

🌸 日本数学会

2018年度秋季総合分科会

英 文 サ マ リ 集

2018年9月

於 岡山大学

2018 日本数学会

秋季総合分科会プログラム

期 日 2018年9月24日(月)～9月27日(木)

会 場 岡山大学津島キャンパス
〒700-8530 岡山市北区津島中2-1-1

連絡先 岡山大学理学部数学科
〒700-8530 岡山市北区津島中3-1-1
E-mail okayama18sept@mathsoc.jp

(会期中) Tel 090-1791-3483

一般社団法人 日本数学会
Tel 03-3835-3483

	第I会場 一般教育A棟 A21	第II会場 一般教育A棟 A36	第III会場 一般教育A棟 A37	第IV会場 一般教育A棟 A41	第V会場 一般教育B棟 B11	第VI会場 一般教育B棟 B32	第VII会場 一般教育B棟 B33	第VIII会場 一般教育B棟 B41	第IX会場 一般教育E棟 E11
24日 (月)	函数方程式論 9:15～12:00 14:15～16:15	函 数 論 9:00～11:50 15:30～16:20	函数解析学 10:30～12:00 14:15～16:15	応用数学 9:00～12:00 14:20～16:30	無限可積分系 9:15～10:50 14:15～16:25	トポロジー 9:20～12:00 14:15～14:55	幾何学 9:40～11:40 14:15～16:15	代数学 9:15～11:45 15:30～17:10	統計数学 9:30～12:00 14:15～15:00
	企画特別講演 13:00～14:00								
	特別講演 16:30～17:30	特別講演 14:15～15:15 16:35～17:35	特別講演 16:30～17:30	特別講演 16:40～17:40	特別講演 11:00～12:00 16:40～17:40	特別講演 15:10～16:10	特別講演 16:30～17:30	特別講演 14:15～15:15	特別講演 15:15～16:15 16:30～17:30
25日 (火)	函数方程式論 9:15～12:00	函 数 論 9:00～11:45 13:15～14:20	函数解析学 9:15～12:00	応用数学 9:00～12:00		トポロジー 13:15～14:15	幾何学・ トポロジー 特別講演 10:30～11:30 幾何学 特別講演 13:15～14:15	代数学 9:30～12:00 特別講演 13:00～14:00	統計数学 9:30～11:30
	特別講演 13:15～14:15		特別講演 13:15～14:15						
	日本数学会賞授賞式(創立五十周年記念館)..... (14:50～15:20)								
	総合講演(") 日本数学会賞秋季賞受賞者..... (15:30～16:30) 立川裕二(東大 IPMU)..... (16:45～17:45) 懇 親 会(南福利施設「ピーチユニオン」)..... (18:00～20:00)								
26日 (水)	函数方程式論 9:15～12:00 14:15～16:15	実函数論 9:00～12:00 14:15～16:30	函数解析学 9:30～12:00 14:15～15:00	応用数学 14:15～16:20	数学基礎論 および歴史 9:30～11:25 14:15～16:15	トポロジー 10:20～12:00 14:15～14:50	幾何学 10:00～11:40 14:15～16:15	代数学 9:15～11:25 15:30～17:40	統計数学 9:40～12:00 14:15～15:05
	企画特別講演 13:00～14:00								
	特別講演 16:30～17:30	特別講演 16:45～17:45	特別講演 15:15～16:15	特別講演 16:40～17:40	特別講演 16:30～17:30	特別講演 15:10～16:10	特別講演 16:30～17:30	特別講演 14:15～15:15	特別講演 15:20～16:20 16:40～17:40
27日 (木)	函数方程式論 9:15～12:00 14:15～16:15	実函数論 9:15～12:00 14:15～16:00		応用数学 10:00～11:40 14:15～15:50	数学基礎論 および歴史 9:00～10:50			代数学 9:15～12:00 15:30～16:40	統計数学 9:40～11:30 14:15～15:05
	企画特別講演 13:00～14:00								
	特別講演 16:30～17:30	特別講演 16:15～17:15		特別講演 16:10～17:10	特別講演 11:00～12:00			特別講演 14:15～15:15	

