Einstein metrics and uniform stability for toric Fano manifolds ····· 15

Summary: We give a complete criterion for the existence of generalized Kähler Einstein metrics on toric Fano manifolds from view points of a uniform stability in a sense of GIT and the properness of a functional on the space of Kähler metrics.

11 Ryosuke Nomura (Univ. of Tokyo) — Miyaoka–Yau inequality for compact Kähler manifolds with semipositive canonical bundles ····· 15

Summary: The Miyaoka–Yau inequality is an inequality for Chern classes. In this talk, we prove it for compact Kähler manifold with semipositive canonical bundle.

12 Ryosuke Takahashi (Tohoku Univ.), Shunsuke Saito (Tohoku Univ.) — Stability of anti-canonically balanced metrics ····· 15

Summary: Anti-canonically balanced metrics are quantization of Kähler–Einstein metrics on Fano manifolds. We introduce a new algebro-geometric stability on Fano manifolds and show that the existence of anti-canonically balanced metrics implies our stability. The relation between our stability and others is also discussed.

13 Ryosuke Takahashi (Tohoku Univ.) Smooth approximation of the modified conical Kähler–Ricci flow ····· 15

Summary: On a Fano manifold M, the conical Kähler–Ricci flow (CKRF) evolves Kähler metrics while preserving cone singularities along an effective divisor D. When D is smooth and M admits a conical Kähler–Einstein metric, the limiting behavior of CKRF is studied by Liu–Zhang. However, allowing D to have simple normal crossing support changes the whole situation. In this talk, we consider the case when D is simple normal crossing and M admits a conical Kähler–Ricci soliton. In order to study the limiting behavior of CKRF, we construct the regularized flow of CKRF modified by a holomorphic vector field from the view point of the gradient flow interpretation with respect to the modified log/twisted Mabuchi K-energy.

16:00–17:00 Talk Invited by Geometry Section

Yasufumi Nitta (Tokyo Tech) On the existence of canonical Kähler metrics and stability

Summary: We will talk about the relationship between the existence of "canonical" Kähler metrics and algebraic geometric stabilities of polarized manifolds. It is conjectured that the existence of constant scalar curvature Kähler metrics will be equivalent to the notion of K-polystability, which is known as the Yau–Tian–Donaldson conjecture. For the case of Kähler–Einstein metrics on Fano manifolds, it was solved affirmatively by Chen–Donaldson–Sun. However, for general polarizations, the above conjecture is still open. In this talk, we shall discuss on the recent developement for this problem and some versions. (for extremal Kähler metrics, generalized Kähler–Einstein metrics, etc.)

September 12th (Tue) Conference Room Ⅲ

10:10–10:25 Presentation Ceremony for the 2017 MSJ Geometry Prize

10:30–11:30 Award Lecture for the 2017 MSJ Geometry Prize

Kobayashi Osamu ♭ Weyl's gauge theory, the Schwarzian derivative and a sphere theorem

Summary: For many years I have been interested in conformal differential geometry and projective differential geometry. In this talk I would like to explain what these geometries mean at the present day and what can be expected in the future. I am now, as of June 2017, planning the talk and it will be concerned chiefly with a new conformal invariant which is similar to Yamabe's conformal invariant in many respects. In addition a conjecture, a sphere theorem, will be presented. If time permits I touch upon projective differential geometry and discuss some complements to Weyl's setting. This talk as a whole is a derivation from H. Weyl's "Reine Infinitesimalgeometrie" and subsequent developments by K. Yano, H. Yamabe and M. Obata.

13:00–14:00 Award Lecture for the 2017 MSJ Geometry Prize

Makoto Sakuma (Hiroshima Univ.) Fiber surfaces vs Heegaard surfaces of 3-manifolds

Summary: Though fiber surfaces and Heegaard surfaces have completely different natures, we can find various analogies between them. We describe the analogies from the view points of (1) the branched fibration theorem, (2) monodromy groups, (3) McShane's identity and (4) geometric structures.

September 13th (Wed) Conference Room Ⅱ

10:00–11:40

14 Kohei Yamamoto (Tohoku Univ.) Cheeger constant and percolation process ····· 15

Summary: Percolation process is a kind of probability theory. Let $G = (V, E)$ be a connected graph, and fix a parameter $p \in [0, 1]$, then we consider each edge $e \in E$ to be open with probability p independently. We have a subgraph of G which consisted only of open edges, it has some connected components. In this talk, we discuss the relationship between the number of connected components and Cheeger constant.

15 Kenzi Satô (Tamagawa Univ.) The existence and uniqueness of orthocenters of simplices of high-dimensional spheres 15

Summary: We consider orthocenters of simplices of the unit sphere of the n-dimensional Euclidean space. For $n = 3$, orthocenters always exist for all simplices, but for $n \geqq 4$, they do not necessarily exist. Moreover, unlike the case of the Euclidean space, it is possible that there exist infinite numbers of orthocenters. In this talk, we give characterizations of the existence and the uniqueness of orthocenters.

16 Homare Tadano (Tokyo Univ. of Sci.) Some compactness theorems via m-Bakry–Émery and m-Modified Ricci curvatures with negative m 15

Summary: In this talk, stimulated by Ohta and Takatsu, and Wylie, we shall establish some new compactness theorems for complete Riemannian manifolds via m-Bakry–Émery and m-modified Ricci curvatures with negative m. Our compactness theorems may be considered as natural generalizations of the classical compact theorems due to Ambrose, Galloway, and Cheeger–Gromov–Taylor.

17 Junichi Mukuno (Nagoya Univ.) On the fundamental group of semi-Riemannian manifolds with positive curvature operator 15

Summary: We consider semi-Riemannian submersions $\pi : (E, g) \to (B, -g_B)$ under the condition with (B, g_B) Riemannian, the fiber closed Riemannian, and the horizontal distribution integrable. Then we prove that, if the non-spacelike geodesically complete semi-Riemannian manifold E has some positivity of curvature, then the fundamental group of the fiber is finite. Moreover we construct an example of semi-Riemannian submersions with some positivity of curvature, non-integrable horizontal distribution, and the finiteness of the fundamental group of the fiber.

18 Nobuhiro Innami (Niigata Univ.) Projective Randers change and cut locus 15

Summary: Let g be a Riemannian metric on a manifold M. We call a Finsler metric $F(x, y) = \sqrt{g(x)(y, y)} + \omega(y)$ a Randers metric where ω is a 1-form on M. Two Finsler metrics are said to be pointwise projectively related if they have the same geodesics as point sets. If the 1-form ω is closed, then F is pointwise projectively related to g. We see that the invariance of the cut loci w.r.t g and F implies the exactness of a closed 1-form ω.

19 Chen Tao (Tohoku Univ.) A convergence theory of discrete surface on graphs 15

Summary: In present presentation, we attempt to identify a hidden smooth surface for a given discrete surface by providing a convergence theorem of the sequence of subdivisions of a network. We prove the sequence of the Goldberg–Coxeter subdivisions of a trivalent network realized in 3-dim Euclidean space by harmonic maps are consisting of a Cauchy sequence in the Hausdorff topology. As an application, we study the Mackay Crystal and estimate the convergence of subdivisions and their normal vectors.

14:20–15:45

20 Kouhei Miura (Miyagi Univ.)
Gabor Toth (Rutgers Univ., Camden) On the moduli of isotropic and helical minimal immersions between spheres 10

Summary: We first give a simple criterion for (the lowest order) isotropy of a spherical minimal immersion in terms of orthogonality relations in the third (ordinary) derivative of the image curves. This is then applied in the main result of this talk which gives a full characterization of isotropic $SU(2)$-equivariant spherical minimal immersions of S^3 into the unit sphere of real and complex $SU(2)$-modules. Specific examples include the polyhedral minimal immersions of which the icosahedral minimal immersion is isotropic whereas its tetrahedral and octahedral cousins are not.

21 Yuichiro Sato (Tokyo Metro. Univ.) On the classification of ruled minimal surfaces in pseudo-Euclidean space ····· 10

Summary: This talk gives, in generic situations, a complete classification of ruled minimal surfaces in pseudo-Euclidean space with arbitrary index. In addition, we discuss the condition for ruled minimal surfaces to exist, and give a counter-example on the problem of Bernstein type. We see that there are very fruitful ruled minimal surfaces in four dimensional Minkowski space or four dimensional pseudo-Euclidean space with neutral metric, i.e. having index 2. In particular, it should be remarkable that some of those ruled minimal surfaces are embedded in three dimensional subspace with degenerate metric of pseudo-Euclidean space.

22 Masahiro Ooguri (Chuo Univ.)* Three-dimensional locally homogeneous nondegenerate centroaffine hypersurfaces with nondiagonalizable Tchebychev operator ····· 10

Summary: We determine three-dimensional locally homogeneous nondegenerate centroaffine hypersurfaces with nondiagonalizable Tchebychev operator.

23 Masashi Yasumoto (Osaka City Univ.) Discrete timelike minimal surfaces and discrete wave equations ····· 15

Summary: In the continuous case, a timelike immersion with vanishing mean curvature in 3-dimensional Minkowski space is called a timelike minimal surface. Timelike minimal surfaces are highly related to linear and nonlinear wave equations. In this talk we briefly introduce a theory of discrete timelike surfaces. In particular, by a reparametrizion of discrete surfaces, we show that each coordinate function of a discrete timelike minimal surface satisfies a discrete wave equation. This result provides not only the geometric meaning of special solutions for a discrete wave equation but also a new representation formula for discrete timelike minimal surfaces.

24 Kazuyuki Enomoto (Tokyo Univ. of Sci.)
Jin-ichi Itoh (Kumamoto Univ.) Total mixed curvature of curves in Euclidean space ····· 15

Summary: The total mixed curvature of a curve in E^3 is defined as the integral of $\sqrt{\kappa^2+\tau^2}$, where κ is the curvature and τ is the torsion. The total mixed curvature is the length of the spherical curve defined by the principal normal vector field. We study the infimum of the total mixed curvature in a set of curves, where the endpoints and the principal normal vectors at the endpoints are prescribed. In our previous works, similar problems have been studied for the unit tangent vector and for the binormal vector.

25 Takashi Kurose (Kwansei Gakuin Univ.)
Nozomu Matsuura (Fukuoka Univ.) Certain transformations from curves on a Minkowski plane and on a two-dimensional de Sitter space to equicentroaffine plane curves ····· 15

Summary: Geometric counterparts of the Miura transformation between the Korteweg–de Vries (KdV) equation and the defocusing modified KdV equation are given, by using the fact that the KdV equation arises from certain time-evolutions of equicentroaffine curves and the defocusing modified KdV equation from those of curves on a Minkowski plane and on a two-dimensional de Sitter space.

16:00–17:00 Talk Invited by Geometry Section

Kota Hattori (Keio Univ.)♭ The nonuniqueness of the tangent cones at infinity of Ricci-flat manifolds

Summary: For a metric space (X,d), the Gromov–Hausdorff limit of $(X,a_n d)$ as $a_n \to 0$ is called the tangent cone at infinity of (X,d). Although the tangent cone at infinity always exists if (X,d) is a complete Riemannian manifold with nonnegative Ricci curvature, the uniqueness does not hold in general. Colding and Minicozzi showed the uniqueness under the assumption that (X,d) is a Ricci-flat manifold satisfying some additional conditions. In this talk, I will explain some examples of noncompact complete hyper-Kähler manifolds who have several tangent cones at infinity, and determine the moduli spaces of them.

Complex Analysis

September 11th (Mon) Conference Room VII

9:00–12:00

1 Toshiyuki Sugawa (Tohoku Univ.) On geometric properties of hypergeometric functions 10
Li-Mei Wang
(Univ. of Int. Business and Econ.)

Summary: In this talk, we will see spirallikenss (including starlikeness) of the shifted hypergeometric function $F(z) = z_2F_1(a, b; c; z)$ with complex parameters a, b, c. First, we observe the asymptotic behaviour of the hypergeometric function around the point $z = 1$ to obtain necessary conditions for F to be λ-spirallike for a given λ with $-\pi/2 < \lambda < \pi/2$. We next give sufficient conditions for F to be λ-spirallike. More general results will also be given in the talk if time permits.

2 Toshiyuki Sugawa (Tohoku Univ.) Characterizations of convexity of a domain in terms of the hyperbolic metric 10

Summary: Let Ω be a domain in the complex plane with hyperbolic metric $\lambda_\Omega(z)|dz|$ of Gaussian curvature -4. Mejia and Minda proved that Ω is (Euclidean) convex if and only if $d(z, \partial\Omega)\lambda_\Omega(z) \geq 1/2$ for $z \in \Omega$, where $d(z, \partial\Omega)$ denotes the Euclidean distance from z to the boundary $\partial\Omega$. In the present talk, we give spherical and hyperbolic counterparts of this result in terms of the spherical/hyperbolic density of the hyperbolic metric $\lambda_\Omega(z)|dz|$. A key idea is to obtain a geometric characterization of such convex domains relative to the spherical/hyperbolic metric.

3 Masakazu Shiba (Hiroshima Univ.*) Conformal embeddings of an open Riemann surface into closed ones of the same genus —closings and hydrodynamic period matrices 15
Hiroshi Yamaguchi (Shiga Univ.*)

Summary: Let R be an open Riemann surface of finite genus $g(\geq 1)$ and χ_R be a canonical homology basis of R modulo dividing cycles. A closing of (R, χ_R) is, roughly speaking, a triplet $[S, \chi_S, \iota]$ consisting of a closed Riemann surface S of genus g, a canonical homology basis χ_S, and a conformal mapping $\iota : R \to S$ which induces the prescribed corespondence between χ_R and χ_S. Denote by C the set of closings of (R, χ_R), and let $\mathfrak{M}$ be the set of the period matrices (τ_{jk}) of (S, χ_S), $[S, \chi_S, \iota] \in C$. For any $(a_1, a_2, \ldots, a_g) \in \mathbb{R}^g$ with $\sqrt{a_1^2 + a_2^2 + \cdots + a_g^2} \neq 0$ the set $\{\sum a_j a_k \tau_{jk} \mid (\tau_{jk}) \in \mathfrak{M}\}$ is a closed disk in $\mathbb{H}$. We show among other things that $\partial\mathfrak{M}$ is described by the generalized period matrices derived from holomorphic differentials with hydrodynamically specific boundary behavior.

4 Hideki Miyachi (Osaka Univ.) Harmonic differentials for infinitesimal deformations of singular Euclidean structures 15

Summary: In this talk, I will describe the infinitesimal deformations of singular flat structures defined from generic holomorphic quadratic differentials under the de Rham theoretic framework.

5 Hideki Miyachi (Osaka Univ.) A formula of the Levi form of Teichmüller distance 15

Summary: I will give a formula of the Levi form of the Teichmüller distance on the Teichmüller space.

6 Yohei Komori (Waseda Univ.) On Schwarz automorphic functions 15
Shota Kubo
(Waseda Univ. Senior High School)

Summary: Let Γ be the (a, b, c)-hyperbolic triangle group acting on $\hat{\mathbf{D}}$, the unit disk $\mathbf{D}$ with the set of cusps of Γ. Then the quotient space $\hat{\mathbf{D}}/\Gamma$ is isomorphic to the Riemann sphere $P^1(\mathbf{D})$ which induces a meromorphic function on $\mathbf{D}$. It is called the Schwarz automorphic function, and we write it down explicitly in terms of a, b and c.

7 Katsuhiko Matsuzaki (Waseda Univ.) Injectivity of the quotient Bers embedding of Teichmüller space ····· 15

Summary: The Bers embedding of the Teichmüller space is a map into the Banach space of corresponding holomorphic quadratic differentials. This induces a complex Banach manifold structure to the Teichmüller space. If we take a subspace of the universal Teichmüller space, we can usually project down the Bers embedding to a well-define map from the quotient Teichmüller space to the quotient Banach space. We call this the quotient Bers embedding but its injectivity is not a trivial matter. In this talk, we consider several cases where the injectivity holds true.

8 Gou Nakamura (Aichi Inst. of Tech.) Polynomial solution to Dirichlet problems for the heat equation ····· 15
Noriaki Suzuki (Meijo Univ.)

Summary: We consider polynomial solution to Dirichlet problems for the heat equation, where polynomials are in two variables x and t with real coefficients. Our interest is to determine a polynomial $\psi(x,t)$ such that for any polynomial $f(x,t)$ there exists a heat polynomial $u(x,t)$ which is equal to $f(x,t)$ on the curve $\psi(x,t)=0$ in the xt-plane. In our previous work we determined ψ of degree at most two and showed that there exist no such ψ of degree 3. In this talk we show that there exist no such ψ of degree greater than 3.

9 Hiroaki Aikawa (Hokkaido Univ.) Dichotomy of global capacity density ····· 15

Summary: We show that the limit of the lower capacity density is equal either to 0 or to 1.

10 Masaharu Nishio (Osaka City Univ.) Weighted polyharmonic and polyparabolic Bergman spaces on the upper
Katsunori Shimomura (Ibaraki Univ.) half space ····· 15

Summary: Polyharmonic functions are solutions of the iterated Laplace equation. In this talk, we discuss spaces of polyharmonic functions together with iterated parabolic operators on the upper half space of the Euclidean space. After explaining some basic properties of polyharmonic functions and parabolic operators of fractional order, we introduce weighted polyharmonic and polyparabolic Bergman spaces, and shall discuss their relations and reproducing properties.

11 Katsunori Shimomura (Ibaraki Univ.) Caloric morphism with Bateman space mapping for radial metrics ···· 15

Summary: Caloric morphisms are transformations preserving solutions of heat equation. Bateman mappings are conformal in semi-euclidean spaces. In this talk, we shall discuss problems whether there exist caloric morphisms with Bateman space mapping for radial semi-riemannean metrics.

14:15–15:00

12 Koh Katagata (Ichinoseki Nat. Coll. of Tech.) Entire functions whose Julia sets include any finitely many copies of quadratic Julia sets ····· 15

Summary: We show that for any finite collection of quadratic Julia sets, there exist a polynomial and a transcendental entire function whose Julia sets include copies of the given quadratic Julia sets. In order to prove the result, we construct quasiregular maps with required dynamics and employ the quasiconformal surgery to obtain the desired functions.

13 Tomoki Kawahira (Tokyo Tech) Almost conformal copies of the Julia sets in the Mandelbrot set ····· 15
Masashi Kisaka (Kyoto Univ.)

Summary: We show that there are quasiconformal copies of the Cantor Julia sets embedded in the boundary of the Mandelbrot set, whose dilatations are arbitrarily close to one. Indeed, these embeddings are also close to complex affine maps. It implies that these copies are "superfine".

14 Kohei Ueno (Daido Univ.)* Böttcher coordinates for holomorphic skew products ····· 15

Summary: For a holomorphic skew product with a superattracting fixed point, we construct a Böttcher coordinate on an invariant open set whose closure contains the fixed point.

15:20–16:20 Talk Invited by Complex Analysis Section

Risto Korhonen (Univ. of Eastern Finland) Delay differential Painlevé equations and difference Nevanlinna theory

Summary: Necessary conditions are obtained for certain types of rational delay differential equations to admit a transcendental meromorphic solution of hyper-order less than one. The equations obtained include delay Painlevé equations and equations solved by elliptic functions. Difference analogue of Nevanlinna theory is a central tool in the proofs of the main results. An overview of this theory, as well as some of its applications to difference Painlevé equations, are also presented.

16:30–17:30 Talk Invited by Complex Analysis Section

Masaharu Nishio (Osaka City Univ.) Potential theory and function spaces for parabolic equations

Summary: We consider a parabolic operator $L^{(\alpha)} = \partial_t + (-\Delta)^\alpha$ on $\boldsymbol{R}^{n+1}$ for $0 < \alpha \leq 1$ and $n \in \boldsymbol{N}$. When $\alpha = 1$, $L^{(1)}$ is the heat operator, and otherwise, $L^{(\alpha)}$ is a non-local operator. When $\alpha = 1/2$, the operator $L^{(\alpha)}$ is called the Poisson operator and closely related with harmonic functions on $\boldsymbol{R}^{n+1}$. In this talk, after recalling the potential theory for $L^{(\alpha)}$ to define $L^{(\alpha)}$-harmonic functions, we discuss function spaces of $L^{(\alpha)}$-harmonic functions, called the parabolic Bergman space and the parabolic Bloch space.

September 12th (Tue) Conference Room VII

9:00–12:00

15 Shizuo Nakane (Tokyo Polytechnic Univ.) On formal normal forms of holomorphic germs at super-saddle fixed points ····· 15

Summary: We consider a class of rigid holomorphic germs on $\mathbf{C}^2$ at super saddle fixed points. Their formal normal forms are given by Ruggiero. We investigate the convergence/divergence of their formal conjugacies to the normal forms. It turns out that, in most cases, the formal conjugacies diverge. We also show convergence result under some assumptions.

16 Shinichi Tajima (Univ. of Tsukuba), Mitsuo Kato (Univ. of Ryukyus), Katsusuke Nabeshima (Tokushima Univ.) B-functions of semi-quasihomogeneous hypersurface singularities and integral dependence relations ····· 15

Summary: Annihilators in the ring of analytic linear partial differential operators associated with a μ-constant deformation of isolated hypersurface singularities are considered. Algorithmic methods of computing annihilators and b-functions are described for semi-quasihomogeneous singularities. Key ingredients of the proposed methods are local cohomology classes and integral dependence relations.

17 Katsusuke Nabeshima (Tokushima Univ.), Shinichi Tajima (Univ. of Tsukuba) Algorithms for computing integral numbers in a ring of convergent power series —Gröbner bases vs Local cohomology— ····· 10

Summary: We present new algorithms for computing integral numbers w.r.t. an ideal in a ring of convergent power series. The problems of solving the integral numbers can be regarded as the ideal membership problems in the ring of convergent power series. In this talk, we give two methods for solving the membership problems. One is utilizing Gröbner bases and the another is utilizing local cohomology classes. We also address the question of how to generalize the methods to parametric cases.

18 Shinichi Tajima (Univ. of Tsukuba) Computing Grothendieck local residues via transformation law ····· 15
Katsusuke Nabeshima
(Tokushima Univ.)

Summary: We give an algorithm for computing Grothendieck local residues via transformation law. Actually, we need syzygy, standard bases, ideal quotient, local cohomology etc, to get Grothendieck local residues. Thus, we give the relations in the talk. Furthermore, we give some computation examples.

19 Takashi Umeno (Kyushu Sangyo Univ.) Toroidal groups defined by algebraic number fields ····· 15

Summary: Let p be any prime number. The toroidal group defined by $Q(\sqrt[5]{p})$ has no non-constant meromorphic functions on it. On the other hand, the toroidal group defined by $Q(\sqrt[6]{p})$ is a quasi-Abelian variety.

20 Takayuki Koike (Kyoto Univ.)* Complex $K3$ surfaces containing Levi-flat hypersurfaces ····· 10

Summary: We show the existence of a complex $K3$ surface X which is not a Kummer surface and has a one-parameter family of Levi-flat hypersurfaces in which all the leaves are dense. We construct such X by patching two open complex surfaces obtained as the complements of tubular neighborhoods of elliptic curves embedded in blow-ups of the projective planes at general nine points.

21 Yusaku Tiba (Ochanomizu Univ.) The extension of holomorphic functions on a non-pluriharmonic locus ····· 15

Summary: Let $n \geq 4$ and let Ω be a bounded hyperconvex domain in $\mathbb{C}^n$. Let φ be a negative exhaustive smooth plurisubharmonic function on Ω. We show that any holomorphic function defined on a connected open neighborhood of the support of $(i\partial\overline{\partial}\varphi)^{n-3}$ can be extended to the holomorphic function on Ω.

22 Hidetaka Hamada (Kyushu Sangyo Univ.) Bounded support points for the Carathéodory families in several complex variables ····· 10

Summary: In this talk, we will show that the shearing process recently introduced by Bracci can be generalized to $\mathcal{N}_A(\mathbb{B}^2)$ and $\mathcal{M}_g(\mathbb{B}^2)$, where A is a diagonal matrix whose diagonal elements are λ and 1 with $\lambda \in [1,2)$ and $g \in H(\mathbb{U})$ is a convex (univalent) function with real coefficients such that $g(0) = 1$, $\Re g(\zeta) > 0$ for all $\zeta \in \mathbb{U}$ and $\mathbb{U}(1, a_0) \subseteq g(\mathbb{U})$, where a_0 is a constant defined by g. We also give the results for $\mathcal{M}_g(\mathbb{U}^2)$.

23 Hidetaka Hamada (Kyushu Sangyo Univ.) Bounded support points for the families with parametric representation in several complex variables ····· 10

Summary: In this talk, we will show that the shearing process recently introduced by Bracci can be generalized to $S^0_A(\mathbb{B}^2)$, $S^0_g(\mathbb{B}^2)$, where A is a diagonal matrix whose diagonal elements are λ and 1 with $\lambda \in [1,2)$ and $g \in H(\mathbb{U})$ is a convex (univalent) function with real coefficients such that $g(0) = 1$, $\Re g(\zeta) > 0$ for $\zeta \in \mathbb{U}$ and $\mathbb{U}(1, a_0) \subseteq g(\mathbb{U})$. As a corollary, we obtain bounded suppot points for these families. This result is in contrast to the one dimensional case, where all support points of S are unbounded. Also, our result shows the existence of bounded support points for various subclasses of $S^*(\mathbb{B}^2)$ and that $S^0_A(\mathbb{B}^2) \neq S^0(\mathbb{B}^2)$. We also give a result for $S^0_g(\mathbb{U}^2)$ and $S^*_g(\mathbb{U}^2)$.

24 Hidetaka Hamada (Kyushu Sangyo Univ.) The reachable families and the support points in several complex variables ····· 10

Summary: In this talk, we show the relation of the reachable families and the support points of $S^0_A(\mathbb{B}^2)$(or, $S^0_g(\mathbb{B}^2)$) and apply it to show that $\tilde{\mathcal{R}}_{\log M}(\mathrm{id}_{\mathbb{B}^2}, \mathcal{N}_A(\mathbb{B}^2)) \neq S^0_A(\mathbb{B}^2, M)$ and $\tilde{\mathcal{R}}_{\log M}(\mathrm{id}_{\mathbb{B}^2}, \mathcal{M}_g(\mathbb{B}^2)) \neq S^0_g(\mathbb{B}^2, M)$, where A is a diagonal matrix whose diagonal elements are λ and 1 with $\lambda \in [1,2)$ and $g \in H(\mathbb{U})$ is a convex (univalent) function with real coefficients such that $g(0) = 1$, $\Re g(\zeta) > 0$ for all $\zeta \in \mathbb{U}$ and $\mathbb{U}(1, a_0) \subseteq g(\mathbb{U})$. This result provides a basic difference between the theory of bounded univalent mappings on the unit disc $\mathbb{U}$ and that on the unit ball $\mathbb{B}^n$, $n \geq 2$.