目次

総合講演	1
企画特別講演	2
数学基礎論および歴史	5
9月26日(水)	5
9月27日(木)	8
代数学	10
9月24日(月)	10
9月25日(火)	15
9月26日(水)	18
9月27日(木)	23
幾何学	28
9月24日(月)	28
9月25日(火)	31
9月26日(水)	32
函数論	36
9月24日(月)	36
9月25日(火)	39
函数方程式論	43
9月24日(月)	43
9月25日(火)	48
9月26日(水)	51
9月27日(木)	57
実函数論	63
9月26日(水)	63
9月27日(木)	68
函数解析学	73
9月24日(月)	73
9月25日(火)	76
9月26日(水)	78
統計数学	82
9月24日(月)	82
9月25日(火)	85
9月26日(水)	86
9月27日(木)	90

応用数学	94
9月24日(月)	94
9月25日(火)	99
9月26日(水)	101
9月27日(木)	104
トポロジー	108
9月24日(月)	108
9月25日(火)	112
9月26日(水)	113
無限可積分系	115
9月24日(月)	115

総 合 講 演

9月25日(火) 総合講演会場

日本数学会賞秋季賞受賞者 (15:30~16:30)
Autumn Prize Winner

立 川 裕 二 (東 大 I P M U) 場の量子論の, 場の量子論による, 場の量子論のための数学
..... (16:45~17:45)
Yuji Tachikawa (Univ. of Tokyo) Mathematics of the QFT, by the QFT, for the QFT

概要 Quantum field theory (QFT) is a branch of theoretical physics where the quantum property of fields is studied, where a field stand for any physical entity extended through time and space. In this talk, I would like to illustrate three aspects of connections between QFT and mathematics though a number of examples:
- the first is to formulate QFT in a mathematical language, i.e. to find mathematics of QFT.
- the second is to obtain mathematical conjectures using the ideas of QFT, i.e. to derive mathematics by QFT,
- and the third is to apply existing mathematics in the analysis of QFT, i.e. to use mathematics for QFT.

企 画 特 別 講 演

9月24日(月)

第I会場

志賀啓成 (東工大理) Klein群の函数論 (13:00~14:00)
 Hiroshige Shiga (Tokyo Tech) Complex analysis on Kleinian groups

概要 A discrete subgroup of $\mathrm{PSL}(2, \mathbb{C})$ is called a Kleinian group. An element of $\mathrm{PSL}(2, \mathbb{C})$ is a conformal automorphism of the Riemann sphere and also it is a hyperbolic isometry on the hyperbolic 3-space. Hence, the theory of Kleinian makes significant contributions to complex analysis as well as to the hyperbolic geometry. In this talk, we discuss complex analytic properties related to Kleinian groups. In particular, we consider geometric function theoretic properties of regions of discontinuity of Kleinian groups and complex structures of deformation spaces of Kleinian groups.

第VIII会場

特別招待講演(台湾数学会)

Shun-Jen Cheng (台湾中研院) Representation theory of Lie superalgebras in the BGG category (13:00~14:00)

Shun-Jen Cheng (Academia Sinica) Representation theory of Lie superalgebras in the BGG category

9月26日(水)

第I会場

諏訪立雄 (北大*)^b 相対 Dolbeault コホモロジーとその佐藤超関数論への応用 · (13:00~14:00)
 Tatsuo Suwa (Hokkaido Univ.*) Relative Dolbeault cohomology and its application to the Sato hyperfunction theory

概要 The Čech–de Rham cohomology together with its integration theory has been effectively used in various problems related to localization of characteristic classes. Likewise we may develop the Čech–Dolbeault cohomology theory and on the way we naturally come up with the relative Dolbeault cohomology. This cohomology turns out to be canonically isomorphic with the local (relative) cohomology of A. Grothendieck and M. Sato with coefficients in the sheaf of holomorphic forms so that it provides a handy way of representing the latter.