25 Satoru Shimizu (Tohoku Univ.)* Tube domains with solvable groups of automorphisms 15

Summary: Let T_Ω be a tube domain in $\mathbf{C}^n$ with polynomial infinitesimal automorphisms and $\mathfrak{g}(T_\Omega)$ the Lie algebra of all complete holomorphic vector fields on T_Ω. By definition, every element of $\mathfrak{g}(T_\Omega)$ has the form of a polynomial vector field. The investigation into the tube domain T_Ω such that $\mathfrak{g}(T_\Omega)$ is solvable has significance to the general study of tube domains with polynomial infinitesimal automorphisms. We have made an experimental investigation into such a case previously. In this talk, we disucuss the general structure of solvable $\mathfrak{g}(T_\Omega)$, which gives a development to the previous investigation.

26 Junjiro Noguchi (Univ. of Tokyo*)$^\flat$ A remark on Oka's coherence without Weierstrass' preparation theorem and the Oka theory 15

Summary: The proofs of Oka's Coherence Theorems are based on Weierstrass' Preparation (division) Theorem. Here we observe that a Weak Coherence of Oka proved without Weierstrass' Preparation (division) Theorem, but only with *power series expansions* is sufficient to prove Oka's Jôku-Ikô and hence Cousin I, II, holomorphic extensions, and Levi's Problem, as far as the domain spaces are non-singular. The proof of the Weak Coherence of Oka is almost of linear algebra. We will present some new or simplified arguments in the proofs.

13:00–14:00 Talk Invited by Complex Analysis Section

Tatsuhiro Honda (Hiroshima Inst. of Tech.) Distortion theorems for holomorphic mappings on bounded symmetric domains

Summary: In this talk, we will generalize distortion theorems for normalized holomorphic functions on the unit disc in $\mathbb{C}$ to normalized holomorphic mappings on bounded symmetric domains in a higher dimensional complex Banach space.

Functional Equations

September 11th (Mon) Conference Room VIII

9:00–12:00

1 Keiji Matsumoto (Hokkaido Univ.) Relative twisted (co)homology groups associated with Lauricella's F_D 12

Summary: We define a relative twisted homology group $H_1(T, D; \mathcal{L})$ isomorphic to the space of local solutions to Lauricella's hypergeometric system F_D for any parameters. We define a relative twisted cohomology group $H^1(T, D; \mathcal{L})$ as its dual space. We show that $H^1(T, D; \mathcal{L})$ is isomorphic to three kinds of twisted de Rham cohomology groups. We define an intersection form between relative twisted homology groups and that between relative twisted cohomology groups, and show their compatibility.

2 Hideaki Izumi (Chiba Inst. of Tech.) Solving Abel equation by using recurrence relations 12

Summary: In this talk, we deal with recurrence relations of the form

$$a_{n+1} - a_n = P(a_n),$$

where P is a polynomial consisting of deg ≥ 2 terms or more generally,

$$a_{n+k} - a_n = P(a_n,\ a_{n+1},\ a_{n+2}, \ldots,\ a_{n+k-1})$$

and find general terms which converge to 0.

3 Toru Tsutsui (Chiba Univ.) Propagation of regular singularities in a complex analytic characteristic initial value problem 12

Summary: We consider a chatacteristic initial value problem of a class of second order linear partial differential equation with regular singular initial data in the complex domain. We express the solution by means of series of hypergeometric functions, and show that the solution has regular singularities on three intersecting hypersurfaces. We also clarify the structure of analytic continuation of the solution.

4 Katsuyoshi Ohara (Kanazawa Univ.)
Takayama Nobuki (Kobe Univ.)
Fadil Danufane (Kanazawa Univ.)
Numerical evaluation of the distribution function of the largest root of complex non-central Wishart matrices 9

Summary: Kang and Alouini gave a determinant formula for the cumulative distribution function of the largest root of complex non-central Wishart matrices in their study of a wireless communication system with multiple antennas. The entries of the determinant formula are expressed in terms of a hypergeometric function in 2 variables. We give an asymptotic formula of the hypergeometric function and give a stable numerical analysis scheme to evaluate the hypergeometric function.

5 Kohei Iwaki (Nagoya Univ.)
Tatsuya Koike (Kobe Univ.)
Yumiko Takei (Kobe Univ.)
On the expression of Voros coefficients for (confluent) hypergeometric differential equations in terms of the topological recursion and its applications 12

Summary: Voros coefficients are important objects in exact WKB analysis to study global behaviors of solutions of differential equations. In this talk we will report that the Voros coefficients for (confluent) hypergeometric differential equations are given by the generating functions of free energies defined in terms of the Eynard–Orantin topological recursion. From these results, we can give concrete forms of the free energies for algebraic equations related to these equations.

6 Hikaru Igarashi
Kouichi Takemura (Chuo Univ.) On solutions of ultradiscrete Painlevé II equation with parity variables · · · · · 12

Summary: We introduce a simultaneous ultradiscrete Painlevé II equation with parity variables, which is shown to be more suitable for studying two-parameter solutions than the single second-order ultradiscrete Painlevé II equation with parity variables. We investigate several types of two-parameter solutions and the solutions which are related with the ultradiscrete limit of determinant type solutions of q-Painlevé II.

7 Daisuke Kawagoe (Kyoto Univ.)
I-Kun Chen (Taiwan Univ.) Propagation of boundary-induced discontinuity in stationary radiative transfer · · · · · 9

Summary: We consider the boundary value problem of the stationary transport equation, an intedro-differential equation, in the slab domain of general dimensions. In this talk, we discuss the relation between discontinuity of the incoming boundary data and that of the solution to the boundary value problem. We introduce two conditions posed on the boundary data so that discontinuity of the boundary data propagates along the positive characteristic lines. We also introduce an example in two dimensional case which shows that piecewise continuity of the boundary data is not a sufficient condition for the main result.

8 Wataru Ichinose (Shinshu Univ.) On the relativistic covariance of the Feynman path integral for the Dirac equation · · · · · 12

Summary: In recent days the Feynman path integral has been constructed mathematically for the Dirac equation. In this talk we will show that this Feynman path integral is relativistically covariant, i.e. has the property of spinor under the Lorentz transformations. First we give the representation of the fundamental solution by Fourier transformation with respect to momentum variables $p \in \mathbb{R}^4$ to the free Dirac equation, as of the Feynman propagator. Then, our proof can be completed by means of the theories of both the Dirac matrices and the Lie group.

9 Mitsuru Shibayama (Kyoto Univ.) Periodic solutions for a prescribed-energy problem of Keplerian-type potential systems · · · · · 12

Summary: We study the existence of periodic solutions for a prescribed-energy problem of Hamiltonian systems whose potential function has a singularity at the origin like $-1/|q|^\alpha (q \in \mathbb{R}^N)$. It is known that there exist generalized periodic solutions which may have collisions, and the number of possible collisions has been estimated. In this talk we provide a new estimation of the number of collisions. Especially we show that the obtained solutions have no collision if $N \geq 2$ and $\alpha > 1$.

10 Hiroyuki Usami (Gifu Univ.)* Decay of solutions to generalized pendulum equations · · · · · 12

Summary: Decay of solutions to generalized pendulum equations are considered. Explicit sufficient conditions are given for solutions of such equations to decay at the infinity.

11 Kazuyuki Yagasaki (Kyoto Univ.) Nonintegrability of the normal form of the fold-Hopf bifurcation · · · · · 12

Summary: We consider the unfolding of the codimension-two fold-Hopf bifurcation and prove its meromorphic nonintegrability in the meaning of Bogoyavlenskij for almost all parameter values. Our proof is based on a generalized version of the Morales–Ramis–Simó theory for non-Hamiltonian systems and related variational equations up to second order are used.

12 Yutaka Kamimura
(Tokyo Univ. of Marine Sci. and Tech.) A bursting 2-soliton · · · · · 12

Summary: It is shown that each 2-soliton obtained by an inverse scattering method with respect to an energy dependent Schrödinger equation has a finite life span, in the reflectionless case where the transmission coefficient has two poles on the imaginary axis.

13 Kohji Ohtsuka (Hiroshima Kokusai Gakuin Univ.) ♭ Relation of shape optimization of singular points in boundary value problems and trace theorem in Sobolev space ····· 12

Summary: The shape of the object is determined by materials and environment. The materials is described by the boundary value problem for partial differential equation with given functions (the environment) and the shape given by the boundary. We already constructed the theory of shape optimization of sets of singular points which determines the shape of the object and the method of numerical calculations exists. I will talk about that the strength of the singular point give the influence to the shape optimization process that the trace theorem of Sobolev spaces. On the contrary, we can observe the strength of a singular point with a shape optimization process.

14 Masato Hashizume (Osaka City Univ.), Megumi Sano (Osaka City Univ.) Embedding on the Strauss's radial compactness lemma ····· 9

Summary: We consider the embedding related to Strauss's compactness lemma. We study the sufficiently condition of compactness and non-compactness for the embedding from the radial Sobolev space to the Lebesgue space with variable exponent.

14:15–16:15

15 Lorenzo Cavallina (Tohoku Univ.) On the spherically symmetric solutions to the two-phase torsional rigidity optimization problem ····· 12

Summary: We consider the unit ball $\Omega \subset \mathbb{R}^N$ $(N \geq 2)$ filled with two materials with different conductivities. We perform shape derivatives up to the second order to find out precise information about locally optimal configurations with respect to the torsional rigidity functional. In particular we analyse the role played by the configuration obtained by putting a smaller concentric ball inside Ω. In this case the stress function admits an explicit form which is radially symmetric: this allows us to compute the sign of the second order shape derivative of the torsional rigidity functional with the aid of spherical harmonics. Depending on the ratio of the conductivities a symmetry breaking phenomenon occurs.

16 Kazuhiro Oeda (Waseda Univ.), Kousuke Kuto (Univ. of Electro-Comm.) Coexistence steady states of a prey-predator model with population flux by attractive transition ····· 12

Summary: This talk is concerned with the Dirichlet problem of a diffusive Lotka–Volterra prey-predator system with population flux by attractive transition. We study the global bifurcation structure of positive stationary solutions. Moreover, we discuss the asymptotic behavior of positive stationary solutions as the nonlinear diffusion coefficient approaches infinity.

17 Tetsutaro Shibata (Hiroshima Univ.) Oscillatory structures of bifurcation curves for semilinear eigenvalue problems ····· 12

Summary: We study the global and local behavior of bifurcation curves for nonlinear eigenvalue problems which include some oscillatory nonlinear term g. We consider the case where λ is parameterized by the maximum norm $\alpha = \|u_\lambda\|_\infty$ of the solution u_λ corresponding to λ and is represented as $\lambda = \lambda(g, \alpha)$. Especially, we restrict our attention to the case where $\lambda(g, \alpha) \to \pi^2/4$ as $\alpha \to \infty$. We establish several precise asymptotic formulas for $\lambda(g, \alpha)$ as $\alpha \to \infty$ and $\alpha \to 0$ with the exact second terms to understand well the total structures of the bifurcation curves.

18 Yasuhito Miyamoto (Univ. of Tokyo) On the existence of infinitely many nonradial solutions of a semilinear elliptic equation ····· 9

Summary: We construct countably infinitely many nonradial singular solutions of the problem

$$\Delta u + e^u = 0 \quad in \quad \mathbb{R}^N \backslash \{0\}, \quad 4 \le N \le 10$$

of the form $u(r,\sigma) = -2\log r + \log 2(N-2) + v(\sigma)$, where $v(\sigma)$ depends only on $\sigma \in \mathbb{S}^{N-1}$. To this end we construct countably infinitely many solutions of

$$\Delta_{\mathbb{S}^{N-1}} v + 2(N-2)(e^v - 1) = 0, \quad 4 \le N \le 10,$$

using ODE techniques.

19 Alessio Pomponio (Politecnico di Bari)
Tatsuya Watanabe (Kyoto Sangyo Univ.) Quasilinear elliptic equations of Born–Infeld type ····· 12

Summary: In this talk, we study, with variational technique, the existence of positive solutions for quasilinear elliptic equations of Born–Infeld type. We obtain the existence result for a large class of nonlinearities.

20 Kotaro Watanabe (Nat. Defense Acad. of Japan)
Naoki Sioji (Yokohama Nat. Univ.) Bifurcation and symmetry breaking for Brezis–Nirenberg problem on the thin annulus of the n-dimensional sphere ····· 9

Summary: In this talk, we consider the Brezis–Nirenberg problem on the thin annulus of the standard sphere $\mathbb{S}^n$. By the consideration of Morse index of linearlized equation, we construct bifurcation solution from radially symmetric solution. To obtain the results, uniqueness of the positive radial solution plays an important role.

21 Futoshi Takahashi (Osaka City Univ.) Critical and subcritical fractional Trudinger–Moser type inequalities on $\mathbb{R}$ ····· 9

Summary: In this talk, we are concerned with the critical and subcritical Trudinger–Moser type inequalities for functions in a fractional Sobolev space $H^{1/2,2}$ on the whole real line. We prove the relation between two inequalities and discuss the attainability of the suprema.

22 Futoshi Takahashi (Osaka City Univ.)
Van Hoang Nguyen (Inst. de Math. de Toulouse) On a weighted Trudinger–Moser type inequality on the whole space and related maximizing problem ····· 9

Summary: We establish a weighted Trudinger–Moser type inequality with the full Sobolev norm constraint on the whole Euclidean space. Main tool is the singular Trudinger–Moser inequality on the whole space recently established by Adimurthi and Yang, and a transformation of functions. We also discuss the existence and non-existence of maximizers for the associated variational problem.

23 Ryuji Kajikiya (Saga Univ.) Symmetric solutions of p-Laplace equations in hollow domains ····· 12

Summary: In this lecture, we study the p-Laplace equation in a hollow symmetric domain. Let H and G be closed subgroups of the orthogonal group such that $H \subset G$ and $H \neq G$. Then we prove the existence of a positive solution which is H invariant and G non-invariant.

24 Shigeru Sakaguchi (Tohoku Univ.)* Two-phase heat conductors with a stationary isothermic surface and their related elliptic overdetermined problems · 12

Summary: In the previous paper in 2016, we considered a two-phase heat conductor in $\mathbb{R}^N$ with $N \geq 2$ consisting of a core and a shell with different constant conductivities. Among other things, when the medium outside the two-phase conductor has a possibly different conductivity, we treated the Cauchy problem for $N \geq 3$ with the initial condition where the conductor has temperature 0 and the outside medium has temperature 1. It was shown that if there is a stationary isothermic surface in the shell near the boundary, then the structure of the conductor must be spherical. Here we report that the same proposition holds true even when $N = 2$, and as by-products, we can give other proofs of all the previous results of that paper in $N(\geq 2)$ dimensions and prove a symmetry theorem on their related two-phase elliptic overdetermined problems.

16:30–17:30 Talk Invited by Functional Equations Section

Oleg Lisovyi (Univ. de Tours) Painlevé functions, Fredholm determinants and combinatorics

September 12th (Tue) Conference Room VIII

9:15–12:00

25 Shoya Kawakami (Saitama Univ.) A discretization of the knot energies · 12

Summary: “Knot energy” was proposed to answer the question of what is a “good” figure in a given knot type. A requirement of the knot energy is that the better the figure of a knot is, the lesser the value of its energy is. Jun O’Hara gave a definition of a family of knot energies satisfying such a property in 1991. One of his energies is invariant under Möbius transformations and is called the Möbius energy. To study the Möbius energy, several discrete versions have been proposed, for example, by Kim–Kusner in 1993 and by Simon in 1994. Rawdon–Simon in 2006, Rawdon–Worthington in 2010, and Scholtes in 2014 showed their convergence. In this talk, discrete energies not only of the Möbius energy but of the general energies are given, and their convergence is discussed.

26 Katsunori Gunji (Saitama Univ.) The Łojasiewicz inequalities for decomposed Möbius energies · · · · · · · · 12

Summary: The Möbius energy is one of the knot energies defined by O’Hara. Blatt showed the global existence and convergence of the gradient flow of the Möbius energy near stationary points. The Łojasiewicz inequality played an important role for proving such results. On the other hand, by work of Ishizeki–Nagasawa, it is known that the Möbius energy can be decomposed into parts which keep the Möbius invariance. In this study, the Łojasiewicz inequality is proved for each decomposed part of the Möbius energy. In an appropriate function space setting, we can show that the 2nd variations of the decomposed Möbius energies have L^2-representations and, using a result of Chill, the energies satisfy the Łojasiewicz inequality.

27 Simon Blatt (Paris Lodron Univ. Salzburg)
Takeyuki Nagasawa (Saitama Univ.)
Alternative representation of the decomposed Möbius energies with the Möbius invariant densities · 9

Summary: The Möbius energy, defined by O’Hara, is one of the knot energies, and named after the Möbius invariant property which was shown by Freedman–He–Wang. It is also known that the energy can be decomposed into three parts keeping the Möbius invariance, proved by Ishizeki–Nagasawa. Though the decomposed energies are Möbius invariant, their densities are not. In this talk, the authors announce that the decomposed energies have alternative representation with the Möbius invariant densities. Using the fact that the cross ratio is invariant under the Möbius transformation, we define new Möbius invariant energies whose densities can be written by the cross ratio. Furthermore we show that these coincide with the decomposed energies.

28 Simon Blatt (Paris Lodron Univ. Salzburg), Takeyuki Nagasawa (Saitama Univ.) — A Möbius invariant discretization and decomposition of the Möbius energy 9

Summary: The Möbius energy, defined by O'Hara, is named after the Möbius invariant property which was shown by Freedman–He–Wang. The energy can be decomposed into three parts, each of which is Möbius invariant, proved by Ishizeki–Nagasawa. Several discrete versions of Möbius energy, that is, corresponding energies for polygons, are known, and it showed that they converge to the continuum version as the number of vertices to infinity. However already-known discrete energies lost the property of Möbius invariance, nor the Möbius invariant decomposition. Here a new discretization of the Möbius energy is proposed. It has the Möbius invariant property, and can be decomposed into the Möbius invariant components which converge to the original components of decomposition in the continuum limit.

29 Kouta Takano (Saitama Univ.) — A geometric representation of the generalized mean curvature vector using a limit of integral means 9

Summary: The generalized mean curvature is usually represented by the first variation of the varifold. A limit of integral means of the discretization of the classical mean curvature vector suggests a new representation of the generalized mean curvature without using the variation. A similar idea applicable to varifolds satisfying some regularity conditions. As a result, a new geometric representation of the generalized mean curvature is obtained, which has geometric meaning. The approximate tangent space of the measure on Euclidean space is used, however the tangential element of the varifold is not needed for our representation. Consequently, it has the advantage of giving rise to a definition of the generalized mean curvature vector for general measure on Euclidean space.

30 Ryuichi Sato (Tohoku Univ.), Goro Akagi (Tohoku Univ.), Kazuhiro Ishige (Tohoku Univ.) — The Cauchy problem for the Finsler heat equation 12

Summary: Let H be a norm of $\mathbf{R}^N$ and H_0 the dual norm of H. Denote by Δ_H the Finsler–Laplace operator defined by $\Delta_H u := \mathrm{div}\,(H(\nabla u)\nabla_\xi H(\nabla u))$. In this paper we prove that the Finsler–Laplace operator Δ_H acts as a linear operator to H_0-radially symmetric smooth functions. Furthermore, we obtain an optimal sufficient condition for the existence of the solution of the Cauchy problem to the Finsler heat equation

$$\partial_t u = \Delta_H u, \qquad x \in \mathbf{R}^N,\ t > 0,$$

where $N \geq 1$ and $\partial_t := \partial/\partial t$.

31 Yukihiro Seki (Kyushu Univ.) — Type II blow-up mechanisms in a semilinear heat equation with critical Joseph–Lundgren exponent, Part II: neutral case 12

Summary: We are concerned with blow-up mechanisms in a semilinear heat equation

$$u_t = \Delta u + |u|^{p-1}u, \qquad x \in \mathbf{R}^N,\ t > 0,$$

where $p > 1$ is a constant. It is well known that type II blow-up does occur if $N \geq 11$ and $p > p_{JL}$, where p_{JL} stands for the Joseph–Lundgren exponent. I will report a recent result on type II blow-up for $p = p_{JL}$.

32 Hiroko Yamamoto (Meiji Univ.), Hirokazu Ninomiya (Meiji Univ.) — Reaction-diffuion approximation of a semilinear wave equation 12

Summary: Reaction-diffusion systems are one of nonlinear parabolic systems and are often used as models described chemical reaction system, combustion system, and so on. If the number of unknown variables of a reaction-diffusion system increases, the dynamics of a reaction-diffusion system may become complicated. In order to study the complexity of the dynamics, we consider the following question: What kinds of systems can we approximate by reaction-diffusion systems? In this talk, we introduce a reaction-diffusion system which approximates a semilinear wave equation. The proof is based on the energy estimates.

33 Masaharu Taniguchi (Okayama Univ.) The uniqueness and stability of pyramidal traveling fronts in the Allen–Cahn equations 12

Summary: Traveling front solutions with pyramidal shapes are studied in the Allen–Cahn equation (Nagumo Equation) in the n-dimensional Euclidean space. Here n is any integer that is greater or equal to 3. The existence of pyramidal traveling fronts was shown by [1] and [3]. The uniqueness and stability was shown by [2] for $n = 3$. In this work, I report the uniqueness and stability of pyramidal traveling fronts for n that are greater or equal to 3.

34 Kentarou Fujie (Tokyo Univ. of Sci.)[♭], Tomasz Cieślak (IMPAN) No critical nonlinear diffusion in 1D quasilinear Keller–Segel system 12

Summary: This talk deals with the fully parabolic 1D chemotaxis system with diffusion $1/(1+u)$. We prove that the above mentioned nonlinearity, despite being a natural candidate, is not critical. It means that for such a diffusion any initial condition, independently on the magnitude of mass, generates global-in-time solution. In view of our theorem one sees that one-dimensional Keller–Segel system is essentially different than its higher-dimensional versions. In order to prove our theorem we establish a new Lyapunov-like functional associated to the system. The information we gain from our new functional (together with some estimates based on the well-known old Lyapunov functional) turns out to be rich enough to establish global existence for the initial-boundary value problem.

35 Toshitaka Nagai (Hiroshima Univ.[⋆]), Tetsuya Yamada (Fukui Nat. Coll. of Tech.) Boundedness of solutions to a parabolic-elliptic chemotaxis model in $\mathbb{R}^2$ with critical mass 12

Summary: We consider the Cauchy problem of a parabolic-elliptic chemotaxis model in $\mathbb{R}^2$. Our purpose is to discuss the boundedness of nonnegative solutions to the Cauchy problem in the critical case where the total mass of the initial data is 8π.

36 Xinru Cao (Paderborn Univ.), Shunsuke Kurima (Tokyo Univ. of Sci.), Masaaki Mizukami (Tokyo Univ. of Sci.) Global existence and stabilization in a 3D two-species chemotaxis-Stokes system with competitive kinetics 12

Summary: This talk deals with a 3D two-species chemotaxis-Stokes system with competitive kinetics. A single-species case was studied by e.g., Winkler (2012), Tao–Winkler (2015, 2016) and Lankeit (2016). However, there has not been rich results on coupled two-species-fluid systems. Recently, Hirata–K.–Mizukami–Yokota (2017) proved global existence of classical solutions for a 2D two-species chemotaxis-Navier–Stokes system. The present work asserts global existence and behaviour of classical solutions for the case of two species in 3D.

37 Masaaki Mizukami (Tokyo Univ. of Sci.) Improvement of conditions for asymptotic stability in a fully parabolic two-species chemotaxis-competition model 12

Summary: This talk is concerned with asymptotic bahavior of solutions to a fully parabolic two-species chemotaxis-competition model. Bai and Winkler proved asymptotic behavior in the system under some conditions and special setting in 2016. Recently, the conditions assumed in the previous work were improved (M., 2017); however, this result did not give a complete improvement. The main result of this talk asserts complete improvement of the conditions assumed in Bai–Winkler (2016) and M. (2017) for asymptotic stability.

13:00–14:00 Talk Invited by Functional Equations Section

Shinji Adachi (Shizuoka Univ.) On the uniqueness and the non-degeneracy of positive solutions for a class of semilinear elliptic equations in $\mathbb{R}^N$ and its applications

Summary: We survey some recent results for the uniqueness and the non-degeneracy of positive solutions for a class of semilinear elliptic equations in $\mathbb{R}^N$. Especially, we show the uniqueness and the non-degeneracy of positive solutions in the cases where nonlinear terms may have sublinear growth at infinity. As applications, we obtain the uniqueness and the non-degeneracy of positive solutions for some quasilinear elliptic equations.

September 13th (Wed) Conference Room VIII

9:15–12:00

38 Taiga Kumagai (Waseda Univ.) Asymptotics of the solutions of Hamilton–Jacobi equations with large drift term 9

Summary: In this talk, we consider the asymptotic behavior of solutions to Hamilton–Jacobi equations with large drift term in an open subset of two dimensional Euclidean space, where the set is determined through a Hamiltonian and the drift is given by the Hamiltonian vector field. Under some growth assumptions on the Hamiltonian, in the case where the Hamiltonian has degenerate critical points, we establish the convergence of solutions of the Hamilton–Jacobi equations and identify the limit of the solutions as the solution of systems of ordinary differential equations on a graph. The graph has many line segments more than four at a node.

39 Takahiro Kosugi (Tohoku Univ.)[b] Equivalence of viscosity solutions between obstacle problems and gradient constraint problems 12

Summary: It is showed that the unique viscosity solutions of fully nonlinear elliptic partial differential equations under gradient constraint coincides with that of the equation with suitably selected bilateral obstacles. To this end, it is necessary to obtain the Lipschitz estimates on viscosity solutions of bilateral obstacle problems.

40 Haruya Mizutani (Osaka Univ.) Resolvent estimates for scaling-critical Schrödinger operators and applications II 12

Summary: We discuss a recent progress on uniform resolvent estimates for Schrödinger operators with scaling-critical potentials and their applications to global-in-time Strichartz estimates for the Cauchy problem of the Schrödinger equation and Keller type eigenvalue bounds for non-self-adjoint Schrödinger operators with complex-valued potentials.