In this talk we present the theory of relative Dolbeault cohomology and give, as applications, simple explicit expressions of Sato hyperfunctions, some fundamental operations on them and related local duality theorems. Particularly noteworthy is that the integration of hyperfunctions in our framework, which is a descendant of the integration theory on the Čech–de Rham cohomology, is simply given as the usual integration of C^∞ differential forms. Also the Thom class in relative de Rham cohomology plays an essential role in the scene of interaction between topology and analysis. This approach also yields a new insight into the theory of hyperfunctions and further leads to a number of results that cannot be achieved by the conventional way. The talk includes a joint work with N. Honda and T. Izawa.

第IV会場

納谷 信 (名大多元数理)^b ラプラスリアンの第1固有値の最大化と極小曲面 (13:00~14:00)
 Shin Nayatani (Nagoya Univ.) Maximization of the first eigenvalue of Laplacian and minimal surface

概要 In this lecture, I will focus on recent progress on metrics that maximize the first eigenvalue of the Laplacian (under area normalization) on a closed surface. I first discuss Hersch–Yang–Yau’s inequality (1970, 1980), which was the starting point of the above problem. This is an inequality indicating that the first eigenvalue (precisely, the product of it with the area) is bounded from above by a constant depending only on the genus of the surface. Then I overview the recent progress on the existence problem for maximizing metrics together with the relation with minimal surfaces in the sphere. Finally I will discuss Jacobson–Levitin–Nadirashvili–Nigam–Polterovich’s conjecture, which explicitly predicts maximizing metrics in the case of genus two, and the affirmative resolution of it (joint work with Toshihiro Shoda).

第VIII会場

安福 悠 (日大理工) アーベル多様体と数論的力学系 —類似と相違 (13:00~14:00)
 Yu Yasufuku (Nihon Univ.) Abelian varieties and arithmetic dynamics —Similarities and differences

概要 In this talk, we survey some of the results in the field of arithmetic dynamics, focusing on problems which arise as analogs of theorems and conjectures for abelian varieties. More specifically, a central object of study in arithmetic dynamics is the orbit

$$\{P, \phi(P), \phi(\phi(P)), \phi(\phi(\phi(P))), \dots\},$$

where $\phi : X \dashrightarrow X$ is a rational map of an algebraic variety X to itself defined over a number field k and P is a k -rational point of X . Because of the *formal* analogy between an orbit

$$P \mapsto \phi(P) \mapsto \phi(\phi(P)) \mapsto \phi(\phi(\phi(P))) \mapsto \dots$$

(where each arrow is an application of ϕ) and the subgroup generated by a point in an abelian variety

$$O \mapsto P \mapsto 2P \mapsto 3P \mapsto \dots$$

(where each arrow is an addition by P), one *could hope* that theorems and conjectures for abelian varieties over number fields hold when we restrict to a single orbit, even if the entire variety X does not have a group structure. We will explore this “hope” for questions concerning torsion points, Galois images, integral points, and intersections with subvarieties. We will find that sometimes the dynamical analog holds, sometimes the dynamical analog holds conditionally on deep conjectures, and sometimes the most natural dynamical analog fails completely and the revised analog remains open.

9月27日(木)

第I会場

林 伸夫 (阪大理工) Inhomogeneous Dirichlet-boundary value problem for one dimensional nonlinear Schrödinger equations (13:00~14:00)
 Nakao Hayashi (Osaka Univ.) Inhomogeneous Dirichlet-boundary value problem for one dimensional nonlinear Schrödinger equations

概要 We consider the inhomogeneous Dirichlet-boundary value problem for the cubic nonlinear Schrödinger equations on the half line. We present sufficient conditions of initial and boundary data which ensure asymptotic behavior of small solutions to the problem by using the classical energy method and factorization techniques.