41 Masahito Ohta (Tokyo Univ. of Sci.) Strong instability of standing waves for nonlinear Schrödinger equations with a partial confinement 12

Summary: We study the instability of standing wave solutions for nonlinear Schrödinger equations with a one-dimensional harmonic potential in dimension $N \geq 2$. We prove that if the nonlinearity is L^2-critical or supercritical in dimension $N-1$, then any ground states are strongly unstable by blowup.

42 Gaku Hoshino (Osaka Univ.) Analyticity of solutions to the nonlinear Schrödinger equations without gauge invariance 9

Summary: We study analyticity of global solutions to NLS without gauge invariance.

43 Gaku Hoshino (Osaka Univ.) Analytic smoothing effect for global solutions to a system of Schrödinger equations with large data 9

Summary: We study analytic smoothing effect for a system of Schrödinger equations.

44 Ryosuke Hyakuna (Waseda Univ.)* A well-posedness result for the Hartree equation ····· 9
Gaku Hoshino (Osaka Univ.)

Summary: In this talk, we consider the Cauchy problem of the Hartree equation and we discuss the local existence when data are not characterized by any kind of square integrability.

45 Shinya Kinoshita (Nagoya Univ.) Local well-posedness for the Cauchy problem of the Klein–Gordon–Zakharov system in two and three dimensions ····· 12

Summary: We consider the Cauchy problem of 2D and 3D Klein–Gordon–Zakharov system with very low regularity initial data. We prove the bilinear estimates which are crucial to get the local in time well-posedness. The estimatesare established by the Fourier restriction norm method. We utilize the nonlinearversion of the classical Loomis–Whitney inequality.

46 Yuji Sagawa (Osaka Univ.) A sharp lower bound for the lifespan of small solutions to the Schrödinger
Hideaki Sunagawa (Osaka Univ.) equation with a subcritical power nonlinearity ····· 12
Shunsuke Yasuda

Summary: Let T_ε be the lifespan for the solution to the Schrödinger equation on $\mathbb{R}^d$ with a subcritical power nonlinearity and the initial data in the form $\varepsilon\varphi(x)$. We provide a sharp lower bound estimate for T_ε as $\varepsilon \to +0$ which can be written explicitly by the initial data and the nonlinearity. This is an improvement of the previous result by H. Sasaki [Adv. Diff. Eq. 14 (2009), 1021–1039].

47 Nobu Kishimoto (Kyoto Univ.) Ill-posedness of the third order NLS equation with Raman scattering
Yoshio Tsutsumi (Kyoto Univ.) term ····· 12

Summary: We consider the nonlinear Schrödinger equation with third order dispersion and intrapulse Raman scattering term. Without the Raman scattering term, the associated Cauchy problem is known to be locally well-posed in Sobolev spaces. We show that the Raman scattering term causes the ill-posedness of the Cauchy problem (nonexistence of local-in-time solutions) in Sobolev spaces. We also mention the unique solvability of the Cauchy problem in the analytic function space.

48 Mamoru Okamoto (Shinshu Univ.) Probabilistic Cauchy problem for the energy critical nonlinear Schrödinger
Tadahiro Oh (Univ. of Edinburgh) equations ····· 12
Oana Pocovnicu (Heriot-Watt Univ.)

Summary: We consider the Cauchy problem for the nonlinear Schrödinger equations (NLS) with non-algebraic nonlinearities on the Euclidean space. In particular, we study the energy-critical NLS in $\mathbb{R}^d$ $(d = 5, 6)$ and energy-critical NLS without gauge invariance and prove that they are almost surely locally well-posed with respect to randomized initial data below the energy space.

49 Kazuki Aoki (Osaka Univ.) Global existence of solutions for fourth-order nonlinear Schrödinger equations ····· 12

Summary: We consider the Cauchy problem for the fourth-order nonlinear Schrödinger equations with super critical power nonlinearities. The class of the fourth-order nonlinear Schrödinger equations describe deep water wave dynamics. We prove global existence of small solutions in one or two space dimensions. This is an improvement of the result by N. Hayashi, J. A. Mendez-Navarro, and P. I. Naumkin. [Commun. Contemp. Math. 18(3), 1550035, 24 pp (2016)]

50 Kota Uriya (Okayama Univ. of Sci.) * Satoshi Masaki (Osaka Univ.) Hayato Miyazaki (Tsuyama Nat. Coll. of Tech.)
Long range scattering for nonlinear Schrödinger equations with critical homogeneous nonlinearity in three dimensions 12

Summary: We consider the final state problem for the nonlinear Schrödinger equation with a homogeneous nonlinearity of the critical order which is not necessarily a polynomial in three dimensions. We give a sufficient condition on the nonlinearity for that the corresponding equation admits a solution that behaves like a free solution with or without a logarithmic phase correction. This is the extension of the previous result in one and two dimensions. Moreover, we present a candidate of the second asymptotic profile to the solution.

51 Itsuko Hashimoto (Kansai Univ. / Osaka City Univ.) Akitaka Matsumura (Osaka Univ.)
Asymototic behavior toward nonlinear waves for radially symmetric solutions of multi-dimensional Burgers equation 9

Summary: This talk is concerned with the asymptotic behaviors of radially symmetric solutions for multi-dimensional Burgers equation on the exterior domain in n-dimensional space, where the boundary and far field conditions are prescribed. In a case where the corresponding 1-D Riemann problem for the non-viscous part admits a shock wave, we show the solution tends toward a superposition of stationary wave and rarefaction wave as time goes to infinity, and also show the decay rate estimate. Furthermore, for $n = 3$, we give the complete classification of the asymptotic states, which includes even a superposition of stationary wave and viscous shock wave.

12:15–12:30 Presentation Ceremony for the 2017 MSJ Analysis Prize

14:15–16:15

52 Motohiro Sobajima * (Tokyo Univ. of Sci.) Yuta Wakasugi (Ehime Univ.)
Diffusion phenomena for the wave equation with space-dependent damping term growing at infinity 9

Summary: We study the asymptotic behavior of solutions to the wave equation with damping depending on the space variable and growing at the spatial infinity. We prove that the solution is approximated by that of the corresponding heat equation as time tends to infinity.

53 Motohiro Sobajima (Tokyo Univ. of Sci.) Yuta Wakasugi (Ehime Univ.)
Weighted energy estimates for wave equation with space-dependent damping term for slowly decaying initial data 9

Summary: In this talk we consider the wave equation with space-dependent damping coefficient $a(x) = |x|^{-\alpha}$ ($\alpha \in [0, 1)$) in an exterior domain Ω having a smooth boundary. Weighted energy estimates with weight functions like polymonials are given and these decay rate are almost sharp, even when the initial data do not have compact support in Ω. The crucial idea is to use special solution of $\partial_t u = |x|^{\alpha}\Delta u$ with a polynomial decay.

54 Soichiro Katayama (Osaka Univ.) Kyouhei Wakasa (Muroran Inst. of Tech.) Borislav Yordanov (Hokkaido Univ.)
A note on the decay property for dissipative nonlinear wave equations in one space dimension 9

Summary: In this talk, we consider the Cauchy problem for the dissipative nonlinear wave equation in one space dimension. In the work of the dissipative nonlinear wave equation, it is well-studied by using the energy estimates. The purpose of this talk is to show the point-wise estimates of solutions. Such kind of estimates describe the characteristics of the wave equation and precious information. Making use of these estimates, we can also get the result of the energy decay.

55 Natsumi Yoshida (Ritsumeikan Univ.) Decay properties of solutions toward a multiwave pattern for the scalar conservation law with the Ostwald–de Waele-type viscosity ····· 12

Summary: We study the asymptotic decay of solutions toward a multiwave pattern (rarefaction wave and viscous contact wave) of the Cauchy problem for the one-dimensional viscous conservation law where the far field states are prescribed. Especially, we deal with the case when the flux function is convex or concave but linearly degenerate on some interval, and also the viscosity is a nonlinearly degenerate one. The proof is given by a technical time-weighted energy method and the careful estimates for the interactions between the nonlinear waves.

56 Natsumi Yoshida (Ritsumeikan Univ.) Large time behavior of solutions toward viscous shock waves to the Cauchy problem for the scalar conservation law with nonlinear flux and viscosity ····· 12

Summary: We study the large time asymptotics of solutions to the Cauchy problem for the one-dimensional scalar viscous conservation law where the far field states are prescribed. Especially, we deal with the case when the flux function is a non-convex nonlinear function, and also the viscosity is a nonlinear function. The proof is given using a technical weighted energy method associated with the nonlinearity of the flux and the viscosity.

57 Yusuke Sugiyama (Tokyo Univ. of Sci.)
Yunguang Lu (Hangzhou Normal Univ.) On the global existence of weak solutions to 1D degenerate quasilinear wave equations ····· 12

Summary: We consider the existence and the nonexistence of global generalized (nonnegative) solutions of the nonlinearly degenerate wave equations $\partial_t^2 u = \partial_x(u^{2a}\partial_x u)$ with the nonnegative initial data $u_0(x) \geq 0$ and $a > 0$. This result is an extension of the results in the second author's paper, where the existence and the nonexistence of the unique global classical solution were studied with a threshold on $\int_{-\infty}^{\infty} u_1(x)dx$ and the non-degeneracy condition $u_0(x) \geq \delta_0 > 0$ on the initial data.

58 Kunio Hidano (Mie Univ.) *
Kazuyoshi Yokoyama (Hokkaido Univ. of Sci.) Global existence for a system of quasi-linear wave equations in 3D satisfying the weak null condition ····· 12

Summary: We show global existence of small solutions to the Cauchy problem for a system of quasi-linear wave equations in three space dimensions. The feature of the system lies in that it satisfies the weak null condition, though we permit the presence of some quadratic nonlinear terms which do not satisfy the null condition. Due to the presence of such quadratic terms, the standard argument no longer works for the proof of global existence. To get over this difficulty, we extend the ghost weight method of Alinhac so that it works for the system under consideration.

59 Akira Hoshiga (Shizuoka Univ.) * Lower bound of the lifespan of solutions to systems of quasi-linear wave equations with multiple propagation speeds ····· 9

Summary: We consider the Cauchy problem of systems of quasi-linear wave equations in 2-dimensional space. We assume that the propagation speeds are distinct and that the nonlinearities contain quadratic and cubic terms of the first and second order derivatives of the solution. We know that if the all quadratic and cubic terms of nonlinearities satisfy strong null-condition, then there exists a global solution for sufficiently small initial data. In this paper, we study about the lifespan of the smooth solution, when the cubic terms in the quasi-linear nonlinearities do not satisfy the strong null-condition.

60 Takiko Sasaki (Meiji Univ.) The blow-up curve for a system of nonlinear wave equations ····· 9

Summary: We study a blow-up curve for a system of nonlinear wave equations. The purpose of this talk is to show that the blow-up curve is a C^1 curve if the initial values are large and smooth enough. To prove the result, we convert the system into a first order system, and then apply a modification of the method of Caffarelli and Friedman (1986).

61 Kai Koike (Keio Univ./RIKEN) Wall effect on the motion of a body immersed in a free molecular flow 12

Summary: Satellites, International Space Station, orbital debris all move in highly rarefied atmosphere. This motivates the study of fluid-structure interaction in highly rarefied gas. Caprino et al. [Comm. Math. Phys., **264** (2006), 167–189] analyzed 1-D motion of a rigid body in a free molecular flow. They proved algebraic convergence of the body's velocity $V(t)$ to the terminal velocity V_∞. My question is whether the asymptotic behavior changes if there is a fixed wall behind the moving body. Caprino et al. considered the motion in the whole space $\mathbb{R}^d$; I considered the motion in the half space $\mathbb{R}^d_+$. I proved that the approach to the terminal velocity changes despite the fact that the body and the fixed wall go away infinitely.

16:30–17:30 Talk Invited by Functional Equations Section

Hiromichi Itou (Tokyo Univ. of Sci.) On analysis for partial differential equations in a cracked domain

Summary: Theory of partial differential equations has been developed mainly in smooth domains. In non-smooth domains such as polyhedral or cracked domains, mathematical difficulties appear because domains have singular points. Then, it is important to analyze the precise behavior of the solution of the partial differential equations with boundary conditions near the singular points. This kind of analysis has possibility of application in various fields of science and engineering such as fracture problems, inverse problems (nondestructive evaluation) and so on.
In this talk, first we have an overview of crack problems from both sides of mathematics and mechanics. Second we introduce some convergent series expansions of solutions of a boundary value problem at a crack tip in a linearized elasticity model. Next, we note that the study of cracks within the context of the linearized theory of elasticity has a drawback due to an inconsistency with regard to the strain, namely the strain becomes infinite at the crack tip. Then we consider a boundary value problem in a nonlinear elastic body that exhibits limiting small strain, which does not suffer from the inconsistency. For this problem we introduce the concept of a non-smooth viscosity solution, called generalized solution, which is described as generalized variational inequalities and coincides with the weak solution in the smooth case. Lastly, we mention future and ongoing researches in crack problems and their applications.

September 14th (Thu) Conference Room VIII

9:00–12:00

62 Hiroyuki Takamura (Future Univ. Hakodate), Lai Ning-An (Lishui Univ.) Blow-up and lifespan estimate of solutions of semilinear damped wave equations with sub-Strauss exponent 12

Summary: It is well-known that the critical exponent for semilinear damped wave equations is Fujita exponent when the damping is effective. Introducing a multiplier for the time-derivative of the spatial integral of unknown functions, we succeed to employ the analysis on semilinear wave equations and to prove a blow-up result for semilinear damped wave equations with sub-Strauss exponent when the damping is in the scattering range.

63 Masakazu Kato (Muroran Inst. of Tech.), Miku Sakuraba Global existence and blow-up for wave equations with weighted nonlinear term in 3D 12

Summary: We consider the global existence and blow-up of small data solutions for the wave equation with weighted nonlinear term in three space dimensions. We obtain upper and lower bound of the lifespan of solutions to the problem.

64 Takuto Imai (Future Univ. Hakodate)
Hiroyuki Takamura (Future Univ. Hakodate)
Masakazu Kato (Muroran Inst. of Tech.)
Kyouhei Wakasa (Muroran Inst. of Tech.)
The lifespan of solutions to semilinear damped wave equations with scale invariant in two space dimension 12

Summary: In this talk, we report the sharp upper and lower bound of the lifespan of solutions to semilinear damped wave equations in the scale invariant case with a special constant in two space dimensions. The result is divided into two cases up to the total integral of the sum of the initial data.

65 Yuka Teramoto (Kyushu Univ.)
Yoshiyuki Kagei (Kyushu Univ.)
Takaaki Nishida (Kyoto Univ.)
Bifurcation of the compressible Taylor vortex 12

Summary: We consider the Couette–Taylor problem, a flow between two concentric cylinders, whose inner cylinder is rotating with uniform speed and the outer one is at rest. If the rotating speed is sufficiently small, the Couette flow (laminar flow) is stable. When the rotating speed increases, beyond a certain value of the rotating speed, a vortex flow pattern (Taylor vortex) appears. Mathematically, this phenomena can be formulated as a bifurcation problem. In this talk the Couette–Taylor problem is considered for the compressible Navier–Stokes equation and the bifurcation of the Taylor vortex is proved when the Mach number is sufficiently small.

66 Masashi Aiki (Tokyo Univ. of Sci.)
Motion of a vortex filament on a slanted plane 12

Summary: We consider a nonlinear model equation, known as the localized induction equation, describing the motion of a vortex filament immersed in an incompressible and inviscid fluid. The talk will report on the global-in-time unique solvability of an initial-boundary value problem describing the motion of a vortex filament on a slanted plane. The proof relies on the careful analysis of the shape of the filament near the boundary, and this will be the main focus of this talk.

67 Huanyuan Li (Univ. of Tokyo)
Global strong solutions to the three dimensional density-dependent MHD equations 12

Summary: In this talk, we consider an initial boundary value problem for the three dimensional nonhomogeneous incompressible magnetohydrodynamic equations with density-dependent viscosity and resistivity coefficients over a bounded smooth domain. Global in time unique strong solution is proved to exist when the initial vorticity and current density are both suitably small in some Sobolev space with arbitrary large initial mass density, and the vacuum of initial density is also allowed.

68 Yusuke Sugiyama (Tokyo Univ. of Sci.)
Blow-up of solutions to the 1D Euler equation with valuable damping coefficient 12

Summary: We consider a blow-up problem for the 1D Euler equation with time and space dependent damping. We investigate sufficient conditions on initial data and the rate of spatial or time-like decay of the coefficient of damping for the occurrence of the finite time blow-up. In particular, our sufficient conditions ensure that the derivative blow-up occurs in finite time with the solution itself and the pressure bounded. Our method is based on simple estimates with Riemann invariant.

69 Jan Březina (Tokyo Tech) Eduard Feireisl (Czech Acad. of Sci.) On measure-valued solutions to the complete Euler system 12

Summary: We introduce the concept of dissipative measure-valued solution to the complete Euler system describing the motion of an inviscid compressible fluid. These solutions are characterized by a parameterized (Young) measure and a dissipation defect in the total energy balance. A dissipative measure-valued solution can be seen as the most general concept of solution to the Euler system retaining its structural stability. In particular, we show that a dissipative measure-valued solution necessarily coincides with a classical one on its life span provided they share the same initial data.

70 Keiichi Watanabe (Waseda Univ.) Compressible-incompressible two phase flow of Korteweg type with phase transition: model problem 9

Summary: In this talk, we show the existence of $\mathcal{R}$-bounded solution operator families for a resolvent problem arising from the motion, where one fluid is a capillary compressible viscous flow and the other is an incompressible viscous flow. Moreover, we show that the regularity of density is W^3_q with respect to the space variable, although it is W^1_q in the usual case.

71 Naoto Kajiwara (Univ. of Tokyo) Solvability and stability for the phase-field Navier–Stokes equations via maximal regularity 12

Summary: We study the dynamics of vesicle membranes in incompressible viscous fluids. We prove existence and uniqueness of the local strong solution for this model coupling of the Navier–Stokes equations with a phase field equation in an L_p-L_q setting via maximal regularity. Moreover we have that the solution is real analytic in time and space. It is also shown that the variational strict stable solution is exponentially stable, provided the product of the viscosity coefficient and the mobility constant is large.

72 Kenji Nakamura (Univ. of Tsukuba) Takayuki Kobayashi (Osaka Univ.) Takayuki Kubo (Univ. of Tsukuba) Local energy decay estimate of solutions to the hyperbolic type Stokes equations 9

Summary: In this talk, we discuss a local energy decay estimate of solutions to the initial-boundary value problem for the hyperbolic type Stokes equations of incompressible fluid flow.

73 Hirokazu Saito (Waseda Univ.) Maximal L_p-L_q regularity for a compressible fluid model of Korteweg type on general domains 9

Summary: In this talk, we would like to consider a linearized system on general domains Ω arising from a compressible fluid model of Korteweg type. The boundary of Ω consists of two parts S, Γ with $\mathrm{dist}(S, \Gamma) > 0$. One imposes the free boundary condition on Γ, while the non-slip condition on S. It is admissible that $S = \emptyset$ or $\Gamma = \emptyset$ in this talk. We show the maximal L_p-L_q regularity for the linearized system.

74 Ken Furukawa (Univ. of Tokyo)[b] On asymptotic stability of the three dimensional Oseen type Navier–Stokes flow 9

Summary: In this talk, we construct three dimensional Oseen type Navier–Stokes flows in Euclidean space and vertically periodic space and show their asymptotic stability in vertically periodic space under large initial perturbation.

75 Hiroyuki Tsurumi (Waseda Univ.) Extension criterion via partial components of vorticity on strong solutions to the Navier–Stokes equations in higher dimensions 12

Summary: We consider the extension criterion of strong solutions to the Navier–Stokes equations in $\mathbb{R}^N$. It is proved that among $\frac{N(N-1)}{2}$ components of the vorticity, $\left[\frac{N}{2}\right]$ components are negligible for the criterion whether the time local solutions can be extended beyond the critical time. Our result may be regarded as generalization to the higher dimensional case of Chae–Choe and Kozono–Yatsu in the 3D case which showed that only two components in L^q, $\frac{3}{2} < q \leq \infty$, of the vorticity contribute to such an extension criterion. Furthermore, the critical case $q = \infty$ originally treated by Kato–Ponce in $\mathbb{R}^N$ is also generalized in such a way that $\left[\frac{N}{2}\right]$ components of vorticity are redundant for the extension criterion.

76 Okihiro Sawada (Gifu Univ.) Locally-in-time well-posedness of the primitive equations with linearly growing initial data 12

Summary: The primitive equations with linearly growing initial data in the horizontal direction are concerned. The existence theory of mild solutions is established in certain interpolation spaces. A semi-group of Ornstein–Uhlenbeck type is investigated in Lebesgue spaces, including its smoothing property. Constructing mild solutions, the fixed point arguments of Fujita–Kato type are used.

14:15–16:15

77 Youhei Tsutsui (Shinshu Univ.)
Takahiro Okabe (Hirosaki Univ.)
Jayson Mesitas Cunanan (Saitama Univ.)
Asymptotic stability of stationary solutions to the Navier–Stokes equations in Besov spaces 9

Summary: We give an asymptotic stability result for the incompressible Navier–Stokes equations in Besov spaces with sub/super critical smoothness. Following the argument by Kozono–Yamazaki (1995), we establish smoothing estimates for the semigroup generated by the Laplacian with a perturbation. Applying that, a critical estimate is proved, which is the main ingredient for the proof of the stability result.

78 Hideo Kozono (Waseda Univ.)*
Yutaka Terasawa (Nagoya Univ.)
Yuta Wakasugi (Ehime Univ.)
Finite energy of generalized suitable weak solutions to the Navier–Stokes equations and the Liouville type theorem 9

Summary: Introducing a new notion of generalized suitable weak solutions, we first prove validity of the energy inequality for such a class of weak solutions to the Navier–Stokes equations in the whole space $\mathbb{R}^n$. Although we need certain growth condition on the pressure, we may treat the class even with infinite energy quantity except for the initial velocity.

79 Toshiaki Hishida (Nagoya Univ.)♭ Large time behavior of a generalized Oseen evolution operator, with applications to the Navier–Stokes flow past a rotating obstacle 12

Summary: Consider the motion of a viscous incompressible fluid in a 3D exterior domain when a rigid body moves with a prescribed time-dependent translational and angular velocities. We develop decay estimates of the evolution operator, which provides a solution of the linearized non-autonomous system, and then apply them to the Navier–Stokes initial value problem.

80 Toshiaki Hishida (Nagoya Univ.)♭
Paolo Maremonti (Univ. degli Studi della Campania)
Navier–Stokes flow past a rigid body: attainability of steady solutions as limits of unsteady weak solutions 12

Summary: Consider the Navier–Stokes flow in 3D exterior domains, where the translational velocity of the body becomes $-u_\infty$ after some finite time. For the starting problem raised by Finn, we study some generalized situation in which unsteady solutions start from large motions being in L^3. We then conclude that the steady solutions are still attainable as limits of evolution of those fluid motions provided u_∞ is small enough.

81 Yoshihiro Shibata (Waseda Univ.) Local well-posedness for the Magnetohydrodynamics in the different two liquids case 9

Summary: In this talk, I would like to talk about local well-posedness for the magnetohydrodynamic equations in the two different liquids case. Since two divergence free conditions are over determined, I consider the jump condition for the divergence of magnetic field on the interface. This is a new aspect in treating the MHD. After transforming the time dependent unknown domain to the reference domain by Lagrange transformation, using the maximal L_p-L_q regularity for the linearized equations we prove a local in time unique existence theorem.

82 Yoshihiro Shibata (Waseda Univ.) Maximal L_p-L_q regularity theorem for the linearized electro-magnetic field equations 9

Summary: In this talk, I will present the maximal L_p-L_q regularity theorem for the linearized electro-magnetic field equations. In solving MHD equations, linearized equations are decoupled, because the coupling terms are semi-linear. Thus, as linearized equations, we treat Stokes equations with interface conditions and linear electro-magnetic equations with interface conditions. Stokes equations with interface conditions have been studied by Pruess and Shimonett, and Maryani and Saito, so that I treat only the linear electro-magnetic equations with interface conditions.

83 Yoshihiro Shibata (Waseda Univ.) Local well-posedness for the two component flow 9

Summary: In this talk, I would like to talk about local in time unique existence theorem for the two components flow. I used the modelling due to Vicent Giovangigli: Multiccomponeent flow modeling, Birkhäuser. After transforming the equations to one component case by using the Giovangigli transfomation, I proved the local well-posedness for the resultant system of equations by using Lagrange transformation and the maximal L_p-L_q regularity theorem for the linearliezed equations. This is a joint work with Ewelina Zatorska (Imperial College of London).

84 Yoshihiro Shibata (Waseda Univ.) Global well-posedness for the two component flow 9

Summary: In this talk, I would like to talk about a global in time unique existence theorem for the reduced system of equations from the two component flow. A key is to prove the exponential decay estimate in some quotient space of the linearized equations. Some special structure of equations guarantees this exponential decay property.

85 Akira Okada (Kyoto Univ.)
Hideo Kozono (Waseda Univ.)
Senjo Shimizu (Kyoto Univ.)
C^∞ regularity of strong solutions to the Navier–Stokes equations and its decay property 12

Summary: Global mild solution u to the Navier–Stokes equtation with the small initial data $u(0) \in L_n(\mathbb{R}^n)$ is constructed by Kato. We show u becomes infinitely differentiable with respect to space having the decay property $\|A^m u(t)\|_{L_p} = O(t^{-\frac{n}{2}(\frac{1}{n}-\frac{1}{p})-m})$ as $t \to \infty$ for all $n \le p < \infty$.

86 Kenta Kaneko (Waseda Univ.)
Hideo Kozono (Waseda Univ.)
Senjo Shimizu (Kyoto Univ.)
Stationary solution to the Navier–Stokes equations in the scaling invariant Besov space 12

Summary: We consider the stationary problem of the Navier–Stokes equations in $\mathbb{R}^n$ for $n \ge 3$. We show existence, uniqueness and regularity of solutions in the homogeneous Besov space $\dot{B}^{-1+\frac{n}{p}}_{p,q}$ which is the scaling invariant one. As a corollary of our results, a self-similar solution is obtained. For the proof, several bilinear estimates are established. The essential tool is based on the paraproduct formula and the imbedding theorem in homogeneous Besov spaces.

16:30–17:30 Talk Invited by Functional Equations Section

Ryo Takada (Kyushu Univ.) Dispersive estimates for rotating fluids and stably stratified fluids

Summary: In this talk, we consider the initial value problems for the rotating Navier–Stokes equations and the stably stratified Boussinesq equations. We establish the sharp dispersive estimates for the linear propagators related to the rotation and the stable stratification. As applications, we give explicit relations between the size of initial data and the angular/buoyancy frequency which ensure the unique existence of global solutions to the above systems. Consequently, it is shown that the size of initial data can be taken large in proportion to the speed of rotation and the strength of stable stratification.

Real Analysis

September 13th (Wed) Conference Room VII

9:30–12:00

1 Takanobu Hara (Hokkaido Univ./Tokyo Metro. Univ.) Interpolation properties of reverse Hölder inequalities and their applications to Harnack inequalities ····· 15

Summary: In this talk, we consider a backward self-improvement property of the reverse Hölder inequality with increasing support

$$\left(\frac{1}{\mu(B)}\int_B u^s\,d\mu\right)^{1/s} \le C\left(\frac{1}{\mu(2B)}\int_{2B} u^p\,d\mu\right)^{1/p},$$

where $B = B(x_0, R)$ and $2B = B(x_0, 2R)$ are balls in a metric measure space (X, d, μ), u is a nonnegative function on $2B$ and $0 < p < s \le \infty$ and C are positive constants.

2 Aoi Honda (Kyushu Inst. of Tech.) Yoshiaki Okazaki (Fuzzy Logic Systems Inst.) Linear subspace of L_0 generated by integrable step functions ····· 15

Summary: Let $(\Omega, \mathcal{A}, \mu), \mu(\Omega) = +\infty$, be an infinite measure space and $L_0 = L_0(\Omega, \mathcal{A}, \mu)$ be the space of all real valued measurable functions on $(\Omega, \mathcal{A}, \mu)$. We introduce the closed linear subspace M_0 of L_0 generated by the integrable step functions. We give a characterization of M_0.

3 Jun Kawabe (Shinshu Univ.) The Vitali convergence theorem for Choquet integrals ····· 15

Summary: The Vitali theorem for uniformly integrable functions is fundamental in Lebesgue integration theory and contains other important convergence theorems for abstract Lebesgue integral. The purpose of this talk is to formulate Vitali type theorems for the Choquet integral and its symmetric and asymmetric extensions with respect to a nonadditive measure. The bounded convergence theorem and the dominated convergence theorem for Choquet integrals are obtained as corollaries to our Vitali type theorems.

4 Fumiaki Kohsaka (Tokai Univ.) Fixed points of spherically nonspreading mappings in complete geodesic metric spaces with curvature bounded above ····· 15

Summary: Fixed points of spherically nonspreading mappings in complete geodesic metric spaces with curvature bounded above.

In this talk, we propose the concepts of spherically nonspreading mappings and firmly spherically nonspreading mappings in complete CAT(1) spaces and obtain fixed point and convergence theorems for them. The resolvent of a proper lower semicontinuous convex function is a typical example of these mappings. As applications, we study the problem of minimizing convex functions in such spaces.

5 Shin-ya Matsushita (Akita Pref. Univ.) On the convergence of the proximal point algorithm ····· 15

Summary: Throughout this talk, let H be a Hilbert space and let $f : H \to (-\infty, \infty]$ be a proper lower semicontinuous convex function. We assume that f is bounded below. The proximal point algorithm is an approximation method for finding a minimizer of f. In this talk, we consider the convergence rate of the proximal point point algorithm.

6 Takayuki Tamura (Chiba Univ.) Mikio Kato (Kyushu Inst. of Tech.*) On uniform non-squareness of direct sums of Banach spaces ····· 15

Summary: We shall characterize the uniform non-squareness of the ψ-direct sum $(X_1 \oplus \cdots \oplus X_N)_\psi$ of Banach spaces $X_1, \ldots, X_N$, where ψ is a convex function on the N-simplex Δ_N satisfying certain conditions. To do this we shall introduce a new class of convex functions.

7 Tomonari Suzuki (Kyushu Inst. of Tech.) — Redefinition of τ-distance 15

Summary: We will talk about the redefinition of τ-distance.

8 Sachiko Atsushiba (Univ. of Yamanashi) — Attractive point theorems and convergence theorems for some classes of nonlinear mappings in Hilbert spaces 15

Summary: In this talk, we prove attractive point theorems for nonlinear mappings. Using the ideas of attractive points and acute points, we also prove weak and strong convergence theorems for nonlinear mappings by some iterative methods.

9 Toshikazu Watanabe (Tokyo Univ. of Information Sci.) — Fixed point theorems in ordered metric spaces and applications to nonlinear boundary value problems 15

Summary: In this talk, we extend the concept of mixed monotone mappings and then we consider certain fixed point theorems for a pair of mappings in metric spaces with a partial ordering. As an application, we study existence of solutions for the following fourth-order two-point boundary value problems for elastic beam equations.

14:15–15:45

10 Ryutaro Arai (Ibaraki Univ.)
Eiichi Nakai (Ibaraki Univ.) — Commutators of Calderón–Zygmund and generalized fractional integral operators on generalized Morrey spaces with variable growth condition 15

Summary: We discuss the boundedness of the commutators $[b, T]$ and $[b, I_\rho]$ on generalized Morrey spaces with variable growth condition, where T is a Calderón–Zygmund operator, I_ρ is a generalized fractional integral operator and b is a function in generalized Campanato spaces with variable growth condition.

11 Nao Takemoto (Nara Women's Univ.)
Shinya Moritoh (Nara Women's Univ.) — Some variations on wavelet reconstruction formulae 15

Summary: We consider some variations on wavelet reconstruction formulae. An alternative formula was considered by Lebedeva and Postnikov in 2014. One of the aims of the talk is to give a multidimensional version of their formula.

12 Takeshi Iida (Fukushima Nat. Coll. of Tech.) — On sufficient conditions for the boundedness of the fractional maximal operator between weighted L^p-spaces with different weights 15

Summary: In this talk, we discuss the boundedness of the fractional maximal operator between weighted L^p-spaces with different weights. The B_p-condition which is introduced by Pérez is also necessary and sufficient condition for the boundedness of the fractional maximal operator. As application of this theorem is related to the classical weighted inequality of Fefferman–Stein.

13 Hiroki Saito (Nihon Univ.)
Hitoshi Tanaka (Tsukuba Univ. of Tech.)
Toshikazu Watanabe (Tokyo Univ. of Information Sci.) — Maximal operators with the weighted Hausdorff content 15

Summary: In this talk, we first introduce the d-dimensional weighted Hausdorff content with arbitrary weight on $\mathbb{R}^n$. Then we establish the Fefferman–Stein type inequalities for the fractional maximal operator with the weighted Hausdorff content. Further, we discuss the boundedness of the fractional maximal operator on Choquet–Lorentz spaces.

14 Akihiko Miyachi ♭ (Tokyo Woman's Christian Univ.)
Naohito Tomita (Osaka Univ.)
Boundedness of bilinear pseudo-differential operators with exotic symbols 15

Summary: We give the sharp boundedness result for bilinear pseudo-differential operators in $L^p \times L^q$ to L^r, $1/p + 1/q = 1/r \leq 1$, in the case that the symbols satisfy the Hörmander condition with $0 \leq \rho < 1$.

16:00–17:00 Talk Invited by Real Analysis Section

Akihiro Nakamura (Tokai Univ.) Nonharmonic Fourier series and Riesz bases

Summary: The study of nonharmonic Fourier series was initiated by Paley and Wiener (1934). We take up the problems of the stability of Riesz basis properties of complex exponential systems in $L^2[-\pi, \pi]$. We consider the sequence $\{\lambda_n\}$ with perturbations of some subsequence of integers and investigate whether the system $\{e^{i\lambda_n t}\}$ becomes a Riesz basis in $L^2[-\pi, \pi]$. We use some stability theorems and the criterion obtained by B. S. Pavlov for $\{e^{i\lambda_n t}\}$ to become a Riesz basis. Finally, we refer to the existences of the bases which are not Riesz bases.

September 14th (Thu) Conference Room VII

9:30–12:00

15 Johannes Lankeit (Paderborn Univ.)
Masaaki Mizukami (Tokyo Univ. of Sci.)
How far does small chemotactic interaction perturb the Fisher–KPP dynamics on bounded convex domains? 15

Summary: This work is concerned with the question that "how far does small chemotactic interaction perturb the Fisher–KPP dynamics?". A chemotaxis system with logistic source was studied by e.g., Winkler (2010, 2014) and Zheng (2016). However, there are still many open problems about the chemotaxis system. On the other hand, the Fisher–KPP system has been studied extensively. Thus the development of this work will enable us to see new properties of solutions for the chemotaxis system. The main result of this talk gives convergence of solutions for the chemotaxis system to solutions for the Fisher–KPP system on bounded convex domains.

16 Tobias Black (Paderborn Univ.)
Johannes Lankeit (Paderborn Univ.)
Masaaki Mizukami (Tokyo Univ. of Sci.)
Global existence in a Keller–Segel–(Navier–)Stokes system with singular sensitivity 15

Summary: This talk is concerned with global existence of solutions to a Keller–Segel–(Navier–)Stokes system with singular sensitivity. In the fluid-free case, Winkler established global existence of classical solutions under some condition in 2011, and Fujie showed that the global solutions are bounded in 2015. However, a Keller–Segel system with singular sensitivity coupled with a Navier–Stokes equation has not been studied. The main result of this talk gives that the same condition assumed in Winkler's result (2011) leads to global existence in the system.

17 Taishi Motoda (Kyoto Univ. of Edu.)
Takeshi Fukao (Kyoto Univ. of Edu.)
Abstract approach to degenerate parabolic equations with dynamic boundary conditions 15

Summary: The existence and uniqueness problem for a degenerate parabolic equation with dynamic boundary condition is discussed. Follows from the previous works by A. Damlamian (1977), the abstract theory of evolution equation, governed by the subdifferential of proper, lower-semicontinuous and convex functional, can be applied. Then, the suitable setting of function spaces and duality mapping is needed. One of the key point is the assumption of growth condition for the maximal monotone graph which characterizes the original degenerate diffusion.

18 Risei Kano (Kochi Univ.)
Takeshi Fukao (Kyoto Univ. of Edu.)
The existence of solutions for the one-dementional hardening model 15

Summary: In this talk, we treat some parabolic problem with related to the quasi-variational inequality. The unknown functions $u = u(t, x)$ and $\sigma = \sigma(t, x)$ describe the displacement and stress, respectively in the one-dimensional interval $(0, L)$. The system stands for the hardening problem that the materials are harden by plasticity. That is derived from the perfect plasticity model introduced by Duvaut–Lions. In the perfect plasticity model, the function which stands for threshold value in the plastic deformation is a constant. In this talk, we discuss the solvability for the above model under the situation that threshold function depending upon time or unknown function.

19 Takeshi Fukao (Kyoto Univ. of Edu.)
Shunsuke Kurima (Tokyo Univ. of Sci.)
Tomomi Yokota (Tokyo Univ. of Sci.)
Cahn–Hilliard approach to nonlinear diffusion equations on unbounded domains 15

Summary: This talk deals with nonlinear diffusion equations under Neumann boundary conditions in a unbounded domain with smooth bounded boundary. Recently, Kurima–Yokota (2017) proved existence of solutions to these equations with growth conditions for diffusion terms. The present work asserts that we can solve the original problem by passing to the limit in the approximate problem without growth conditions in a unbounded domain.

20 Takeshi Fukao (Kyoto Univ. of Edu.)
Pierluigi Colli (Pavia Univ.)
Cahn–Hilliard equation on the boundary with bulk condition 15

Summary: The well-posedness for a system of partial differential equations and dynamic boundary conditions is discussed. This system is a sort of transmission problem between the dynamics in the bulk Ω and on the boundary Γ. The Poisson equation for the chemical potential, the Allen–Cahn equation for the order parameter in the bulk Ω are considered as auxiliary conditions for solving the Cahn–Hilliard equation on the boundary Γ.

21 Noriaki Yamazaki (Kanagawa Univ.)
Nobuyuki Kenmochi (Univ. of Warsaw)
Ken Shirakawa (Chiba Univ.)
New class of doubly nonlinear evolution equations governed by double time-dependent subdifferentials 15

Summary: We discuss a new class of doubly nonlinear evolution equations governed by time-dependent subdifferentials in uniformly convex Banach spaces, and establish an abstract existence result of solutions. Also, we give some applications to nonlinear PDEs with gradient constraint for time-derivatives.

22 Ryota Nakayashiki (Chiba Univ.)
Ken Shirakawa (Chiba Univ.)
Qualitative properties of the solution to Allen–Cahn type equations with singularities subject to dynamic boundary condition 15

Summary: In this talk, we consider coupled system of nonlinear PDEs. The system consists of an Allen–Cahn type equation with singular diffusion in a bounded spatial domain Ω, and another Allen–Cahn type equation on the smooth boundary $\partial\Omega$. The coupled PDEs are transmitted via the dynamic boundary condition. The objective of this study is to achieve a mathematical treatment to analyze the systems for singular diffusion equations and the dynamic boundary conditions. Now, the results concerned with the well-posedness of the system, involved in the representation of solution and comparison principal and the continuous association between solutions to our system and those in regular systems, are reported in forms of some Main Theorems.

23 Ken Shirakawa (Chiba Univ.)
Hiroshi Watanabe (Oita Univ.)
Ryota Nakayashiki (Chiba Univ.)
Salvador Moll (Univ. Valencia)
Structures of steady-state solutions to a one-dimensional mathematical model of grain boundary motion ····· 15

Summary: In this talk, we consider a system of one-dimensional elliptic type boundary value problems, denoted by (S_∞). The system corresponds to a one-dimensional steady-state problem for the mathematical model of grain boundary motion, proposed by [Kobayashi et -al, Phys. D, 140 (2000), 141–150], and one of characteristics is in the point that the inhomogeneous Dirichlet type boundary condition is imposed for the crystalline orientation. On this basis, we set the objectives of the talk as follows: (A) to show the structures of all steady-state solutions, including physically-important ones; (B) to clarify the base-structure of steady-states with the physical importance; (C) the verification of the SBV-regularity for the steady-state solutions.

14:15–16:00

24 Toyohiko Aiki (Japan Women's Univ.)
Sergey A. Timoshin
(Siberian Branch Russian Acad. Sci.)
Control problem for the one-dimensional moisture transport equation appearing in concrete carbonation process ····· 15

Summary: We consider a system of partial differential equations describing a mass conservation law for moisture in a porous medium. This type of systems can be found in concrete carbonation process and already proposed and studied by Kumazaki–Aiki. In the system the relationship between the relative humidity and the degree of saturation is described by a play operator. In this talk we consider a real time control problem for the above system. The aim of the problem is to control a solution of the system by putting a multi-valued operator into the differential equation. Here, I will discuss about a physical background for the control and establish the existence of a solution to the control problem.

25 Kosuke Kita (Waseda Univ.)
Mitsuharu Ôtani (Waseda Univ.)
Hiroki Sakamoto
(Hitachi-GE Nuclear Energy, Ltd.)
On some elliptic systems arising from a nuclear reactor model ····· 15

Summary: We consider a stationary problem of a certain reaction diffusion system arising from a nuclear reactor model, which consists of two unknown functions representing the neutron density and the temperature in nuclear reactors. In Gu–Wang (1994, 1996), they studied this problem with some boundary conditions (homogeneous Dirichlet–Dirichlet conditions and homogeneous Neumann–Robin conditions) and prove the solvability and the uniqueness of ordered positive solution. In this talk, we impose Robin and power type nonlinear boundary conditions on the problem and show the existence and the uniqueness results similar to the previous results. We rely on Krasnoselskii's type fixed point theorem due to lack of the variational structure.

26 Takanori Kuroda (Waseda Univ.)
Mitsuharu Ôtani (Waseda Univ.)
Solvability of complex Ginzburg–Landau equations with non-dissipative terms in general domains ····· 15

Summary: We consider the following complex Ginzburg–Landau equation, $(CGL)_-$:

$$u_t(t,x) - (\lambda + i\alpha)\Delta u - (\kappa + i\beta)|u|^{q-2}u - \gamma u = f(t,x) \quad \text{on } [0,T) \times \Omega,$$

where $\lambda, \kappa > 0$; $\alpha, \beta, \gamma \in \mathbb{R}$; i denotes the imaginary unit; $T > 0$; $f : [0,T) \times \Omega \to \mathbb{C}$ is a given external force and Ω is general, possibly unbounded domain. Our approach to $(CGL)_-$ is to regard our equation as a parabolic equation in a product Hilbert space $(L^2(\Omega))^2$ over $\mathbb{R}$ with $-\lambda\Delta u$ being a principal term, and when $\kappa > 0$, our nonlinear term should be treated as a non-monotone perturbation. For a general domain Ω, it is difficult to handle such kind of perturbations, because of the lack of compactness.

27 Hiroshi Watanabe (Oita Univ.) Solvability of degenerate parabolic-elliptic systems 15

Summary: We consider the initial value problem (CP) for degenerate parabolic-elliptic systems with variable coefficients. The systems are coupled with strongly degenerate parabolic equations and elliptic equations. Strongly degenerate parabolic equations are regarded as a linear combination of the time-dependent conservation laws (quasilinear hyperbolic equations) and the porous medium type equations (nonlinear degenerate parabolic equations). Thus, this equation has both properties of hyperbolic equations and those of parabolic equations. In this talk, we formulate entropy solutions to (CP) and show the existence and uniqueness of the solutions.

28 Kota Kumazaki (Tomakomai Nat. Coll. of Tech.) On a free boundary problem for moisture swelling process in porous materials 15

Summary: In this talk, we propose a mathematical model for moisture swelling process in concrete materials. Moisture swelling process appear in, for instance, frost damage in concrete materials which is a nonlinear phenomenon to give rise to crack inside of concrete. Our model consists of a diffusion equation for moisture in a one microscopic hole of concrete and a free boundary problem for the front of moisture region. In this talk, we discuss the existence and uniqueness of a solution of this problem.

29 Yutaka Tsuzuki (Hiroshima Shudo Univ.) Initial-boundary value problems for Vlasov–Poisson systems with angle error in magnetic field 15

Summary: In this talk, we deal with existence of solutions to Vlasov–Poisson systems in a half-space with external magnetic force horizontal to a wall. In 2013, Skubachevskii gives local-in-time solvability to the system. Moreover, in 2017, global-in-time solutions were obtained by effectively using the magnetic force whose direction is horizontal to the wall. This talk provides an existence result for the system where the magnetic force has angle error in the vertical direction.

16:15–17:15 Talk Invited by Real Analysis Section

Yutaka Tsuzuki (Hiroshima Shudo Univ.) Global existence of solutions to Vlasov–Poisson equations with external magnetic field in a half space

Summary: This talk is concerned with solvability of Vlasov–Poisson equations in a half-space with external magnetic field. In 2013, local-in-time existence of solutions to the equation was proved by Skubachevskii. However, the result shows the fact that the existence time T is exponentially small, which means the plasma can reach a wall and melt it in the extremely short time. The purpose of this talk is to an obtain existence result for the equation with a very large time T. Moreover this talk provides global-in-time solvability for the equation with a more strict condition for the magnetic force whose direction is horizontal to the wall.

Functional Analysis

September 11th (Mon) Conference Room VI

14:15–16:45

1 Yoritaka Iwata (Tokyo Tech) Nonlinearity as for the logarithmic representation of infinitesimal generators · · · · · 15

Summary: The logarithmic representation of invertible evolution families is introduced in Ref.[1]. The nonlinearity related to the logarithmic representation is discussed in terms of its similarity with the Coles–Hopf transform.

Ref: [1] Yoritaka Iwata, "Infinitesimal generators of invertible evolution families", Methods Funct. Anal. Topology **23** 1 (2017) 26–36.

2 Kazuyuki Wada ♭ (Nat. Inst. of Tech., Hachinohe Coll.) Spectrum of N-body Stark Hamiltonians · · · · · 15

Summary: We consider N-body Stark Hamiltonians. By Herbst et al, it is shown that both pure point spectrum and singular continuous spectrum of N-body Stark Hamiltonians are empty. Their method is based on Mourre's positive commutator method. We prove this result by applying the theory of generalized canonical commutation relations.

3 Sohei Ashida (Kyoto Univ.) Absence of singular continuous spectrum and propagation estimates of multistate Schrödinger operators · · · · · 15

Summary: We study multistate Schrödinger operators related to molecular dynamics. We consider potentials which do not necessarily decay including those homogeneous of degree zero. We prove absence of the singular continuous spectrum and propagation estimates which mean the scattering at speed larger than a positive constant and decay of the states with potentials higher than considered energy at infinity. We also consider the multistate Schrödinger operators with many-body structures. We obtain the Mourre estimate and the minimal velocity estimate for the many-body operators. The lower bound of the velocity is determined by the distance between the energy and thresholds below the energy.

4 Hisashi Morioka (Doshisha Univ.)
Naotaka Shoji (Univ. of Tsukuba) Interior transmission eigenvalue problems on compact manifolds with smooth boundary · · · · · 15

Summary: We consider an interior transmission eigenvalue (ITE) problem on some compact C^∞-Riemannian manifolds with smooth boundary. In particular, we do not assume that two domains are diffeomorphic, but we impose some conditions of Riemannian metrics and indices of refraction on the boundary. Then we prove the discreteness of the set of ITEs, the existence of infinitely many ITEs, and its Weyl type lower bound.

5 Masaki Kawamoto (Tokyo Univ. of Sci.)
Taisuke Yoneyama (Tokyo Univ. of Sci.) Strichartz estimates for harmonic potential with time-decaying coefficient · · · · · 15

Summary: In this talk, we prove the Strichartz estimates for the Schrödinger equations with a harmonic potential with a time-decaying coefficient by introducing the time weighted Lebesgue space.

6 Hiroaki Niikuni (Maebashi Inst. of Tech.) Spectra of periodic Schrödinger operators on zigzag nanotubes with multiple chemical bonds · · · · · 15

Summary: In this talk, we study the spectral structure of periodic Schrödinger operators on zigzag nanotubes with multiple chemical bonds. Utilizing the Floquet–Bloch theory for the corresponding quantum graph, we see that the spectrum has the band-gap structure. Namely, the spectrum consists of flat band and the absolutely continuous spectrum. In the talk, we see the difference between the case of the single bond and the multiple bonds.

7 Hiroyuki Yamagishi (Tokyo Metropolitan Coll. of Indus. Tech.) The best constant of Sobolev inequality corresponding to a bending problem of a beam under tension on an elastic foundation 3 ····· 15

Summary: We consider two-point boundary value problems for bending of a beam supported by uniformly distributed springs with spring constant $q > 0$ on a fixed floor under tension $p > 0$. The tension is relatively strong, that is $(p/2)^2 > q$. We have treated periodic, Dirichlet, Dirichlet–Neumann and Neumann boundary conditions and found their Green functions. As an application, we have found the best constants of the corresponding Sobolev inequality, which are equal to the maximum of diagonal values of Green functions.

8 Hiroshi Ito (Ehime Univ.)* On the square root of the Pauli operator with a diverging potential ····· 15

Summary: We first study the spectral properties of two relativistic Hamiltonians; one is the square root of a Pauli operator with an electric potential growing polynomially at infinity, and the other differs from it only in the sign of the potential. We next give a resonance free region for the latter. Moreover, we show that resonances (eigenvalues) of each of them converge to resonances (eigenvalues) of the corresponding Pauli operators with the same potential in the nonrelativistic limit.

9 Hiroshi Ito (Ehime Univ.)* Resonances of Dirac operators with a diverging potential ····· 10

Summary: We investigate resonance free regions of Dirac operators with a bounded magnetic potential and an electric potential diverging at infinity with the help of the dilation analytic method and the FW transform. In this work two square roots of c-dependent Pauli operators play an important role.

17:00–18:00 Talk Invited by Functional Analysis Section

Masaki Kawamoto (Tokyo Univ. of Sci.) Scattering theory for periodically pulsed magnetic field

Summary: We study the quantum dynamics of a charged particle in the plane in the presence of a periodically pulsed magnetic field perpendicular to the plane. We show that by controlling the cycle when the magnetic filed is switched on and off appropriately, the result of the asymptotic completeness of wave operators can be obtained under the assumption that the potential V satisfies the decaying condition $|V(x)| \leq C(1+|x|)^{-\rho}$, for some $\rho > 0$.

September 12th (Tue) Conference Room VI

9:45–12:00

10 Rumi Togashi (Nagaoka Nat. Coll. of Tech.) Characterization of maps by peripheral spectra and multiplication ··· 15

Summary: We introduce the condition related to the peripheral spectrum and the multiplication for maps between uniform algebras to be linear and isometric. We can describe maps related to algebra isomorphisms by some property of peripheral spectra and multiplication. We also generalize weakly peripherally-multiplicative maps and peripherally monomial-preserving maps and give some examples.

11 Takeshi Miura (Niigata Univ.) Hiroyuki Takagi (Shinshu Univ.) Isometries on $C^1([0,1])$ ····· 15

Summary: Let $C^1([0,1])$ be a linear space of all continuously differentiable complex valued functions on the closed unit interval $[0,1]$. $C^1([0,1])$ is a Banach space with respect to the following norms: $\|f\|_C = \sup_{t\in[0,1]} (|f(t)|+|f'(t)|)$, $\|f\|_\Sigma = \|f\|_\infty + \|f'\|_\infty$ and $\|f\|_\sigma = |f(0)| + \|f'\|_\infty$, where $\|\cdot\|_\infty$ denotes the supremum norm on $[0,1]$. We give the characterization of surjective isometries on $C^1([0,1])$ with respect to the above norms.

12 Keiichi Watanabe (Niigata Univ.) On the Möbius gyrovector spaces by A. A. Ungar 15

Summary: For the Möbius gyrovector spaces introduced by A. A. Ungar, we reveal the structure of finitely generated gyrovector subspaces, present a notion of orthogonal gyrodecomposition with respect to any gyrovector subspace which is closed under the Poincare metric. Moreover, we show a concrete procedure to obtain orthogonal gyroexpansion in a Möbius gyrovector space, like as the classical orthogonal expansion in a Hilbert space.

13 Osamu Hatori (Niigata Univ.) Peculiar homomorphisms on admissible quadruples 15

Summary: We study unital homomorphisms on admissible quadruples. In particular, we exhibit results that every unital homomorphism between admissible quadruples with certain conditions on maximal ideal spaces is of type BJ.

14 Ryo Tabata (Ariake Nat. Coll. of Tech.) Schur's immanant inequalities and Littlewood–Richardson's correspondence 15

Summary: Immanants are generalizations of the determinant and the permanent, and are labeled by Young diagrams. The limit of immanants of a correlation matrix is an interesting problem in terms of inequality problems, whose origins are Schur's inequality and Lieb's permanental dominance conjecture. In this talk, we give some results of the limit of immanants depending on the arms and legs of the Young diagrams, applying the Littlewood–Richardson rule, which is one of the most important property to describe the representations of the symmetric group. Also, we observe the behavior of the Littlewood–Richardson rule that becomes simple under some conditions.

15 Cid Reyes-Bustos (Kyushu Univ.)
Kazufumi Kimoto (Univ. of Ryukyus)
Masato Wakayama (Kyushu Univ.) Spectral degeneracies in the asymmetric quantum Rabi model 15

Summary: In this talk, the authors prove the existence of spectral degeneracies in the asymmetric quantum Rabi model (AQRM) when the symmetry-breaking parameter ϵ is a half-integer. The degeneracy had been previously established for the case $\epsilon = \frac{1}{2}$ by Wakayama (2017) and verified experimentally the general case by Li and Batchelor in 2015. The main result is established by the study of certain (so-called constraint) polynomials appearing from the finite-dimensional irreducible representations of $\mathfrak{sl}_2(\mathbb{R})$ in the representation theoretical picture of the AQRM. Two independent proofs are given of the main result, each one giving a better understanding of the structure of the spectrum of the AQRM.

16 Nobukazu Shimeno (Kwansei Gakuin Univ.)
Hiroshi Oda (Takushoku Univ.) Harish-Chandra's $\boldsymbol{c}$-functions for small K-types 15

Summary: We study elementary spherical functions on a non-compact real simple Lie group of finite center associated with a small K-type in the sense of Wallach. We prove that in most cases, the radial parts of elementary spherical functions for small K-types are written by hypergeometric functions of Heckman and Opdam. As an application, we give explicit formulae for Harish-Chandra's $\boldsymbol{c}$-functions for small K-types and obtain the inversion formulae for the spherical transforms for small K-types.

17 Ryosuke Nakahama (Univ. of Tokyo) Intertwining operators between holomorphic discrete series representations 15

Summary: In this talk the speaker presents the result on the explicit construction of embedding maps between two holomorphic discrete series representations. Today we mainly deal with the embedding of the holomorphic discrete series representation of $U(s', s'')$ into that of $Sp(s, \mathbb{R})$, where $s = s' + s''$.

13:00–14:00 Talk Invited by Functional Analysis Section

Toshihisa Kubo (Ryukoku Univ.) Differential symmetry breaking operators of $O(n,1)$ for differential forms

Summary: Let X be a smooth manifold and Y a smooth submanifold of X. Take $G' \subset G$ to be a pair of Lie groups that act transitively on $Y \subset X$, respectively. Suppose that $\mathcal{V} \to X$ and $\mathcal{W} \to Y$ are G- and G'-equivariant vector bundles over X and Y with fibers V and W, respectively. Then we call a differential operator $\mathcal{D}\colon C^\infty(X,\mathcal{V}) \to C^\infty(Y,\mathcal{W})$ between the spaces of smooth sections a *differential symmetry breaking operator* (differential SBO) if $\mathcal{D}$ is G'-intertwining.
In the last year, for the setting $(G,G',V,W) = (O(n+1,1),O(n,1),\wedge^i(\mathbb{C}^n),\wedge^j(\mathbb{C}^{n-1}))$ with $n \geq 3$, we completely classified the differential SBOs with their explicit formulas. In other words, for any $0 \leq i \leq n$ and $0 \leq j \leq n-1$, we classified all the differential SBOs $\mathcal{D}^{i\to j}\colon \mathcal{E}^i(S^n) \to \mathcal{E}^j(S^{n-1})$ from the space of differential i-forms $\mathcal{E}^i(S^n)$ over the standard Riemann sphere S^n to that of differential j-forms $\mathcal{E}^j(S^n)$ over the totally geodesic hypersphere S^{n-1}. In this talk we would like to discuss how we classify such operators. This is a joint work with T. Kobayashi and M. Pevzner.

September 13th (Wed) Conference Room VI

9:00–12:00

18 Masayuki Fujimoto (Osaka Kyoiku Univ.) Matrix Wielandt inequality via the matrix geometric mean ····· 15
Yuki Seo (Osaka Kyoiku Univ.)

Summary: In this talk, by virtue of the matrix geomtric mean and the polar decomposition, we present new Wielandt type inequalities for matrices of any size. To this end, based on results due to J. I. Fujii, we reform a matrix Cauchy–Schwarz inequality, which differs from ones due to Marshall and Olkin.

19 Junichi Fujii (Osaka Kyoiku Univ.) Tsallis relative operator entropy with negative parameters ····· 15
Yuki Seo (Osaka Kyoiku Univ.)

Summary: Tsallis relative operator entropy was firstly formulated by Fujii and Kamei as an operator version of Uhlmann's relative entropy. Afterwards, Yanagi, Kuriyama and Furuichi reformulated Tsallis relative operator entropy as an operator version of Tsallis relative entropy. In this talk, we define Tsallis relative operator entropy with negative parameters of (non-invertible) positive operators on a Hilbert space and show some properties.

20 Hiroaki Tohyama (Maebashi Inst. of Tech.) The n-th divergence on the path $A \natural_t B$ ····· 15
Hiroshi Isa (Maebashi Inst. of Tech.)
Masatoshi Ito (Maebashi Inst. of Tech.)
Eizaburou Kamei
Masayuki Watanabe
(Maebashi Inst. of Tech.)

Summary: Let A and B be bounded positive invertible operators on a Hilbert space and let $\Psi_{A,B}(t) \equiv A \natural_t B$ be an operator valued smooth function, where $A \natural_t B \equiv A^{\frac{1}{2}}(A^{-\frac{1}{2}}BA^{-\frac{1}{2}})^tA^{\frac{1}{2}}$ $(t \in \mathbb{R})$ is a path passing through A and B. We consider the following functions $\Psi^{[n]}_{A,B} : \mathbb{R}^2 \to B(\mathcal{H})$: $\Psi^{[1]}_{A,B}(x,y) \equiv \frac{\Psi_{A,B}(x)-\Psi_{A,B}(y)}{x-y}$ and $\Psi^{[n]}_{A,B}(x,y) \equiv \frac{\Psi^{[n-1]}_{A,B}(x,y)-\Psi^{[n-1]}_{A,B}(y,y)}{x-y}$ $(n \geq 2)$. Since Petz–Bregman divergence $D_{FK}(A|B)$ can be represented by $\Psi^{[1]}_{A,B}(1,0) - \Psi^{[1]}_{A,B}(0,0)$, we can give the n-th Petz–Bregman divergence $D^{[n]}_{FK}(A|B) \equiv \Psi^{[n]}_{A,B}(1,0) - \Psi^{[n]}_{A,B}(0,0)$. Moreover, we treat the n-th divergences related with some operator valued divergences defined by the difference between the relative operator entropies.

21 Masatoshi Ito (Maebashi Inst. of Tech.) Estimations of the Lehmer mean by the Heron mean ····· 15

Summary: As generalizations of the arithmetic and geometric means for positive real numbers a and b, the power difference mean $J_q(a,b) = \frac{q}{q+1}\frac{a^{q+1}-b^{q+1}}{a^q-b^q}$, the Lehmer mean $L_q(a,b) = \frac{a^{q+1}+b^{q+1}}{a^q+b^q}$, and the Heron mean $K_q(a,b) = (1-q)\sqrt{ab} + q\frac{a+b}{2}$ are well known. Recently, we have shown estimations of the power difference mean by the Heron mean.
In this talk, similarly to these results, we get estimations of the Lehmer mean by the Heron mean. In other words, we obtain the greatest value $\alpha = \alpha(q)$ and the least value $\beta = \beta(q)$ such that the double inequality $K_\alpha(a,b) < L_q(a,b) < K_\beta(a,b)$ holds for any $q \in \mathbb{R}$. We can also obtain operator inequalities for bounded linear operators on a Hilbert space.

22 Takeaki Yamazaki (Toyo Univ.)
Masatoshi Ito (Maebashi Inst. of Tech.)
Takayuki Furuta (Hirosaki Univ.*)
Masahiro Yanagida (Tokyo Univ. of Sci.)
Upper and lower bounds, and operator monotonicity of an extension of the Petz–Hasegawa function ····· 10

Summary: In this talk, we shall consider an extension of the Petz–Hasegawa function. In fact, we shall give upper and lower bounds, and operator monotonicity of this function with elementary proofs.

23 Masaru Nagisa (Chiba Univ.)
Imam Nugraha Albania (Univ. Pendidikan Indonesia)
Positive definite functions and operator norm inequalities ····· 15

Summary: Let $a_1 \geq a_2 \geq \ldots \geq a_K > 0$ and $b_1 \geq b_2 \geq \ldots \geq b_K > 0$. We consider the function

$$g(x) = \prod_{i=1}^{K} \frac{\sinh a_i x}{\sinh b_i x}.$$

It is kwnown that the positive definiteness of such functions are related to some operator norm inequalities. In the case of $K = 2$, g is positive definite if and only if $a_1 \leq b_1$ and $a_1 + a_2 \leq b_1 + b_2$. Unfortunately we do not know such an equivalent condition when $K \geq 3$. We consider the condition which related to the positive definiteness of g.

24 Shûichi Ohno (Nippon Inst. of Tech.)* The Toeplitzness of weighted composition operators ····· 10

Summary: We will consider the asymptotic toeplitzness associated with weighted composition operators on the Hardy–Hilbert space H^2.

25 Masatoshi Enomoto * Configulation problem of two subspaces ····· 15
Yasuo Watatani (Kyushu Univ.)

Summary: P. R. Halmos has presented his famous results of a classification of 2 subspaces under unitary equivalence. In this talk we discuss two subspaces under more weak equivalence. We point out that operator ranges are crucially important to study a classification of 2 subspaces under more weak equivalence. Under this equivalence, we give continuously many non-isomorphic examples of systems of 2 subspaces. We also give a relation between operator ranges, Hilbert representations of A_2 Dynkin quiver and particular systems of 3 subspaces.

26 Tsuyoshi Kajiwara (Okayama Univ.)
Yasuo Watatani (Kyushu Univ.)
C*-algebra associated with Seirpinski carpet ····· 15

Summary: In this talk, we present analysis of the core of the C*-algebras associated with self-similar maps associated with Sierpinski carpet. Although, the branch set if a infinite set and the structure of branching is complex for Sierpinski carpet, we can classify finite traces and ideals of the core, and can describe the matrix representation of the core.

27 Takahiro Sudo (Univ. of Ryukyus) The K-theory for the group and subgroup C^*-algebras of the special or general linear groups over integers ····· 15

Summary: We consider the K-theory of the group and subgroup C^*-algebras of the special or general linear groups over the ring of integers and of their canonical subgroups. We further consider the K-theory of the associated, crossed product C^*-algebras.

28 Kengo Matsumoto * (Joetsu Univ. of Edu.) Asymptotic continuous orbit equivalence of hyperbolic dynamics and Ruelle C*-algebras ····· 15

Summary: A Smale space is a hyperbolic dynamical system with local product structure. D. Ruelle constructed C*-algebras from Smale spaces. The algebras are regarded as higher dimensional analogues of Cuntz–Krieger algebras. We introduce notions of asymptotic continuous orbit equivalence and asymptotic conjugacy in Smale spaces and characterize them in terms of their étale groupoids and their asymptotic Ruelle algebras with their dual actions, respectively.

14:15–15:30

29 Yuhei Suzuki (Nagoya Univ.) On pure infiniteness of crossed products of minimal extensions ····· 15

Summary: We show that pure infiniteness of reduced crossed product is inherited to minimal extensions.

30 Norio Nawata (Osaka Kyoiku Univ.) Trace scaling automorphisms of $\mathcal{W} \otimes \mathbb{K}$ ····· 15

Summary: In this tallk, we classify trace scaling automorphisms of $\mathcal{W} \otimes \mathbb{K}$ up to outer conjugacy, where $\mathcal{W}$ is a certain simple separable nuclear stably projectionless C*-algebra having trivial K-groups.

31 Yasuhiko Sato (Kyoto Univ.) Projections associated with quasidiagonality ····· 15

Summary: In the recent breakthrough by Tikuisis, White, and Winter, it is shown that the universal coefficient theorem and nuclearity imply quasidiagonality for separable C*-algebras. Precisely, they showed a faithful tracial state is quasi-diagonal under the natural assumption required in the classification theory. In this talk, we explain a technical ingredient in their proof and several alternative approaches to obtaining quasidiagonality.

32 Yusuke Sawada (Nagoya Univ.) The bicategory of W*-bimodules ····· 15
Shigeru Yamagami (Nagoya Univ.)

Summary: When a von Neumann algebra acts on a Hilbert space, the relative tensor product of the Hilbert spaces is defined. The notion of the relative tensor product was introduced by Alain Connes. There are two ways which we define it by changing left or right Hilbert space into the operator space. We call them the left and right relative tensor products respectively. We will show that the two categories consisting of all bimodules (i.e. Hilbert spaces on which von Neumann algebras act from left and right) with left and right relative tensor products are equivalent. This is a joint work with Shigeru Yamagami.

15:45–16:45 Talk Invited by Functional Analysis Section

Yusuke Isono (Kyoto Univ.) Deformation/rigidity theory and type III von Neumann algebras

Summary: Deformation/rigidity theory is initiated by S. Popa in 2001 to study *non-amenable* von Neumann algebras. Amenable von Neumann algebras naturally appear in physics and they were extensively studied. The study of non-amenable algebras also attracted attention but very few had been known until 1990s. Deformation/rigidity theory is a great success in the study of non-amenable algebras. It brought much progress and in fact solved lots of open problems for non-amenable algebras.

Most of technologies used in this new theory require so-called a *trace* (a generalization of traces on matrices). Since this requirement is crucial, the above development is mostly restricted to algebras with traces. Von Neumann algebras without any traces are called *type III*. For example, von Neumann algebras in physics are always of type III. They also appear in many other context such as ergodic theory, quantum groups, free probability theory etc.

In this talk, I focus on type III algebras, particularly non-amenable type III algebras. To study them, it is important to find a way of applying technologies of deformation/rigidity theory to type III algebras. This problem has been mainly studied by C. Houdayer and myself. I will survey recent progress on this problem.

Final: 2017/8/22

Statistics and Probability

September 11th (Mon) Conference Room I

9:15–12:00

1 Tamio Koyama (Kobe Univ.) An inversion formula utilizing hyperfunctions and it's application · · · · 15

Summary: We show that an inversion formula for probability measures on the real line holds in a sense of the theory of hyperfunctions. As an application of our inversion formula, we give a representation of probability density functions utilizing characteristic functions.

2 Hiroki Takahashi (Keio Univ.), Mao Shinoda (Keio Univ.) Lyapunov optimization for non-generic one-dimensional expanding Markov maps · · · · 15

Summary: For a non-generic, yet dense subset of C^1 expanding Markov maps of the interval we prove the existence of uncountably many Lyapunov optimizing measures which are ergodic, fully supported and have positive entropy. We also prove the existence of another non-generic dense subset for which the optimizing measure is unique and supported on a single periodic orbit. A key ingredient is a new C^1 perturbation lemma which allows us to interpolate between expanding Markov maps and the shift map on a finite number of symbols.

3 Johannes Jaerisch (Shimane Univ.), Hiroki Sumi (Kyoto Univ.) Spectral gap property for random dynamics on the real line and the Hölder regularity of generalised Takagi functions · · · · 15

Summary: We consider the random iteration of two expanding diffeomorphisms on the real-line without a common fixed point. We derive the spectral gap property of an associated transition operator acting on spaces of Hölder continuous functions. We introduce generalised Takagi functions on the real-line and we investigate their regularity properties.

4 Naoto Shimaru (Okayama Univ. of Sci.), Keizo Takashima (Okayama Univ. of Sci.) Another proof of Weyl's lemma · · · · 10

Summary: We give an upper bound for the discrepancy of irrational rotations $\{n\alpha\}$ in terms of the continued fraction expansion of α and the related Ostrowski expansion. Our result improves earlier bounds in the literature and substantially simplifies their proofs.

5 Hideaki Uemura (Aichi Univ. of Edu.), Shigeyoshi Ogawa (Ritsumeikan Univ.) On the reconstruction of random function from its SFCs defined by an arbitrary CONS · · · · 15

Summary: We consider the reconstruction problem of a random function from the system of its stochastic Fourier coefficients (SFC in abbr.). We employ arbitrary orthonormal basis and Ogawa integral to construct SFCs. We first discuss the representation of Ogawa integral of a random function from its SFCs and H^1 basis, and then solve the reconstruction problem.

6 Kiyoiki Hoshino (Osaka Pref. Univ.) Identification of finite variation processes from the SFC · · · · 15

Summary: We consider the question whether a random function (or a stochastic derivative as an extension) is identified from the stochastic Fourier coefficient (SFC). We give an answer for the stochastic derivatives driven by finite variation processes. Especially, any finite variation process is identified from the SFC of Ogawa type. Also, we reconstruct, independently of values of the Brownian motion, nonnegative absolutely continuous noncausal Wiener functionals from the SFC of Skorokhod type.

7 Masato Hoshino (Waseda Univ.) Global well-posedness of complex Ginzburg–Landau equation with a space-time white noise ····· 15

Summary: We show the global-in-time well-posedness of the complex Ginzburg–Landau (CGL) equation with a space-time Gaussian white noise on the 3-dimensional torus. The local well-posedness was obtained by Hoshino, Inahama and Naganuma, as an application of the theory of paracontrolled calculus. For the global well-posedness, we use a similar argument to Mourrat and Weber's work about the global well-posedness of the dynamical Φ^4_3 model. By improving their method, we show a priori L^{2p} estimate of the solution for $p > \frac{3}{2}$.

8 Masato Hoshino (Waseda Univ.)
Tadahisa Funaki (Waseda Univ.) A coupled KPZ equation, its two types of approximations and existence of global solutions ····· 15

Summary: We discuss the multi-component coupled Kardar–Parisi–Zhang (KPZ) equation and its two types of approximations. By applying the paracontrolled calculus introduced by Gubinelli, Imkeller and Perkowski, we show that these approximations have a common limit under well adjusted choices of renormalization factors. Moreover, if the coupling constants satisfy the so-called "trilinear" condition, then the Wiener measure becomes stationary for the limit, so that this limit exists globally in time when the initial value is sampled under the stationary measure.

9 Masaki Wada (Fukushima Univ.) Large time asymptotics for fundamental solutions of critical Schrödinger operators ····· 15

Summary: Let $\{X_t\}_{t\geq 0}$ be the symmetric α-stable process with generator $\mathcal{L} = -(-\Delta)^{\alpha/2}$ for $0 < \alpha \leq 2$ and μ be a positive Radon measure in a certain class. We define the Schrödinger operator $\mathcal{L}^\mu = \mathcal{L} + \mu$ and consider the fundamental solution of the equation $\partial u/\partial t = \mathcal{L}^\mu u$. If μ is critical, the behavior of the fundamental solution is different from that of the transition density function of $\{X_t\}_{t\geq 0}$. In this talk, we give large time asymptotics for fundamental solutions of critical Schrödinger operators.

14:15–15:00

10 Kazuhiro Yoshikawa (Ritsumeikan Univ.)
Takahiro Aoyama (Okayama Univ.) Composed order statistics and multivariate compound Poisson processes ····· 15

Summary: In this talk, we give an order statistic with random vectors to construct multivariate compound Poisson processes. The method works well for some processes, especially generated by zeta distributions. For example, Aoyama and Nakamura introduced generalized Euler products attached to a subclass of multidimensional infinitely divisible distributions. We will construct the compound Poisson processes corresponding their infinitely divisible distributions generated by the Euler products.

11 Masatake Hirao (Aichi Pref. Univ.) Frame potentials of determinantal point processes on the d-sphere ···· 15

Summary: In the recent years, finite frame theory has come to draw a lot of attention since there exist many applications, e.g, numerical analysis, algebraic design theory, directional statistics, compressed sensing and so on. In this talk we show that determinantal point processes on the sphere give almost tight finite frames. We give two expectations of frame potentials of spherical ensembles and harmonic ensembles, which are the typical types of DPPs on the sphere. We also discuss random matrices induced by determinantal point processes on the sphere.

12 Masato Takei (Yokohama Nat. Univ.)
Tomohiro Ishikawa (Yokohama Nat. Univ.) Vertex-reinforced random walks on complete bipartite graphs ····· 10

Summary: We consider vertex-reinforced random walks on complete bipartite graphs, and study their limiting behavior.

15:15–16:15 Talk Invited by Statistics and Probability Section

Kazuki Okamura (Kyoto Univ.) Several properties for random walks on graphs

Summary: In this talk we will state several properties for random walks on graphs. We will mainly focus on simple random walks on infinite connected graphs such as fractal graphs and percolation clusters. This talk will consist of two large parts. First, we will state the range of random walk on graphs satisfying a uniform condition, which includes several fractal graphs. Second, we will state a level-2 quenched large deviation principle for simple random walk on a class of percolation clusters including long-range correlations. The second part is based on a joint work with Noam Berger and Chiranjib Mukherjee.

16:30–17:30 Talk Invited by Statistics and Probability Section

Akira Sakai (Hokkaido Univ.) Recent progress in researches on phase transitions and critical behavior for Ising ferromagnets

Summary: In this talk, I will review a class of most important results, chosen based on my personal preference, on phase transitions and critical behavior for the Ising model, a model of ferromagnetism in classical equilibrium statistical mechanics. First, I will overview the results obtained by the end of the previous century and recall the problems left unsolved then. Next, I will review how some of those problems have been solved since 2001. The common tool to solve most of those problems is the random-current representation. I will explain the derivation of the representation and its implication by showing some examples, such as exponential decay of the subcritical two-point function, uniqueness of the critical point, the mean-field bound on the 1-arm exponent, and the lace expansion for the two-point function. Finally, I will summarize the remaining open problems for future researches.

September 12th (Tue) Conference Room I

9:20–11:30

13 Toshiharu Fujita (Kyushu Inst. of Tech.)
Naoki Saikawa (Kyushu Inst. of Tech.)
On nonserial dyanmic programming —Converging branch systems— 15

Summary: In this study, we consider a new decision process model with a converging branch system which is one of the nonserial transition systems. We give the formulation of the model and introduce a recursive method to solve it by using dynamic programming.

14 Kazuki Matsubara (ChuoGakuin Univ.)
Sanpei Kageyama (Tokyo Univ. of Sci.)
The existence of two-pairwise additive cyclic BIB designs of block size two 15

Summary: The existence of pairwise additive cyclic balanced incomplete block (BIB) designs with $k = 2$ and $\lambda = 1$ has been discussed in the literature. In this talk, for an odd prime $p \geq 5$, 2-pairwise additive cyclic BIB designs with $(v, k, \lambda) = (3p, 2, 1), (2p, 2, 2)$ are mainly constructed through methods of block replacements. Finally, the existence of 2-pairwise additive cyclic BIB designs with $k = 2$ and $\lambda \geq 1$ is shown entirely.

15 Hiromu Yumiba (Int. Inst. for Nat. Sci.)
Yoshifumi Hyodo (Okayama Univ. of Sci./Int. Inst. for Nat. Sci.)
Masahide Kuwada (Int. Inst. for Nat. Sci.)
A*-optimal balanced third-order designs of resolution R*({10, 01}) with $N < \nu(m)$ for 3^m factorials ····· 15

Summary: We consider the third-order linear model for 3^m factorials. In previous talks (MSJ Autumn Meeting 2016; MSJ Spring Meeting 2017), we have established a necessary and sufficient condition for a simple array (SA) to be a balanced third-order (3^m-BTO) design of resolution R*({10, 01}), where the number of assemblies ($= N$) is less than the number of non-negligible factorial effects ($= \nu(m)$) and $m \geq 6$. Let T be a 3^m-BTO design of resolution R*({10, 01}) derived from an SA with N assemblies, and further let $\sigma^2 S_T$ be the trace of the variance-covariance matrix of the estimators concerning with all the main effects based on T. If $S_T \leq S_{T^*}$ for any T^*, then T is said to be A*-optimal, where T^* is a 3^m-BTO design of resolution R*({10, 01}) derived from an SA with N assemblies. In this talk, we give A*-optimal 3^m-BTO designs of resolution R*({10, 01}) derived from SA's for $m = 6, 7, 8$, where $N < \nu(m)$.

16 Xiao-Nan Lu (Tokyo Univ. of Sci.)
Masakazu Jimbo (Chubu Univ.)
Locating arrays with error-correcting ability ····· 15

Summary: Locating arrays are introduced for identifying interaction faults and their locations in component-based systems. This class of problems are closely related with covering arrays and group testing, but the constructions are less known. Under the assumption that the system contains (at most) d faults, each involving (at most) t interacting factors, the notion of a $(\bar{d}, t)$-locating array is proposed. In this talk, I will focus on $(\bar{1}, t)$-locating arrays. Moreover, by taking the similar consideration to error-correcting codes, the notion of locating arrays with error-correcting ability will be introduced.

17 Kanta Naito (Shimane Univ.)
Takuma Yoshida (Kagoshima Univ.)
Regression with stagewise minimization on the risk ····· 15

Summary: This talk is concerned with regression based on the empirical risk minimization. The estimator is composed as a convex combination of the word (learner) in dictionary. The word is selected in each step of the proposed stagewise algorithm, which minimizes a certain divergence measure. A non-asymptotic error bound of the estimator is developed, and it is seen that the error bound becomes sharp as the number of iteration of the algorithm increases.

18 Yoshihiko Maesono (Kyushu Univ.)
Masanari Motoyama (ZEN-NOH)
On direct kernel estimator of density ratio ····· 10

Summary: Let $f(x)$ and $g(x)$ denote probability density functions and $g(x_0) \neq 0$. In this paper we discuss the density ratio $f(x_0)/g(x_0)$. A naive estimator is constituted from separate estimators of $f(x_0)$ and $g(x_0)$, which we call an indirect estimaotr. The other estimator is proposed by Cwik and Mielniczuk (1989), which we call a direct estimator. Here we propose a new direct estimator, and derive asymptotic mean squared error. We also prove central limit theorem of the new estimator. We also compare mean squared errors of the proposed estimator and others by simulation

19 Yoshihide Kakizawa (Hokkaido Univ.)
Symmetrical-based q-MIG kernel density estimation ····· 15

Summary: We consider estimation of the probability density for nonnegative data. In that case, the standard kernel density estimator is, in general, inconsistent near the boundary, due to the so-called boundary bias. Many authors have suggested various remedies, e.g., renormalization, reflection, and generalized jackknifing (see Jones (1993) for a review). On the other hand, over the last decade, there has been growing interest in the use of asymmetric kernel (AK), whose support matches the support of the density to be estimated. We propose a new AK density estimator using a q-MIG kernel. Here, "MIG" is a mixture of symmetrical-based inverse Gaussian (IG) and its reciprocal (RIG), and "q-MIG" is its generalization via Yang's (2006) dual transformation, including a subfamily of log-symmetrical densities as a special case.

11:30–12:00 Research Section Assembly

13:15–14:15

20 Kiyotaka Iki (Tokyo Univ. of Sci.) Decomposition of diamond model for square contingency tables with ordered categories 10

Summary: For square contingency table with the same row and column ordinal classifications, this paper shows that the diamond model holds if and only if the weighted covariance for the difference between the row and column classifications and the sum of them equals zero and the uniform association diamond model holds.

21 Kouji Tahata (Tokyo Univ. of Sci.) Asymmetry model and decomposition of symmetry for square contingency tables 10

Summary: For the analysis of square contingency tables with ordered categories, the present paper proposes a model that indicates the structure of asymmetry for cell probabilities. The model is the closest to the symmetry model in terms of the f-divergence under certain conditions, and includes the asymmetry models, which have been proposed by many statisticians, in the special cases. Also, it is shown the theorem that the symmetry model can be separated into some models by using the proposed model. It may be useful to see the reason for the poor fit of the symmetry model.

22 Ayaka Yagi (Tokyo Univ. of Sci.), Takashi Seo (Tokyo Univ. of Sci.) Transformed T^2-type statistics for testing equality of two mean vectors with monotone samples 15

Summary: We consider the null distribution of the Hotelling's T^2-type statistic for testing equality of two mean vectors when the two data matrices are of the same monotone missing pattern. As with the one-sample problem, a simplified T^2 statistic and an asymptotic expansion of its null distribution using decomposition of the test statistic are derived. Decomposition of the test statistic proposed in the study allowed to calculate the asymptotic expansion more easily. Further, we present the transformed test statistics based on the Bartlett adjustment. Finally, by a Monte Carlo simulation, we investigate the accuracy and asymptotic behavior of the approximation for chi-squared distribution.

23 Masashi Hyodo (Osaka Pref. Univ.), Hayate Ogawa (Osaka Pref. Univ.), Takahiro Nishiyama (Senshu Univ.) Simultaneous test of mean vector and variance covariance matrix using Euclidean norm for multi-sample problem 15

Summary: In this talk, we propose an L^2-norm-based statistic and its asymptotic distribution for simultaneous test of the mean vector and covariance matrix for multi-sample problem. An asymptotic distribution of test statistic are derived under a high-dimensional framework to deal with high-dimensional problems. This result is used for asymptotic size adjustment and derivation of asymptotic power. Finally, we study the finite sample and dimension performance of this test via Monte Carlo simulations.

September 13th (Wed) Conference Room I

9:40–12:10

24 Koji Tsukuda (Univ. of Tokyo), Hiroshi Kurata (Univ. of Tokyo) Covariance structure associated with equality between two general ridge estimators 15

Summary: The Rao structure about the dispersion matrix in the general linear model is a well-known necessary and sufficient condition which guarantees that the ordinary least square estimator becomes the best linear unbiased estimator. In this presentation, we discuss a general ridge estimator to derive an extension of the Rao structure, that is, a necessary and sufficient condition under which two general ridge estimators coincide with each other.

25 Aki Ishii (Tokyo Univ. of Sci.)
Kazuyoshi Yata (Univ. of Tsukuba)
Makoto Aoshima (Univ. of Tsukuba)
Equality tests of high-dimensional covariance matrices based on eigenstructures 15

Summary: In this talk, we consider the equality test of covariance matrices for high-dimensional data. Aoshima and Yata (2017, SS) proposed two eigenvalue models for high-dimensional data. One is called the strongly spiked eigenvalue (SSE) model and the other one is called the non-SSE (NSSE) model. Li and Chen (2012) proposed a test statistic under the NSSE model. We verify that the statistic is asymptotically distributed as a chi-squared distribution under the SSE model. With the help of the asymptotic distribution, we proposed an equality test under the SSE model.

26 Kazuyoshi Yata (Univ. of Tsukuba)
Makoto Aoshima (Univ. of Tsukuba)
Asymptotic normality for inference on high-dimensional mean vectors under the SSE model 15

Summary: In this talk, we consider the asymptotic normality for inference on high-dimensional mean vectors under two disjoint models: the strongly spiked eigenvalue (SSE) model and the non-SSE (NSSE) model. We first consider a distance-based statistics. We verify that it is asymptotically distributed as a normal distribution under the NSSE model. We also show that the asymptotic normality does not hold under the SSE model. We propose a new statistics by the estimation of eigenstructures for the SSE model. We verify that the proposed statistics is asymptotically distributed as a normal distribution under the SSE model. With the help of the asymptotic normality, we consider inferences on multi-sample and mean vectors under the SSE model.

27 Yugo Nakayama (Univ. of Tsukuba)
Kazuyoshi Yata (Univ. of Tsukuba)
Makoto Aoshima (Univ. of Tsukuba)
Asymptotic properties of support vector machines in high-dimension, low-sample-size settings 15

Summary: In this talk, we consider asymptotic properties of the support vector machine (SVM) in high-dimension, low-sample-size (HDLSS) settings. We show that the SVM holds a consistency property in which misclassification rates tend to zero as the dimension goes to infinity under certain severe conditions. We show that the SVM is very biased in HDLSS settings and its performance is affected by the bias directly. In order to overcome such difficulties, we propose a bias-corrected SVM (BC-SVM). We show that the BC-SVM gives preferable performances in HDLSS settings for typical kernel functions. Finally, we check the performance of the BC-SVM by numerical simulations.

28 Yujie Xue (Waseda Univ.)
Taniguchi Masanobu (Waseda Univ.)
Modified LASSO estimators of the models with long-memory disturbances 10

Summary: When we deal with actual problems by model building, it is often commonly assumed that the response variable and covariates satisfy linear relationship. One of the usual assumptions is that the disturbances follow identically independent distribution. Nevertheless the correlation of them may occur when the data are collected sequentially in time, especially in the field of economics and geophysics. In this talk, we assume the errors are strongly dependent. Then the asymptotic theory for modified LASSO estimators is discussed.

29 Kou Fujimori (Waseda Univ.)
The Dantzig selector for high-dimensional linear models of diffusion processes 10

Summary: The Dantzig selector, which was proposed by Candés and Tao in 2007, is an estimation procedure for regression models in a high-dimensional and sparse setting. In this presentation, linear models of diffusion processes with unknown drift matrices and diagonal diffusion matrices are discussed. We will consider the estimation problems for drift and diffusion matrices based on the discrete time observation in high-dimensional and sparse settings for drift matrices. To estimate drift matrices, we will apply the Dantzig selector and prove the l_q consistency of the estimator for every $q \in [1, \infty]$ under some appropriate conditions.

30 Hideaki Nagahata (Waseda Univ.) Masanobu Taniguchi (Waseda Univ.) Analysis of variance for high dimensional time series · · · · · · · · · · · · · · · · 15

Summary: For independent observations, analysis of variance (ANOVA) has been enoughly tailored. Recently there has been much demand for ANOVA of high dimensional and dependent observations in many fields. However ANOVA for high dimensional and dependent observations has been immature. In this paper, we study ANOVA for high dimensional and dependent observations. Specifically, we show asymptotics of classical tests proposed for independent observations and give a sufficient condition for them to be asymptotically normal. Some numerical examples for simulated and real financial data are given as applications of these results. The extension in this paper is not straightforward and contains a lot of novel aspects for the analysis of variance for high dimensional time series.

31 Kazuhiko Takano (Shinshu Univ.) Geometric properties of system spaces of autoregressive process of degree 1 · 10

Summary: We study a system space of autoregressive process of degree 1. System spaces of time series in information geometry have a Fisher metric as a Riemannian metric, and admit an α-connection which is defined by the power spectrum. This space is a two dimensional α-flat statistical manifold. Moreover, for $\alpha = -1, 0, 1$ we discuss α-geodesics and almost complex structures which are parallel with respect to the α-connection.

32 Yan Liu (Waseda Univ.) A test for stationarity by copula spectral density · · · · · · · · · · · · · · · · · · · 15

Summary: We consider a hypothesis testing problem on the stationarity in locally stationary processes. In the existing literature, several test statistics have been proposed in the framework of local periodogram generated from the local stationary processes. However, we need sufficient moments of the stochastic processes under that framework. Thus, we propose a new test statistic constructed from the local quantile periodogram, where the measure of stationarity is also redefined in the quantiles. In addition, we extend our test statistic to the empirical likelihood ratio statistic to test the hypothesis. The theoretical results and numerical results under the alternative hypotheses will be given in the talk.

14:15–15:15 Talk Invited by Statistics and Probability Section

Tomonari Sei (Univ. of Tokyo) A scaling problem of multi-dimensional probability distributions

Summary: We discuss a scaling problem of continuous probability distributions on the Euclidean space, where scaling means a coordinate-wise transformation in order that some functional identity is satisfied. In linear algebra, it is known that any non-negative definite matrix has a unique diagonal scaling such that the transformed matrix is quasi-doubly stochastic, whenever it is strictly copositive. We generalize the result to the space of probability distributions, where the set of matrices is identified with the Gaussian family. It is shown that, under a strictly copositive condition for distributions, there exists a unique coordinate-wise transformation such that the transformed distribution satisfies a Stein-type identity. The result is interpreted as an alternative representation of copulas. The proof is based on an energy minimization problem over a subset of the Wasserstein space. Some open problems will be discussed.

15:30–16:30 Talk Invited by Statistics and Probability Section

Fumiya Akashi (Waseda Univ.) Robust statistical inference for non-standard time series models based on the empirical likelihood and normalization methods

Summary: This talk introduces robust statistical inference for various time series models under non-standard settings. In these few decades, non-standard aspects of real data in some sense are frequently observed in practical situations. First, a prominent example of long-range dependence was found by Hurst (1951, Trans. Amer. Soc. Civil Eng.) via the analysis of records of water flows through the Nile and though other rivers. Second, Mandelbrot (1963, J. Polit. Econ.) and Fama (1965, J. Bus.) found heavy-tailed economic and financial data which were poorly captured by the Gaussian models. When a statistical model has long-range dependence and/or heavy-tails, the limit distributions of fundamental statistics (e.g., sample mean) are not expressed in a closed form, and the rate of convergence contains the Hurst-index of long-range dependence and the tail-index of the underlying innovation density. Such properties make the situation complicated, and it is unfeasible to use the classical maximum likelihood method or the method of moments directly. To overcome the hurdles, we make use of some statistical methodologies involving the empirical likelihood, self-weighting and self-normalization methods. The empirical likelihood method proposed by Owen (1988, Biometrika) is a modern important statistical framework without knowledge of the underlying distribution. In particular, we integrate the concepts of the empirical likelihood and the least absolute deviations-based self-weighting method proposed by Ling (2005, J. Roy. Stat. Soc.), and construct the robust empirical likelihood statistic which is not affected by the nuisance parameters of the model and has the standard chi-square limit distribution. On the other hand, we also overcome the difficulties brought by the long-range dependence by using the self-normalized sabsampling method proposed by Bai et al. (2016, Ann. Stat.). Finally, a unified, feasible and robust framework for various time series models under the non-standard situation is established.

Applied Mathematics

September 11th (Mon) Conference Room IV

10:00–12:00

1 Shohei Satake (Kobe Univ.) Constructions of Ramanujan graphs and related results ····· 15

Summary: Ramanujan graph were defined by Lubotzky–Phillips–Sarnak in 1988. It is well known that Ramanujan graphs have nice properties as networks. In combinatorics, to give explicit constructions of Ramanujan graphs is recognized as a very interesting problems. In this talk, we give some explicit constructions of Ramanujan graphs as Cayley graphs over finite fields and rings. Moreover, we will discuss some properties which our graphs have.

2 Tomoko Adachi (Toho Univ.) Ordering of the complete bipartite graph and its application to rectangular RAID system ····· 10

Summary: We replace the problem of the RAID system in computer science with the problem of cyclic orderings in graph theory. We pay attention to constructions of cyclic orderings called cluttered orderings. There have been several studies on cluttered orderings of the complete bipartite graph $K_{\ell,\ell}$. Mueller et al. presented cluttered orderings in the case of $\ell = 3t, 10t$. In this paper, we investigate cluttered orderings of the complete bipartite graph $K_{\ell,m}$.

3 Sho Fujimura (Fukuoka Univ.)
Shuji Shiraishi (Fukuoka Univ.) On the number of perfect matchings of line graphs ····· 10

Summary: We give a method for counting perfect matchings in line graphs. Consequently, for graphs G of maiximum degree at most 3, we give a closed formula for the number of perfect matchings in $L(G)$.

4 Raiji Mukae
(Kisarazu Nat. Coll. of Tech.)
Terukazu Sano
(Kisarazu Nat. Coll. of Tech.) Impurity of projective planar graphs ····· 15

Summary: We shall determine the impurity of projective planar graphs. The concept of impurity is related to edge-maximal graphs.

5 Kohei Tanaka (Shinshu Univ.) Discrete Euler calculus and its application to the counting problem ····· 15

Summary: This talk introduces the integration theory with respect to the Euler characteristics of posets (categories), as a discrete analog of Baryshnikov and Ghrist's work on topological Euler calculus. As its application, we consider the counting problem in sensor network theory. We enumerate targets which lie on an acyclic network graph with sensors detecting the targets, by using discrete Euler calculus.

6 Aoi Honda (Kyushu Inst. of Tech.)
Yoshiaki Okazaki
(Fuzzy Logic Systems Inst.) Monotonicity of inclusion-exclusion integral and interaction operator ····· 15

Summary: We have proposed the inclusion-exclusion integral which is an integral with respect to monotone measure and interaction operator. In this talk, we show a concrete way of construction of interaction operator based on t-norm and give a sufficient condition for monotonicity of the inclusion-exclusion integral. Moreover we give several examples of the operators which satisfy this sufficient condition.

7 Yoshitaka Sasaki (Osaka Univ. of Health and Sport Sci.)
Yasuo Ohno (Tohoku Univ.)
Counting restricted lonesum matrices 10

Summary: A lonesum matrix is a (0,1)-matrix which can be uniquely reconstructed from its row and column sums. We plan to talk about counting restricted lonesum matrices. We also discuss recurrence formulas for poly-Bernoulli numbers which derived from such counting formulas.

8 Atsuhiko Mizusawa
Diogo Kendy Matsumoto (Shibaura Inst. of Tech.)
On characterization of simple non-confusing travel groupoids 15

Summary: A travel groupoid is an algebraic structure which has information of a graph and walks (paths) on the graph. We study a special travel groupoid called a simple non-confusing travel groupoid and characterize it by spanning trees on the graph associated to the simple non-confusing groupoid. We also count the number of simple non-confusing groupoids on cycle graphs.

14:15–15:45

9 Kazuki Matsubara (ChuoGakuin Univ.)
Chie Nara (Meiji Univ.)
Continuous flattening of α-trapezoidal polyhedra 15

Summary: It was proved that any orthogonal polyhedron is continuously flattened by using a property of a rhombus. We investigated the method precisely, and found that there are infinitely many ways to flatten such polyhedra. In this talk, we prove that the infimum of the area of moving creases is zero for α-trapezoidal polyhedra. As a by-product we provide a continuous flattening motion whose area of moving creases is arbitrarily small for more general types of polyhedra.

10 Kiyoshi Ando (Nat. Inst. of Information / JST ERATO)
A new forbidden subgraph for 5-contractible edges 15

Summary: An edge of a k-connected graph is said to be k-contractible if the contraction of the edge results in a k-connected graph. A k-connected graph with no k-contractible edge is said to be contraction-critically k-connected. Kawarabayashi showed that $K_1 + (P_3 \cup K_2)$ is a forbidden subgraph of contraction-critically 5-connected graphs. We present a new forbidden subgraph which has $K_1 + (P_3 \cup K_2)$. This is an extension of the previous result due to Kawarabayashi.

11 Akira Saito (Nihon Univ.)
Colton Magnant (Georgia Southern Univ.)
Rainbow forbidden subgraphs in edge-colored graphs 15

Summary: A pair (G, c) of a graph and an edge-coloring $c\colon E(G) \to \mathbf{N}$ is called an edge-colored graph. If c is an injection, we say that (G, c) is a rainbow graph. For a connected graph H, an edge-colored graph (G, c) is said to be rainbow H-free if G does not contain a rainbow subgraph which is isomorphic to H. By definition, if H' is a connected subgraph of H, every rainbow H'-free graph is rainbow H-free. In this talk, we report a reverse phenomenon. Let $K^+_{1,k}$ denote the graph of order $k+2$ which is obtained from $K_{1,k}$ by performing a simple subdivision to one edge. Then we show that every rainbow $K^+_{1,k}$-free complete graph edge-colored in sufficiently many colors is rainbow $K_{1,k}$-free. We also show that for a connected graph H and a connected proper subgraph H', if every rainbow H-free complete graph edge-colored in sufficiently many colors is rainbow H-reee, then $(H', H) = (K_{1,k}, K^+_{1,k})$ for some k.

12 Shinya Fujita (Yokohama City Univ.)
Degree conditions for cycles in edge-colored graphs 10

Summary: In this talk, some recent results on degree conditions for properly colored cycles and rainbow cycles in edge-colored graphs will be reviewed.

13 Morimasa Tsuchiya (Tokai Univ.)
Shinichiro Tashiro (Tokai Univ.)
On series parallel orders and strict-double-bound graphs ····· 10

Summary: For a poset P, the strict-double-bound graph (sDB-graph sDB(P)) is the graph on $V(P)$ for which vertices u and v of sDB(P) are adjacent if and only if u is not v and there exist x and y in $V(P)$ distinct from u and v such that x is a lower bound of u, v and y is an upper bound of u, v. For a poset P, P is a series parallel order if P contains no induced subposet isomorphic to the N-poset. We obtain the following result. For a series parallel order P, if P_3 is an induced subgraph of a component with at least four vertices of sDB(P), then P_3 is contained C_4, $K_4 - e$, $K_{1,3}$ or 3-pan as an induced subgraph.

14 Momoko Hayamizu
(Inst. of Stat. Math./JST PRESTO)
Shizuo Kaji
(Yamaguchi Univ./JST PRESTO)
Satoru Fujishige
(Kyoto Univ./Kyoto Univ.*)
On the size of universal tree-based networks ····· 15

Summary: A tree-based network on a set X of leaves is said to be universal if any rooted binary phylogenetic tree on X can be its base tree. In my earlier work, the concept of universal tree-based networks was defined and it was shown that there exist infinitely many universal tree-based networks for any number —X— of leaves. In this talk, I will discuss the minimum size of universal tree-based networks. This talk is based on joint work with Satoru Fujishige (RIMS, Kyoto University) and Shizuo Kaji (Yamaguchi University, JST PRESTO).

16:00–17:00 Talk Invited by Applied Mathematics Section

Shuya Chiba (Kumamoto Univ.)
2-factors with a specified number of components and degree sum conditions

Summary: O. Ore (1960) proved that if the degree sum of every pair of non-adjacent vertices is at least the order of the graph, then the graph is hamiltonian. The study of sufficient conditions on degrees for the existence of a Hamilton cycle started from such a classical result. In this talk, as one of the generalizations of Ore's theorem, we focus on degree sum conditions for the existence of a 2-factor with a specified number of components in general simple graphs, bipartite graphs and directed graphs, and we survey results including recent progress on the research field. We also discuss the difference from the results on Hamilton cycles.

September 12th (Tue) Conference Room IV

9:30–12:00

15 Hideo Mitsuhashi (Hosei Univ.)
Norio Konno (Yokohama Nat. Univ.)
Kaname Matsue
(Kyushu Univ./Kyushu Univ.)
Iwao Sato (Oyama Nat. Coll. of Tech.)
Quaternionic quantum walks of Szegedy type on finite graphs and second weighted zeta functions ····· 15

Summary: We define a quaternionic analogue of the Szegedy walk on a graph and study its right spectral properties. The condition for the transition matrix of the quaternionic Szegedy walk on a graph to be quaternionic unitary is given. In order to derive the spectral mapping theorem for the quaternionic Szegedy walk, we show a quaternionic analogue of the determinant expression of the second weighted zeta function of a graph. Our main results determine explicitly all the right eigenvalues of the quaternionic Szegedy walk by using complex right eigenvalues of the corresponding doubly weighted matrix. We also show the manner of obtaining eigenvectors corresponding to right eigenvalues derived from those of doubly weighted matrix.

16 Iwao Sato (Oyama Nat. Coll. of Tech.)
Hideo Mitsuhashi (Hosei Univ.)
Hideaki Morita (Muroran Inst. of Tech.)
A generalized Bartholdi zeta function of a graph 15

Summary: We define an $(n+1)$-variable Bartholdi zeta function and an $(n+1)$-variable Bartholdi L-function of a graph G, and give determinant expressions of them. We present a decomposition formula for the $(n+1)$-variable Bartholdi zeta function of a regular covering of G. Furthermore, we express the $(n+1)$-variable Bartholdi zeta function of a regular covering of G as a product of its $(n+1)$-variable Bartholdi L-functions.

17 Norio Konno (Yokohama Nat. Univ.)
Renato Portugal (LNCC)
Iwao Sato (Oyama Nat. Coll. of Tech.)
Etsuo Segawa (Tohoku Univ.)
Partition-based quantum walk 15

Summary: We introduce an extension model called partition-based quantum walk, which includes most quantum walk models driven by two local operators, such as the coined model, Szegedy's model, and the 2-tessellable staggered model. We show that all those families of quantum walk models using two local operators are unitary equivalent. The new framework is based on two equivalence-class partitions of the computational basis, which establishes the notion of local dynamics.

18 Kaname Matsue (Kyushu Univ./Kyushu Univ.)
Osamu Ogurisu (Kanazawa Univ.)
Etsuo Segawa (Tohoku Univ.)
Simplicial quantum walks version 2 —correspondence to coined walks on graphs— 15

Summary: We propose a new version of quantum walks on simplicial complexes (named simplicial quantum walk), which is an alternative of preceding studies by authors. We show that it is unitary equivalent to a bipartite walk on associated bipartite graphs, coined quantum walk on a graph. Moreover, if simplicial complexes are orientable, the simplicial quantum walk is unitary equivalent to coined quantum walk on a graph with duplication structure.

19 Kaname Matsue (Kyushu Univ./Kyushu Univ.)
Osamu Ogurisu (Kanazawa Univ.)
Etsuo Segawa (Tohoku Univ.)
Simplicial quantum search 15

Summary: Here we show that the quantum search on the specific simplicial complex corresponding to the triangulation of n-dimensional unit square driven by this new simplicial quantum walk works well, namely, a marked simplex can be found with probability $1 + o(1)$ with in a time $O(\sqrt{N})$, where N is the number of simplices with the dimension of marked simplex.

20 Yusuke Yoshie (Tohoku Univ.)
Etsuo Segawa (Tohoku Univ.)
Tetsuji Taniguchi (Hiroshima Inst. of Tech.)
Sho Kubota (Tohoku Univ.)
A periodicity of the Grover walk on Bethe trees 10

Summary: A Bethe tree is a rooted tree such that in each level the vertices have equal degree. In this paper we focus on the periodicity of the Grover walk on Bethe trees. The Grover walk is a kind of quantum walks on graphs, and the time evolution operator of the Grover walk is determined by the graph. A periodicity is a special feature of quantum walk, and we have found some graphs to induce a periodic Grover walk. We find the classes of Bethe trees which induce a periodic Grover walk under an assumption.

21 Daiju Funakawa (Hokkaido Univ.) Localization of a 2-dimensional 4-state quantum walk ····· 15
Toru Fuda (Hokkaido Univ.)
Satoshi Sasayama (Hokkaido Univ.)
Akito Suzuki (Shinshu Univ.)

Summary: We consider a discrete-time 2-dimensional 4-state quantum walk. The evolution of the quantum walk is described by a unitary operator U, which is the product of a space-dependent coin operator and a shift operator weighted with probabilities q_1 and q_2. Supposing that the coin operator and the shift operator are self-adjoint and unitary,
Fuda, Funakawa, and Suzuki proved that localization occurs $|q| = \sqrt{|q_1|^2 + |q_2|^2}$ is sufficiently small. In this talk, we study about the localization without smallness of $|q|$.

22 Toru Fuda (Hokkaido Univ.) Weak limit distribution of a one-dimensional split-step quantum walk
Daiju Funakawa (Hokkaido Univ.) ····· 15
Akito Suzuki (Shinshu Univ.)

Summary: In this talk, we consider a discrete-time one-dimensional two-state quantum walk called a split-step quantum walk. The evolution operator of the split-step quantum walk is defined by the product of a shift operator and a space-dependent coin operator. Weak limit theorem of the split-step quantum walk and its explicit limit distribution are presented.

23 Tomohiro Ikkai (Nagoya Univ.) Hypergroups and random walks on graphs ····· 15
Yusuke Sawada (Nagoya Univ.)

Summary: Wildberger gave a way to construct a finite hypergroup from a random walk on a certain kind of finite graphs. His method is applicable to a random walk on a certain kind of infinite graphs. In this talk, we formulate his method and give some examples that produce hypergroups and that do not produce hypergroups.

September 13th (Wed) Conference Room IV

9:30–11:40

24 Shunzi Horiguchi Extended Newton method and fractals (in case of real variable function)
····· 15

Summary: The convergences of the extended Newton method to the roots of different initial values cause catastrophe, chaos, and fractals.

25 Ippei Obayashi (Tohoku Univ.) Data analysis using persistence homology and machine learning ····· 15

Summary: In this talk, I will show you methods of data analysis using persistent homology and machine learning. Persistent homology enables us to describe the shape of data quantitatively from the viewpoint of homology and it is useful to study heterogeneous geometric structures. Machine learning enables us to detect characteristic patterns from data. By the combination of persistence homology and machine learning, we can quantitatively and statistically find characteristic geometric pattern hidden behind the data. Persistence Image and linear machine learning models are used for our methods. This combination gives us a very intuitive visualization of the learned result. “Inverse Problem” techniques for persistence diagrams are also effectively used to visualize the learned result.

26 Fuminori Sakaguchi (Univ. of Fukui) Some possible relationships among an integer-type algorithm for solving ODEs, difference equations and number theory ····· 15

Summary: A integer-type algorithm for accurately solving linear ODEs by means only of four arithmetic operations among integers had been proposed by the author. Some direct 'decipherments' of numerical results by this algorithm enable us to see what is the essence of the accuracy of this algorithm, because this algorithm uses 'exact' Gaussian-integer-valued expansion coefficient sequences. By the decipherments, in this study, it turned out that this algorithm is closely related to number theory, in that a numerical expansion coefficient sequence by this algorithm is a rational linear combination of rational solution sequences of homogeneous linear difference equations with non-constant rational coefficients which accurately approximates their finite-norm irrational linear combination described in terms of algebraic extension of rational field. The relationship of this algorithm to continued fractions can be explained in this context.

27 George Miyake (Ube Nat. Coll. of Tech.)
Yuji Katsuta (Ube Nat. Coll. of Tech.) A computational method for stationary solutions in nonlinear autonomous dynamical system ····· 10

Summary: A computational method for equilibria of a nonlinear autonomous system is considered by using bisection method. The method led to analyze dynamical behavior and qualitative properties of the autonomous system.

28 Koichi Anada (Waseda Univ. Senior High School)
Tetsuya Ishiwata (Shibaura Inst. of Tech.)
Takeo Ushijima (Tokyo Univ. of Sci.) A numerical method of estimating blow-up rates for nonlinear evolution equations by using rescaling algorithm ····· 15

Summary: In this talk, we proposed a numerical method for estimating blow-up rate of blow-up solutions for a class of nonlinear evolution equations which have a scaling invariance. To use this scaling invariance we adopt the rescaling algorithm to the problems and numerically estimate the blow-up rates. Applying the method to several examples, we examine the effectiveness of the method.

29 Tomoki Uda (Kyoto Univ.) Shape derivative and its application to vortex patch equilibria in a periodic array ····· 15

Summary: We propose a new shape derivative formula for contour integrals with logarithmic kernels which yields a numerical scheme to compute vortex patch equilibria. Owing to its simplicity, any steady configuration of point vortices can be extended to that of vortex patches. As a test problem, a periodic array of vortex patches is considered to show the efficiency of the new formula.

30 Takuya Tsuchiya (Waseda Univ.)
Makoto Nakamura (Yamagata Univ.) On the numerical analysis of the Cauchy problem for semi-linear Klein–Gordon equation in de Sitter spacetime ····· 15

Summary: The numerical analysis of the Cauchy problem for semi-linear Klein–Gordon equation in the de Sitter spacetime is considered. The solution of the equation expresses the property of expansion or contraction depending on conditions. Some of the terms in the equation present the dissipative and antidissipative effects. Since it is difficult to study the property and the effects analytically, we investigate them with numerical simulations. In addition, we study the numerical stability of the solutions.

31 Ryosuke Urakawa (Waseda Univ.)
Tsuchiya Takuya (Waseda Univ.)
Yoneda Gen (Waseda Univ.) Verification of Einstein's equation by geodesics ····· 15

Summary: When we search for numerical solutions to the Einstein's equation, we typically monitor the conservation of the constraints as a sanity check against numerical errors in the solution. The conservation of constraints is a necessary but not sufficient condition for the solutions to the Einstein's equation. We propose a method by using the geodesic equation to improve the reliability of the solution.

14:15–16:15

32 Takehiko Kinoshita
Yoshitaka Watanabe (Kyushu Univ.)
Mitsuhiro T. Nakao (Waseda Univ.)
An improvement of norm bound computation for inverses of linear operators in Hilbert spaces ····· 15

Summary: We propose a computer-assisted procedure to prove the invertibility of a linear operator in a Hilbert space and to compute a verified norm bound of its inverse. A number of the authors have previously proposed two verification approaches that are based on projection and constructive a priori error estimates. The approach of the present talk is expected to bridge the gap between the two previous procedures in actual numerical verifications. Several verification examples that confirm the actual effectiveness of the proposed procedure are reported.

33 Tomoya Kemmochi (Univ. of Tokyo)
Time-global error estimates for finite element approximation of parabolic problems ····· 15

Summary: We consider the finite element approximation for the linear homogeneous parabolic problem with the homogeneous Neumann boundary condition. We assume that the elliptic operator in the equation does not have lower order terms, that is, the operator is not positive definite. In this case, both exact and approximate solutions are globally bounded; thus the error is also bounded uniformly in time. However, in many literature, they use the Gronwall inequality, which causes the exponentially increasing term with respect to the time variable. As far as we know, there are no literature on time-global error estimates for these problems. In this talk, we present the time-global L^∞-L^p-error estimates for sufficiently smooth initial data.

34 Yuki Chiba (Univ. of Tokyo)
Norikazu Saito (Univ. of Tokyo)
Discontinuous Galerkin method for an N-dimensional spherically symmetric Poisson equation ····· 15

Summary: It is useful to make numerical method for nonlinear PDEs in higher dimension for researching critical phenomena of it. So, we consider a spherically symmetric Poisson equation in N-dimensional ball. The previous study proposed finite element method using weight function x^{N-1} and showed optimal weighted L^2 error estimate. However, there is a disadvantage of increasing error near origin. The another approach to use weight function x showed optimal L^∞ error estimate. In this paper, we see the PDE as singularly perturbed convection-diffusion equation through later approach, and apply discontinuous Galerkin method to it. We show some estimates and offer some numerical results.

35 Yukihiko Nakata (Shimane Univ.)
Delay equations for reinfection dynamics ····· 15

Summary: "Re"infection of recovered individuals, as a consequence of waning immunity and change of his/her susceptibility add further complexity in understanding disease transmission dynamics, forming a delayed feedback from infective population to susceptible population. In this talk we discuss dynamical aspects of a series of epidemic models, paying attention to reinfection dynamics, formulated by delay differential equations (DDE) and renewal equations (RE). We introduce a mathematical model by delay differential equations to provide a possible explanation of periodic outbreak of a childhood disease observed in Japan. Simple threshold dynamics is shown for a general SIS epidemic model formulated by a nonlinear renewal equation. On the other hand, we shall show that heterogeneous susceptibility can induce epidemic, after approaching to the trivial equilibrium.

36 Hiromasa Suzuki (Shiga Univ.)
Yasumasa Nishiura (Tohoku Univ.)
Analytical and numerical approaches to codimension-two bifurcation in a three-component reaction-diffusion system ····· 15

Summary: We study the stability and the bifurcation structure of standing pulse solutions to a singularly perturbed three-component reaction-diffusion system. We can show the detailed information of dependence on the parameters about the stability properties and the bifurcation structure.

37 Yuuki Shimizu (Kyoto Univ.)
Takashi Sakajo (Kyoto Univ.)
Toroidal geometry stabilizing a ring of N point vortices on a torus 15

Summary: On a plane and a sphere, an N-ring is unstable for $N > 7$. We introduce on the inner side of a toroidal surface, however, an N-ring is stable when the aspect ratio of the torus is sufficiently large for any fixed N.

38 Mitsuru Shibayama (Kyoto Univ.)[♭]
Non-integrability of the restricted n-body problem 15

Summary: We prove the non-integrability of the spacial n-body problem. In order to prove it, we focus on the singularity of the extended differential equations and then apply the Morales–Ramis theory to it. We also discuss the non-integrability of the spacial restricted $n + 1$-body problem.

16:30–17:30 Talk Invited by Applied Mathematics Section

Kaname Matsue (Kyushu Univ./Kyushu Univ.)
Saddles create connections: Rigorous numerics and dynamical systems

Summary: Validated computations (rigorous numerics) have been applied to dynamical systems, such as the existence of equilibria, periodic orbits, connecting orbits and bifurcations and so on as well as their stability, for a couple of decades. I believe that one of true significance of rigorous numerics to dynamical systems is validation of objects which are very difficult to detect from both mathematical and numerical approach. The root will be either reduction of problems to fixed point problems for nonlinear maps or analysis based on saddle-type equilibria or invariant sets. In this talk, I develop an overview of rigorous numerics to dynamical systems derived from saddles in terms of topological tools such as isolating blocks, cones and Lyapunov functions, as well as various results by analytic approach.

September 14th (Thu) Conference Room IV

9:30–10:30

39 Kazuhiro Oeda (Waseda Univ.)
Stationary problem of a diffusive prey-predator system with protection zones 15

Summary: This talk is concerned with the Neumann problem of a diffusive Lotka–Volterra prey-predator system with finitely many protection zones for the prey species. We discuss the stability of non-negative constant solutions. Moreover, we study the existence and non-existence of positive stationary solutions by applying the bifurcation theory.

40 Takashi Teramoto (Asahikawa Medical Univ.)
Peter van Heijster (Queensland Univ. of Tech.)
Chao-Nien Chen (Nat. Tsing-Hua Univ.)
Yasumasa Nishiura (Tohoku Univ.)
An action functional approach to localized patterns in a three-component FitzHugh–Nagumo model 10

Summary: We analyze the stationary localized patterns in a singularly perturbed three-component FitzHugh–Nagumo model. We derive explicit conditions for the existence and stability of these type of localized solutions by combining geometric singular perturbation techniques and an action functional approach. The action functional replaces the Melnikov integral approach and Evans function computation to derive existence conditions and critical information on the stability of the localized patterns.

41 Takashi Suzuki (Osaka Univ.) Bone metabolism modeling —break down of dynamical equilibrium · · 5

Summary: We study break down of bone metabolism, using mathematical modeling. The principal part of this model is composed of two pathways of maturation, that is, from pre-osteoblast to osteoblast and from pre-osteoclast to osteoclast. There is also a pathway of acceleration to the formation of pre-osteoclast by pre-osteoblast. This pathway is evoked by a cytokine, called RANKL. Experimental data, on the other hand, suggest a differentiation annihilation factor, to the maturation pathways above. Here we formulate the above feedback loops as a system of ordinary differential equations, pick up dynamical equilibria, and study their break down.

42 Takashi Suzuki (Osaka Univ.) Cell signal modeling —reproducibility of damping oscillation · · · · · · · · 5

Summary: The transcription factor NF-kB induces expression of multiple genes by shuttling between cytoplasm and nucleus. Previous studies have reported that the transcription of target gene is activated by phosphorylation of NF-kB, and decreased by dephosphorylation. In this study, we constructed a new mathematical model considering phosphorylation and mathematically analyzed how the phosphorylation of NF-kB effects on the oscillation phenomena. As a result, our new model, explained an appearance of a stable periodic orbit, which appeared in a transitional manner in response to the attenuation of an external stimulus, and also indicated that the NF-kB oscillation occurred by attracting to the periodic orbit.

43 Yasumasa Nishiura (Tohoku Univ.) Edgar Avalos (Tohoku Univ.) Takashi Teramoto (Asahikawa Medical Univ.) Hiroshi Yabu (Tohoku Univ.) Lamellae to onion transformation in block copolymer nanoparticles via coupled Cahn–Hilliard equations · 15

Summary: Annealing of copolymers has become a tool of great importance to reconfigure nanoparticles. We present experimental results of annealing copolymer nanoparticles and a mathematical model to describe the morphological transformation from lamellae to onion. A good correspondence between experimental findings and predictions of the model is observed. The model based on an appropriate free energy leads to a set of Cahn–Hilliard equations that correctly describes the dynamical transformation from lamellae particles to onion and reverse onion-like particles, regardless of the nature of the annealing process. This universality makes possible to describe a variety of experimental conditions involving nanoparticles underlying a heating process. A notable advantage of the proposed approach is that it makes possible to selectively control the interaction between the confined copolymer and the surrounding media.

10:45–11:45 Talk Invited by Applied Mathematics Section

Naoto Nakano
(JST PRESTO / Hokkaido Univ.)

Revisiting delay-embedding in terms of Hilbert–Schmidt integral operator theory: Towards dynamical reconstruction for empirical modelling

Summary: Delay embedding is well-known for non-linear time-series analysis, and it is used in several research fields such as physics, informatics, neuroscience and so on. The celebrated theorem of Takens ensures validity of the delay embedding analysis: embedded data preserves topological properties, which the original dynamics possesses, if one embeds into some phase space with sufficiently high dimension. This means that, for example, an attractor can be reconstructed by the delay coordinate system topologically. However, configuration of an embedded dataset may easily vary with the delay width and the delay dimension, namely, "the way of embedding". In a practical sense, this sensitivity may cause degradation of reliability of the method, therefore it is natural to require robustness of the result obtained by the embedding method in certain sense. In this study, we investigate the mathematical structure of the framework of delay-embedding analysis to provide Ansatz to choose the appropriate way of embedding, in order to utilise for time-series prediction. In short, mathematical theories of the Hilbert–Schmidt integral operator and the corresponding Sturm–Liouville eigenvalue problem underlie the framework. Using these mathematical theories, one can derive error estimates of mode decomposition obtained by the present method and can obtain the phase-space reconstruction by using the leading modes of the decomposition. In this talk, we will show some results for some numerical and experimental datasets to validate the present method.

Topology

September 11th (Mon) Conference Room Ⅲ

10:00–12:00

1 Naoyuki Monden (Osaka Electro-Comm. Univ.) Signatures of surface bundles ····· 15

Summary: The signature of a surface bundle over a surface has some restrictions, for examples, it is dividable by 4 and vanishes if the base genus is 0 or 1. Bryan and Donagi constructed examples over a genus-2 surface with non-zero signatures. However, the signatures and the genera of their examples are sporadic. In this talk, for any positive integer n, we give a surface bundle of fiber genus g over a surface of genus 2 with signature $4n$ and a section of self-intersection 0 if g is greater than or equal to $39n$.

2 Naoyuki Monden (Osaka Electro-Comm. Univ.) Stable commutator lengths of Dehn twists ····· 15

Summary: In this talk, we give explicit factrizations of certain powers of Dehn twists as products of commutators. As a corollary, we improve upper bounds for stable commutator lengths of Dehn twists. Moreover, we show that the stable commutator length in the mapping class group is different from that in the hyperelliptic mapping class group for a surface of large genus.

3 Hironobu Naoe (Tohoku Univ.) Corks and their shadow complexities ····· 10

Summary: For a simply connected closed 4-manifold M, any 4-manifold exotic to M is obtained from X by twisting a contractible Stein domain called a cork. We study a cork from a viewpoint of the notion of shadows. A shadow of a 4-manifold is a simple polyhedron collapsed from the manifold. By using a shadow, Costantino defined a complexity of a 4-manifold, which is the minimum number of vertex of its shadow. We show that there are no corks with complexity zero and that there are infinitely many corks with complexity 1 and 2.

4 Kouichi Yasui (Osaka Univ.) Nonexistence of twists and surgeries generating exotic 4-manifolds ···· 15

Summary: It is well known that for any exotic pair of simply connected closed 4-manifolds, one is obtained by twisting the other along a contractible submanifold. In contrast, we show that for each positive integer n, there exists an infinite family of pairwise exotic simply connected closed 4-manifolds such that, for any 4-manifold X and any compact (not necessarily connected) codimension zero submanifold W with $b_1(\partial W) < n$, the family cannot be generated by twisting X along W and varying the gluing map. As a corollary, we show that there exists no 'universal' 4-manifold with boundary such that any exotic family is generated by twisting along an embedded copy of the 4-manifold. Moreover, we give similar results for surgeries.

5 Takahiro Oba (Tokyo Tech) Surfaces in D^4 with the same boundary and fundamental group ····· 15

Summary: This talk is concerned with symplectic surfaces in a symplectic 4-disk (D^4, ω) bounded by the same transverse link in the standard contact 3-sphere (S^3, ξ_{st}). There are some examples of transverse links (or knots) bounding more than two distinct symplectic surfaces. All these surfaces can be distinguished by the fundamental groups of their complements. In this talk, I will present a family of pairs of two distinct symplectic surfaces whose boundaries are the same transverse knot and whose complements have isomorphic fundamental groups. To tell apart the two surfaces of each pair, I take double branched covers branched along them.

6 Shinpei Baba (Univ. Heidelberg) Neck-pinching of $\mathbb{C}P^1$-structures on surfaces and convergence of holonomy representations ····· 15

Summary: A $\mathbb{C}P^1$-structure on a surface is an atlas modeled on $\mathbb{C}P^1$ with transition maps in $\mathrm{PSL}(2,\mathbb{C})$, and a $\mathbb{C}P^1$-structure corresponds to a pair of a Riemann surface and a holomorphic quadratic differential on it. In addition, each $\mathbb{C}P^1$-structure has a holonomy representation from its fundamental group into $\mathrm{PSL}(2,\mathbb{C})$. In this talk, we consider a path of diverging $\mathbb{C}P^1$-structures on a closed oriented surface such that, their holonomy representations converge. We discuss about its limit under the assumption that the Riemann surface structures are pinched along some loops.

7 Norihisa Takahashi (Ritsumeikan Univ.) Hiraku Nozawa (Ritsumeikan Univ.) On a classification of periodic maps on surfaces which commute with certain involutions ····· 15

Summary: Ishizaka classified up to conjugation orientation preserving periodic maps of a surface which commute with a hyperelliptic involution. Here, an involution on a surface is hyperelliptic if and only if the quotient space is a sphere. In this talk, we consider maps which commute with involutions whose quotient space is a torus. We will classify up to conjugation orientation preserving irreducible periodic maps which commute with such involutions to give a complete list. It turned out that there are only finite conjugacy classes. We present a representative of each conjugacy class with certain decomposition of surfaces into fundamental domains.

8 Mao Okada (Univ. of Tokyo) Local rigidity of certain actions of nilpotent-by-cyclic groups on the sphere ····· 10

Summary: Let $G = SU(n,1)$ be the isometry group of complex hyperbolic space X and $G = KAN$ an Iwasawa decomposition. We proved local rigidity of actions of certain finitely generated subgroups Γ of AN on the imaginary boundary of X.

14:15–15:15 Talk Invited by Topology Section

Nariya Kawazumi (Univ. of Tokyo) Mapping class groups, the Goldman–Turaev Lie bialgebra and the Kashiwara–Vergne problem

Summary: Let Σ be a compact connected oriented surface with non-empty boundary and a framing f. Then a subset of the mapping class group of Σ, which includes the Torelli group, is naturally embedded into the (completed) Goldman–Turaev Lie bialgebra of Σ. A framed version of the Turaev cobracket vanishes on the image of the embedding. So we need a formal description of the Goldman–Turaev Lie bialgebra. In the genus 0 case, the set of expansions inducing a formal description of the bialgebra is naturally bijective to the set of solutions of the Kashiwara–Vergne problem in the formulation of Alekseev–Torossian. In view of this bijection, we can formulate a Kashiwara–Vergne problem associated with (Σ, f). The set of its solutions is non-empty except some of the genus 1 case. This talk is based on a joint work with Anton Alekseev, Yusuke Kuno and Florian Naef.

15:30–17:30

9 Yuta Nozaki (Univ. of Tokyo) Every lens space contains a genus one homologically fibered knot ····· 15

Summary: We prove that every lens space contains a genus one homologically fibered knot, which is contrast to the fact that some lens spaces contain no genus one fibered knot. In the proof, the discriminant of a binary quadratic form and the Chebotarev density theorem in number theory play central roles.

10 Michihiko Fujii (Univ. of Ryukyus) The spherical growth series for certain Seifert fiber spaces ····· 10

Summary: We consider groups presented as $G(p,q) = \langle\ x,\ y \mid x^p = y^q\ \rangle$, with integers p and q satisfying $2 \leq p \leq q$. The groups are geometrically realized as the fundamental groups of Seifert fiber spaces over 2-dimensional disks with two cone points. We present rational function expressions for the spherical growth series of such groups with respect to the generating set $\{x, y, x^{-1}, y^{-1}\}$.

11 Teruaki Kitano (Soka Univ.) Finiteness of the values of Reidemeister torsion for a spliced sum along knots with $SL(2;\mathbb{C})$-irreducible representations · · · · · 10

Summary: Let M be a homology 3-sphere. Reidemeister torsion is a topological invariant of M with a representation $\rho : \pi_1(M) \to SL(2;\mathbb{C})$. It gives a complex valued function on the space of conjugacy classes of $SL(2;\mathbb{C})$-irreducible representations. We show the image is a finite set for some splicing manifolds along torus knots or the figure-eight knot.

12 Yuichi Yamada (Univ. of Electro-Comm.) Exceptional Dehn surgeries along the Mazur link · · · · · 10

Summary: A hyperbolic 3-manifold that has torus boundaries can change to a non-hyperbolic 3-manifold by filling the boundary by a solid torus. Such surgeries are called exceptional surgeries. We study the exceptional Dehn surgeries along the Mazur link and Akbulut–Yasui links.

13 Toshio Saito (Joetsu Univ. of Edu.) An approach to defining Hempel distance of generalized Heegaard splittings · · · · · 10

Summary: It is known that Hempel distance of Heegaard splittings has a good relationship with topology and geometry of 3-manifolds. We discuss an approach to defining Hempel distance of generalized Heegaard splittings.

14 Keiichi Sakai (Shinshu Univ.) Ryutaro Sugiyama Generalized connected sum formula for the Arnold invariants of generic plane curves · · · · · 15

Summary: We define the generalized connected sum for generic closed plane curves, generalizing the strange sum defined by Arnold, and completely describe how the Arnold invariants $J^{\pm}$ and St behave under the generalized connected sums.

15 Akane Ishigami (Tokai Univ.) Minimal 5-charts of type (2,4,2) with a lens of type 1 · · · · · 15

Summary: Let Γ be a chart. For each label k, we denote by Γ_k the union of edges of label k and their vertices. Let Γ be a chart. If Γ has exactly 8 white vertices and $\Gamma_m \cap \Gamma_{m+1}$ has 2 white vertices, $\Gamma_{m+1} \cap \Gamma_{m+2}$ has 4 white vertices, $\Gamma_{m+2} \cap \Gamma_{m+3}$ has 2 white vertices, then Γ is called a chart of type (2,4,2). In this talk we study for a minimal 5-chart of type (2,4,2) with a lens of type 1 which has less than or equal to 14 black vertices.

16 Inasa Nakamura (Univ. of Tokyo) Simplifying covering surface-knots by an addition of 1-handles with chart loops · · · · · 10

Summary: We consider a surface-knot in the form of a simple branched covering over an oriented surface-knot F, which is called a covering surface-knot over F. Such a surface-knot is presented by a certain graph called a chart on a surface diagram of F. For a covering surface-knot, an addition of 1-handles with chart loops is a simplifying operation which deforms the chart to a union of free edges and 1-handles with chart loops. Here, we obtain properties of such simplifications.

17 Shin Satoh (Kobe Univ.) Ribbon surface-tangles and doubles of surface-links · · · · · 10

Summary: A ribbon surface-tangle is a compact surface in upper four-space with no minimal points such that the boundary presents a trivial link. Any surface-link is the closure of some ribbon surface-tangle. We introduce an equivalence relation among ribbon surface-tangles, called a root-equivalence, and prove that the closures of two ribbon surface-tangles present the same surface-link if and only if they are root-equivalent. As an application, we see that the double of a surface-link is well-defined up to stable equivalence. We also study several properties of the double.

September 12th (Tue) Conference Room III

10:10–10:25 Presentation Ceremony for the 2017 MSJ Geometry Prize

10:30–11:30 Award Lecture for the 2017 MSJ Geometry Prize

Kobayashi Osamu ♭ Weyl's gauge theory, the Schwarzian derivative and a sphere theorem

Summary: For many years I have been interested in conformal differential geometry and projective differential geometry. In this talk I would like to explain what these geometries mean at the present day and what can be expected in the future. I am now, as of June 2017, planning the talk and it will be concerned chiefly with a new conformal invariant which is similar to Yamabe's conformal invariant in many respects. In addition a conjecture, a sphere theorem, will be presented. If time permits I touch upon projective differential geometry and discuss some complements to Weyl's setting. This talk as a whole is a derivation from H. Weyl's "Reine Infinitesimalgeometrie" and subsequent developments by K. Yano, H. Yamabe and M. Obata.

13:00–14:00 Award Lecture for the 2017 MSJ Geometry Prize

Makoto Sakuma (Hiroshima Univ.) Fiber surfaces vs Heegaard surfaces of 3-manifolds

Summary: Though fiber surfaces and Heegaard surfaces have completely different natures, we can find various analogies between them. We describe the analogies from the view points of (1) the branched fibration theorem, (2) monodromy groups, (3) McShane's identity and (4) geometric structures.

September 13th (Wed) Conference Room III

10:00–12:00

18 Miyazawa Haruko (Tsuda Coll.) Invariants of welded links derived from multiplexing of crossings ····· 10
Kodai Wada (Waseda Univ.)
Akira Yasuhara (Tsuda Coll.)

Summary: For an ordered n-component link diagram D, we construct a virtual link diagram $D(m_1, m_2, \ldots, m_n)$ which is obtained from D by multiplexing of the crossings of D, where m_i is an integer. If two link diagrams D and D' are equivalent, then $D(m_1, m_2, \ldots, m_n)$ and $D'(m_1, m_2, \ldots, m_n)$ are equivalent as welded links. Since an invariant of $D(m_1, m_2, \ldots, m_n)$ is that of D, we try to find new invariants of D via $D(m_1, m_2, \ldots, m_n)$.

19 Yasutaka Nakanishi (Kobe Univ.) A set of local moves generating the writhe polynomial ····· 10
Shin Satoh (Kobe Univ.)

Summary: In the talk, we will consider a relationship between an invariant and local moves for virtual knots. We show that two virtual knots have the same writhe polynomial if and only if they are related by a finite sequence of certain local moves.

20 Keiju Kato (Tokyo Tech) Interior polynomial for signed bipartite graphs and the HOMFLY polynomial ····· 15

Summary: There are many relations between graph theory and knot theory. In particular, certain knot invariants have been expressed in terms of graph invariants. As an example, the interior polynomial is an invariant of bipartite graphs, and a part of the HOMFLY polynomial of a special alternating link coincides with the interior polynomial of the Seifert graph of the link. We extend the interior polynomial to signed bipartite graphs, and we show that, in the planar case, it is equal to a part of the HOMFLY polynomial of a naturally associated link. We also establish some other, more basic properties of this new notion. This leads to new identities involving the original interior polynomial.

21 Takuji Nakamura (Osaka Electro-Comm. Univ.), Yasutaka Nakanishi (Kobe Univ.), Shin Satoh (Kobe Univ.) — On a partial order of virtual knots · · · · · 10

Summary: For the set of virtual knots $\mathcal{V}$, we define a relation $\leq$ as follows. Let K, K' be virtual knots. We write $K' \leq K$ if for any virtual knot diagram D of K, we obtain a virtual knot diagram of K' by replacing several real crossings of D with virtual crossings.
In this talk, we show that $(\mathcal{V}, \leq)$ is a partially ordered set. We also show that any finite subset of $\mathcal{V}$ has an upper bound with respect to this order.

22 Takefumi Nosaka (Tokyo Tech), Hisatoshi Kodani — Milnor invariants via unipotent Magnus embeddings · · · · · 10

Summary: We develop a diagrammatic computation of the Milnor invariant of links, in terms of central group extensions and unipotent Magnus embeddings. As a corollary, we compute the invariants of the Milnor link and of some links. We also powerfully extend the higher invariant, by mproving indeterminacy therein.

23 Takefumi Nosaka (Tokyo Tech) — Cocycles of nilpotent quotients of free groups · · · · · 10

Summary: We focus on the cohomology of the k-th nilpotent quotient of the free group, F/F_k. This paper describes all the group 2-, 3-cocycles in terms of Massey products, and gives expressions for some of the 3-cocycles. We also give simple proofs of some of the results on Milnor invariants and the Johnson–Morita homomorphisms.

24 Anh T. Tran (Univ. of Texas, Dallas), Yoshikazu Yamaguchi (Akita Univ.) — Higher-dimensional twisted Alexander invariants for metabelian representations · · · · · 10

Summary: We will discuss the asymptotic behavior of the twisted Alexander invariants for higher-dimensional representations of a knot group and the relation to the asymptotic behavior of the Reidemeister torsion. We will focus metabelian representations of a knot group into $\mathrm{SL}(2;\mathbb{C})$. It is known that metabelian representations are related to exceptional surgeries along a knot. We will see the relation to our previous result on the asymptotic behavior of the Reidemeister torsion for the resulting manifold obtained by an exceptional surgery along a twist knot.

25 Noboru Ito (Univ. of Tokyo), Migiwa Sakurai (Ibaraki Nat. Coll. of Tech.) — On n-trivialities of classical and virtual knots for some unknotting operations · · · · · 10

Summary: In 1990, Vassiliev introduced a filtered space of knot invariants via a standard unknotting operation, called crossing change. In 2000, Goussarov, Polyak, and Viro introduced another degree and filtration via another unknotting operation, called virtualization, for classical and virtual knots. In these theories, a notion of n-trivialities has played a significant role. However, for an integer n (> 2), any example of n-trivial classical and virtual knot by virtualizations is still missing. In this talk, we obtain an example of n-trivial knots by virtualizations. We also introduce a new filtration of Vassiliev-type invariants by using an unknotting operation, called Forbidden moves. We obtain n-trivial knots of this new degree.

26 Hideo Takioka (Osaka City Univ.) Infinitely many knots with the trivial $(2,1)$-cable Γ-polynomial ····· 10

Summary: It is known that there exist many polynomial invariants for knots. For example, Alexander–Conway, Jones, Γ, Q, HOMFLYPT, Kauffman polynomials are well known. These polynomials of the trivial knot are one. The problem is whether there exists a non-trivial knot such that these polynomials are one. It is known that there exists such a knot for the Alexander–Conway, Γ, Q polynomials. However, it is still an open problem for the other polynomial invariants. Moreover, we consider the $(p,1)$-cable versions of these polynomial invariants for an integer $p(\geq 2)$. These $(p,1)$-cable versions of the trivial knot are one. The problem is whether there exists a non-trivial knot such that these $(p,1)$-cable versions are one. It is known that there exists such a knot for the Alexander–Conway polynomial. However, it is still an open problem for the other polynomial invariants. In this talk, we show that there exist infinitely many knots such that the $(2,1)$-cable version of the Γ-polynomial for the knots is one.

14:15–15:15 Talk Invited by Topology Section

Takahito Naito (Univ. of Tokyo) Sullivan's coproduct on the reduced loop homology

Summary: In the theory of string topology initiated by Chas and Sullivan, the homology of free loop spaces of manifolds (called the loop homology) has very rich algebraic structures. The loop product is a multiplication on the loop homology and it is the most basic operation in string topology. Cohen and Godin discovered a 2-dimensional TQFT structure on the homology. Moreover, Godin showed that the loop homology is a homological conformal field theory. In this talk, I will discuss a coproduct on the reduced loop homology which is introduced by Sullivan. The coproduct and the loop product give the loop homology an infinitesimal bialgebra structure. I will explain how to construct Sullivan's coproduct and give some computational examples.

15:30–17:30

27 Yuya Nishimura (Kyoto Sangyo Univ.) On model structures of Leinster's weak higher categories. ····· 15

Summary: Model structures are known to be important to explore various higher categories. The topic of this talk is canonical model structures on weak higher categories.

28 Shingo Okuyama * (Kagawa Nat. Coll. of Tech.) Configuration space of intervals with partially summable labels ····· 15
Kazuhisa Shimakawa (Okayama Univ.)

Summary: A configuration space of intervals in 1-dimensional Euclidean space with partially summable labels is constructed. It is a kind of an extension of the configuration space with partially summable labels constructed by the second author and at the same time a generalization of the configuration space of intervals with labels in a based space constructed by the first author. An approximation theorem of the preceding configuration space is generalized to our case. More precisely, we construct a configuration space of intervals in $\mathbb{R}$ with labels in a partial abelian monoid M, and show that it is weakly homotopy equivalent to the space of based loops on the classifying space of M.

29 Shunsuke Ichiki (Yokohama Nat. Univ.) Generic linear perturbations ····· 15

Summary: In his celebrated paper "Generic projections", John Mather has shown that almost all linear projections from a submanifold of a vector space into a subspace yield a stable mapping in the nice dimensions. In this talk, an improvement of the Mather result is given. Namely, almost all linear perturbations of a smooth mapping from a submanifold of $\mathbb{R}^m$ into $\mathbb{R}^\ell$ yield a stable mapping in the nice dimensions.

30 Erica Boizan Batista (Federal Univ. of Cariri)
Huhe Han (Yokohama Nat. Univ.)
Takashi Nishimura (Yokohama Nat. Univ.)
Stability of C^∞ convex integrands 15

Summary: In this talk, it is shown that the set consisting of stable convex integrands $S^n \to \mathbb{R}_+$ is open and dense in the set consisting of C^∞ convex integrands with respect to Whitney C^∞ topology. Moreover, it is given examples representing well why stable convex integrands are preferred.

31 Tatsuro Shimizu (Kyoto Univ.) Self-intersection of singular sets of maps and signature defect 10

Summary: We give a geometric proof of that the k-times self-intersection of singular set of a generic smooth map from n-dimensional manifold X to R^p coincides with the corank (of Jacobian)$= k$ singular set of any generic map from X to R^{p+k-1} as homology classes with $Z/2$ coefficient ($(n-p+2)k > n+1$). As an application we give a description of the signature defect of framed 3-manifold from the point of view of singular sets of maps.

32 Masakazu Nasu * Essentially weakly onesided resolving endomorphisms of the shift 15

Summary: Characterizations are given for essentially weakly onesided resolving endomorphisms of subshifts.

33 Masakazu Nasu * On the limits of onesided resolving directions of endomorphisms of subshifts of finite type 15

Summary: We present the results that there exists an automorphism of a full shift having a limit of onesided resolving directions of type II or III and that no automorphism of a transitive subshift of finite type has an irrational unique non-expansive direction.

September 14th (Thu) Conference Room Ⅲ

10:00–11:30

34 Hisao Kato (Univ. of Tsukuba) Topological entropy and topological structures of 1-dimensional continua 15

Summary: In this talk, we define a new notion of "free tracing property by free chains" on G-like continua and we prove that a positive topological entropy homeomorphism on a G-like continuum admits a Cantor set Z such that every tuple of finite points in Z is an IE-tuple of f and Z has the free tracing property by free chains. Also, by use of this notion, we prove the following theorem: If G is any graph and a homeomorphism f on a G-like continuum X has positive topological entropy, then there is a Cantor set Z which is related to both the chaotic behaviors of Kerr and Li in dynamical systems and composants of indecomposable continua in topology. This theorem implies that chaotic dynamics induce complicated topology.

35 Takashi Shimomura (Nagoya Univ. of Economics) Topological rank does not increase by natural extension of Cantor minimals 10

Summary: Downarowicz and Maass (2008) defined the topological rank for all homeomorphic Cantor minimal dynamical systems. This definition can be extended to all continuous surjective Cantor minimal systems. We have made it clear that taking natural extension does not increase the topological rank.

36 Takashi Shimomura (Nagoya Univ. of Economics) Proximal Cantor systems with topological rank 2 are residually scrambled · · · · · 10

Summary: Downarowicz and Maass (2008) introduced the topological rank on all homeomorphic Cantor minimal dynamical systems. This definition can be easily extended to homeomorphic Cantor proximal dynamical systems. We consider the homeomorphic proximal Cantor dynamical systems with topological rank 2. We show that they are all residually scrambled. Evidently, such systems have at most two ergodic measures. We have obtained a necessary and sufficient condition for the unique ergodicity of these systems. In addition, we show that the number of ergodic measures of systems that are topologically mixing can be 1 and 2. Moreover, there exist examples that are topologically weakly mixing, not topologically mixing, and uniquely ergodic. Finally, we show that the number of ergodic measures of systems that are not weakly mixing can be 1 and 2.

37 Katsuhisa Koshino (Kanagawa Univ.) Hyperspaces homeomorphic to Hilbert spaces · · · · · 15

Summary: Let $\mathrm{Comp}(X)$ be the hyperspace consisting of non-empty compact subsets of a space X with the Vietoris topology, and $\mathrm{C}(X)$ be the hyperspace of compact and connected sets in X, that is considered as a subspace of $\mathrm{Comp}(X)$. In this talk, we characterize a metrizable space X whose hyperspaces $\mathrm{Comp}(X)$ and $\mathrm{C}(X)$ are homeomorphic to a non-separable Hilbert space.

38 Tatsuhiko Yagasaki (Kyoto Inst. Tech.) Local and end deformation theorems for uniform embeddings · · · · · 15

Summary: This talk is concerned with local and end deformation properties of spaces of uniform embeddings in metric manifolds. Using the local deformation theorem by Cernavskii and Edwards–Kirby, we show that any metric manifold with a geometric group action has the local deformation property for uniform embeddings (LD). As an example, the κ-cone end ($\kappa \leq 0$) over any compact Lipschitz metric manifold is shown to have the property (LD). We also introduce a notion of end deformation of uniform embeddings (ED) and show that the 0-cone end over any compact Lipschitz metric manifold has the property (ED). A role of uniform isotopies in uniform topology is also clarified.

39 Kaori Yamazaki (Takasaki City Univ. of Econ.) Insertion of poset-valued maps with the way-below and -above relations · · · · · 10

Summary: We give insertion theorems for maps with values in bi-bounded complete and bicontinuous posets by using the way-below relation and the way-above relation.

Infinite Analysis

September 11th (Mon) Conference Room V

9:50–12:00

1 Saburo Kakei (Rikkyo Univ.) Ryohei Kubo (Rikkyo Univ.) Solvable chaos with pseudo-invariants and complex multiplication · · · · 15

Summary: We propose several solvable chaotic systems that have pseudo-invariants. The solution of the systems can be represented by elliptic functions associated to elliptic curves with complex multiplication. We also discuss invariant measures of the systems.

2 Atsuhira Nagano (Univ. of Tokyo) Differential operators from the viewpoint of automorphic forms · · · · · · 15

Summary: The speaker will present a result of linear ordinary differential equations which are parametrized on Hermitian symmetric space and invariant under the action of symmetric groups. They are generalization s of the classical Lame equation. We will see a relation between such differential equations and automorphic forms for symplectic groups.

3 Atsushi Nakayashiki (Tsuda Coll.) Soichi Okada (Nagoya Univ.) Yoko Shigyo (Tsuda Coll.) On the expansion coefficients of KP Tau function · · · · · · · · · · · · · · · · · · 15

Summary: If the tau function does not vanish at the origin, it is known that the coefficients are given by Giambelli formula and that it characterizes solutions of the KP hierarchy. In this talk, we deal with a generalization of Giambelli formula to the case when the tau function vanishes at the origin.

4 Hiroshi Ogawara (Kumamoto Univ.) On algebraic independence of solutions to certain algebraic difference equations · 15

Summary: In the talk, we give criteria for algebraic independence of solutions to a certain system of first order algebraic difference equations. First, as a background of our results, Ostrowski gave a criterion for algebraic independence of integrals of given functions. Inspired by Ostrowski's result, Kolchin gave a criterion for algebraic independence of exponentials of integrals of given functions. Hardouin gave difference analogues of Ostrowski's result and Kolchin's result, that is, criteria for algebraic independence of functions satisfying first order linear difference equations. We generalize the analogues to more general systems of algebraic difference equations. As an application of our results, we show algebraic independence of multiple gamma functions and derivatives of the gamma function. As another application, we show algebraic independence of the logarithmic function, q-polylogarithm functions and q-exponential functions.

5 Kôki Itô (Toyohashi Univ. of Tech.) solution sheaf of q-difference module and its cohomology · · · · · · · · · · · · 15

Summary: Aomoto introduces the global q-difference de Rham complex and the Čech complex. These two complex should be isomorphic to each other in general case. To prove this, we introduce a sheaf-theoretic version of these complexes. We introduce the sheaf $\mathscr{D}^\bullet_{{}_q\mathbb{P}^1_\bullet}$ of q-difference operators, which is a q-analogue of the sheaf of differential operators on $\mathbb{P}^1$. We define the sheaf $\mathscr{D}^\bullet_{{}_q\mathbb{P}^1_\bullet}$ on some simplicial space ${}_q\mathbb{P}^1_\bullet$ (which we also define). For some $\mathscr{D}_{{}_q\mathbb{P}^1_\bullet}$-module $\mathscr{M}^\bullet$ we consider $\mathbb{R}\mathscr{H}om_{\mathscr{D}^\bullet_{{}_q\mathbb{P}^1_\bullet}}(\mathscr{O}^\bullet, \mathscr{M}^\bullet)$, where $\mathscr{O}^\bullet$ is the structure sheaf on ${}_q\mathbb{P}^1_\bullet$. Both the (global) q-difference de Rham complex and the Čech complex are quasi-isomrphic to $\mathbb{R}\Gamma\mathbb{R}\mathscr{H}om_{\mathscr{D}^\bullet_{{}_q\mathbb{P}^1_\bullet}}(\mathscr{O}^\bullet, \mathscr{M}^\bullet)$.

6 Ryo Okawa (Waseda Univ.) Functional equations of Nekrasov functions proposed by Ito–Maruyoshi–Okuda · 15

Summary: We give a proof of functional equations of Nekrasov partition functions for A_1-singularity, suggested by Ito–Maruyoshi–Okuda. We follow method by Nakajima–Yoshioka based on the theory of wall-crossing formula developed by Mochizuki.

7 Yukiko Konishi (Kyoto Univ.)* Almost duality for Saito structure and complex reflection groups ····· 15
Satoshi Minabe (Tokyo Denki Univ.)
Yuuki Shiraishi (Kyoto Univ.)

Summary: We extend Dubrovin's almost duality of Frobenius structures to Saito structures without metric. Then we formulate and study the existence and uniqueness problem of the natural Saito structure on the orbit spaces of finite complex reflection groups from the viewpoint of the almost duality. We give a complete answer to the problem for the irreducible groups.

14:20–16:30

8 Soichi Okada (Nagoya Univ.) Schur Q-functions associated to the root system of type C ····· 15

Summary: Schur Q-functions are a family of symmetric functions introduced by Schur in his study of projective representations of symmetric groups. They are obtained by putting $t = -1$ in the Hall–Littlewood functions associated to the root system of type A. (Schur functions are the $t = 0$ specialization.) This talk concerns symplectic Q-functions, which are obtained by putting $t = -1$ in the Hall–Littlewood functions associated to the root system of type C. We discuss several Pfaffian identities as well as a combinatorial description for them. Also we present some positivity conjectures.

9 Masahiko Ito (Univ. of Ryukyus) A determinant formula for the BC_n elliptic hypergeometric integrals of
Masatoshi Noumi (Kobe Univ.) Selberg type ····· 15

Summary: We will present a determinant formula for the BC_n elliptic hypergeometric integrals of Selberg type. The formula means that the determinant whose entries are the BC_n type elliptic Selberg integrals is expressed explicitly as a product of elliptic gamma functions. For this purpose we make use of the elliptic Lagrange interpolation functions, which play important roles in both definition of the determinant and proof of the product formula.

10 Kouichi Takemura (Chuo Univ.) Degenerations of Ruijsenaars–van Diejen operator and q-Painlevé equations ····· 15

Summary: It is known that the Painlevé VI is obtained by connection preserving deformation of some linear differential equations, and the Heun equation is obtained by a specialization of the linear differential equations. We inverstigate degenerations of the Ruijsenaars-van Diejen difference opearators and show difference analogues of the Painlevé–Heun correspondence.

11 Tetsu Masuda (Aoyama Gakuin Univ.) q-analogues of the Sasano system of the fourth order ····· 15

Summary: The Sasano system is a higher order generalization of the sixth Painlevé equations. The Sasano system of the $2N$-th order admits the affine Weyl group symmetry of type $D^{(1)}_{2N+2}$ as the group of Bäcklund transformations. We propose, in this talk, some q-analogues of the Sasano system of the fourth order. Each of our systems also admits the affine Weyl group symmetry.

12 Takao Suzuki (Kinki Univ.) A bilinear form of the generalized q-Painlevé VI system with $W(A^{(1)}_{2n+1})$ symmetry ····· 15

Summary: The q-Painlevé VI equation (q-P_{VI}) was introduced by Jimbo and Sakai. Recently, from a viewpoint of the Heine's basic hypergeometric function ${}_{n+1}\phi_n$, we proposed a higher order generalization of q-P_{VI}, which admits an extended affine Weyl group symmetry of type $A^{(1)}_{2n+1}$. In this talk, we formulate τ-functions for the generalized q-P_{VI} on the root lattice $Q(A_{2n+1})$ and show that they satisfy Hirota–Miwa type bilinear relations.

13 Naoto Okubo (Univ. of Tokyo) Degeneration of q-discrete Painlevé equations and cluster algebras ···· 15
Takao Suzuki (Kinki Univ.)

Summary: We construct cluster algebras the coefficients of which satisfy several q-discrete Painlevé equations. These cluster algebras are obtained from quivers with the mutation-period property. We will also show that degeneration of q-discrete Painlevé equations corresponds to confluence of quivers.

14 Hidehito Nagao (Akashi Coll. of Tech.), Yasuhiko Yamada (Kobe Univ.) — Various singularity configurations for q-Painlevé equations of type $E_7^{(1)}$ 15

Summary: When we geometrically construct the Painlevé systems by certain rational surfaces called the spaces of initial values, we can variously select deformation directions and singularity configurations in $\mathbb{P}^1 \times \mathbb{P}^1$. However, in order to obtain a simple evolution equation, it is necessary to select the deformation direction and coordinates (singularity configuration) suitably. In this talk, we give some examples of simple evolution equations for the case of q-$E_7^{(1)}$ type, and we discuss a relation among them and their special solutions.

15 Tomoyuki Takenawa (Tokyo Univ. of Marine Sci. and Tech.) — Fiber-dependent deautonomization of integrable 2D mappings and discrete Painlevé equations 15

Summary: In this talk we establish a way of performing the deautonomization for a pair of an autonomous mapping and an anti-canonical divisor. Starting from a single autonomous mapping but varying the type of a chosen fiber, we obtain different types of discrete Painlevé equations using this deautonomization procedure. We also introduce a technique which allows us to obtain factorized expressions of discrete Painlevé equations, including the elliptic case. Further, by imposing certain restrictions on such non-autonomous mappings we obtain new and simple elliptic difference Painlevé equations, including examples whose symmetry groups do not appear explicitly in Sakai's classification. (Based on joint work with A. S. Carstea and A. Dzhamay.)

16:40–17:40 Talk Invited by Infinite Analysis Special Session

Shuhei Kamioka (Kyoto Univ.) — Partition functions for reverse plane partitions derived from the two-dimensional Toda molecule

Summary: Reverse plane partitions are combinatorial objects of tableau-type. One of the most important topics in reverse (and ordinary) plane partitions is the exploration of generating functions and partition functions which can be nicely factored. In this talk we show a close connection between reverse plane partitions and an integrable dynamical system called the discrete two-dimensional (2D) Toda molecule. We consider reverse plane partitions of arbitrary shape and of bounded size of parts and find that each non-vanishing solution to the discrete 2D Toda molecule gives a partition function which can be nicely factored. For the result a combinatorial interpretation of the discrete 2D Toda molecule in terms of lattice paths is crucial. As an instance from a specific solution we obtain a new partition function which generalizes both MacMahon's generating function for boxed plane partitions and the trace generating function for reverse plane partitions of unbounded size of parts.

September 12th (Tue) Conference Room V

9:50–12:00

16 Kohei Motegi (Tokyo Univ. of Marine Sci. and Tech.) — Izergin–Korepin analysis on the wavefunctions of the six-vertex models 10

Summary: We analyze the wavefunctions of the six-vertex models by extending the celebrated Izergin–Korepin analysis which was originally invented by Korepin and Izergin to study the domain wall boundary partition functions. We show that the method can give a systematic way to study the relation between the wavefunctions and symmetric functions. We mainly illustrate the method by taking the basic wavefunctions of the XXZ-type six-vertex models as an example. Next, we show the result for the case of triangular boundary conditions, Felderhof models and their generalizations such as the elliptic analogue.

17 Yas-Hiro Quano (Suzuka Univ. of Med. Sci.) Ising model: 2dim system in a magnetic field and 3 dim system ····· 15

Summary: We consider the two dimensional Ising model by using the CTM (corner transfer matirx) method. We derive the corner Hamiltonian for the Ising model in a magnetic field by purturbatively inserting the magnetic field. This is just a purturbative approximation because the existence of a real magnetic field violates some assumptions for the validity of the CTM method. Thus we find that the CTM method goes well at a particular pure imaginary magnetic filed, and obtain the explicit expression of the spontaneous magnetization.

18 Takeo Kojima (Yamagata Univ.) A bosonization of the quantum affine auperalgebra $U_q(\widehat{sl}(M|N))$ ····· 15

Summary: A bosonization of the quantum affine superalgebra $U_q(\widehat{sl}(M|N))$ is presented for an arbitrary level $k \in \mathbf{C}$. Screening operators that commute with $U_q(\widehat{sl}(M|N))$ are presented for the level $k \neq -M+N$. This talk is based on arXiv.1701.03645 to appear in *Commun. Math. Phys.*

19 Yosuke Saito (Osaka City Univ.) Elliptic analog of an algebra of fermions and the quantum torus algebra ····· 15

Summary: Nakatsu–Takasaki have studied partition functions of five-dimensional gauge theories and topological string theories by using an algebra of fermions. Recently, it has been realized that partition functions of six-dimensional gauge theories are represented by elliptic functions. As an attempt to apply the method due to Nakatsu–Takasaki to the six-dimensional cases, the author has introduced an elliptic analog of an algebra of fermions. An elliptic analog of the quantum torus algebra is also constructed.

20 Yusuke Ohkubo (Nat. Res. Univ. Higher School of Econ.) Singular vectors of the level N representation of Ding–Iohara–Miki algebra ····· 15

Summary: In this talk, I explain that singular vectors of a certain algebra arising from the level N representation of a Hopf algebra called Ding–Iohara–Miki algebra correspond to generalized Macdonald functions (also called AFLT basis or fixed point basis). This correspondence is a generalization of coincidence between singular vectors of the deformed W algebra and ordinary Macdonald functions. Moreover, we also obtain a formula for Kac determinant of the level N representation of DIM algebra.

21 Ivan Chi Ho Ip (Kyoto Univ.) On tensor product decomposition of positive representations ····· 15

Summary: Recently a cluster realization of Drinfeld–Jimbo quantum groups $\mathcal{U}_q(\mathfrak{g})$ has been found via the positive representations, where an embedding into a quantum torus algebra $\mathcal{X}_{\mathfrak{g}}$ is described by certain quiver diagram. Using this new realization, we discuss its application towards the proof of the tensor product decomposition of the positive representations of split real quantum groups restricted to the Borel part, as well as the proof by Schrader–Shapiro on the full decomposition in type A_n, thus solving part of the long-standing conjecture of the closure of positive representations under taking the tensor product.

22 Hitoshi Konno (Tokyo Univ. of Marine Sci. and Tech.) Elliptic quantum group and elliptic weight function ····· 15

Summary: By using representation theory of the elliptic quantum group $U_{q,p}(\widehat{\mathfrak{sl}}_N)$, we present a systematic method of deriving the weight functions. The resultant $\mathfrak{sl}_N$ type elliptic weight functions are new, and give elliptic and dynamical analogue of those obtained by Mimachi and Tarasov–Varchenko in the trigonometric case. We then discuss some basic properties of the elliptic weight functions. We also present an explicit formula for formal elliptic hypergeometric integral solution to the elliptic q-KZ equation.

23 Hitoshi Konno (Tokyo Univ. of Marine Sci. and Tech.) Finite-dimensional representations of elliptic quantum group on the Gelfand–Tsetlin basis 15

Summary: We construct a finite-dimensional representation of the elliptic quantum group $U_{q,p}(\widehat{\mathfrak{sl}}_N)$ on the Gelfand–Tsetlin basis. The resultant representation is described in terms of the partitions of $[1,n]$ in a combinatorial way, and gives an elliptic and dynamical analogue of the geometric representation of $U_q(\widehat{\mathfrak{sl}}_N)$ on the equivariant K-theory constructed by Vasserot and Nakajima. By comparing the elliptic weight functions presented in the previous talk and the elliptic stable envelopes proposed by Aganagic–Okounkov, we conjecture that our finite-dimensional representation provides a geometric representation of $U_{q,p}(\widehat{\mathfrak{sl}}_N)$ on the equivariant elliptic cohomology.

13:00–14:00 Talk Invited by Infinite Analysis Special Session

Hidetoshi Awata (Nagoya Univ.) The representation theory of the Ding–Iohara–Miki algebra

Summary: We will discuss on the recent development of the representation theory of the quantum toroidal algebra of type $\mathfrak{gl}(1)$ i.e. the Ding–Iohara–Miki algebra.