第IX会場

谷口正信(早大理工) 時系列解析へのいざない (13:00~14:00)
Masanobu Taniguchi (Waseda Univ.) Introduction to time series analysis

概要 There has been much demand for the statistical analysis of dependent observations in many fields, for example, economics, engineering and the natural sciences. A model that describes the probability structure of a series of dependent observations is called a stochastic process. The stochastic processes mentioned here are very widespread, e.g., non-Gaussian linear processes, long-memory processes, nonlinear processes and continuous time processes etc. For them we will develop not only the usual estimation and testing theory but also many other statistical methods and techniques, such as discriminant analysis, cluster analysis, nonparametric methods, higher order asymptotic theory etc. Optimality of various procedures is often shown by use of local asymptotic normality (LAN), which is due to LeCam. Applications of the theory are enormous.

数学基礎論および歴史

9月26日(水) 第V会場

9:30~11:25

- 1 大藪 卓 b 連続体仮説と構成可能集合, 他5件 5
 Takashi Oyabu Continuum hypothesis and constructible set, and other 5 talks

概要 (1) Godel's L_α ; continuum hypothesis is correct: one construction is presented

(2) $M \equiv G/K$; Homotopy equivalent $\iff M \equiv G/K$; homeomorphic:

(3) Some considerations on $L_2(M)$ is presented:

(4) Derivation induces an auto-isomorphism:

(5) $\text{DIFF}(H): H \iff H: \text{DIFF}(H)|U(H); H \iff H: \text{DIFF}(|U(H); \text{SPEC}(H) \iff \text{SPEC}(H):$
 $U(H) \partial U$; unitary; $\supset \text{AUT}(H)$

(6) RVE: $R \iff \text{SPEC}(R)$

$\uparrow \swarrow \searrow$

$\text{DIFF}(R) \text{ AUT}(R): G; G'; G''$;

- 2 依岡輝幸(静岡大理) ランダム強制法による拡大モデルの中での弱い Martin's Axiom 15
 Teruyuki Yorioka (Shizuoka Univ.) Fragments of Martin's Axiom in the extension with random forcing

概要 It is known that, under $\text{MA}(\sigma\text{-linked})$, a separable measure algebra forces $\text{MA}(\sigma\text{-linked})$. We extend it to MA for Todorćević orderings $\mathbb{T}(X)$ for topological spaces X . If X is a second countable Hausdorff space, $\mathbb{T}(X)$ is a non- σ -linked ccc forcing. It is proved that, under MA , a separable measure algebra forces MA for all $\mathbb{T}(X)$ for second countable Hausdorff X .

- 3 矢島幸信(神奈川大工) Undecidability of the cardinality of C^* -embedded discrete subsets in
 平田康史(神奈川大工) products of natural numbers 15
 Yukinobu Yajima (Kanagawa Univ.) Undecidability of the cardinality of C^* -embedded discrete subsets in
 Yasushi Hirata (Kanagawa Univ.) products of natural numbers

概要 Let \mathbb{N} denote an infinite countable discrete space. Let \mathbb{N}^κ denote the products of κ many copies of \mathbb{N} . We prove that it is undecidable in ZFC that there is an uncountable C^* -embedded discrete subset in \mathbb{N}^{2^ω} . Moreover, we show that the existence of C^* -embedded discrete subset with cardinality κ in \mathbb{N}^κ is depends on the choice of κ .

- 4 薄葉季路(早大理工) Extendible cardinals and the mantle 15
 Toshimichi Usuba (Waseda Univ.) Extendible cardinals and the mantle

概要 We show that if there is an extendible cardinal, then the mantle, the intersection of all ground models of the universe, must be the minimum ground model.

- 5 岡部峻典(神戸大システム情報) On width of automorphism groups of countable structures with station-
 ary independence relations 15
 Shunsuke Okabe (Kobe Univ.) On width of automorphism groups of countable structures with station-
 ary independence relations

概要 J. K. Truss showed that for all automorphism g on Rado graph, any other automorphisms can be described by product of just 3 conjugates of g in 2003. We call such number of products a width of automorphism groups. There is several result on width of automorphisms with some conditions obtained by using techniques of descriptive set theory. We talk on the way of the improvements of width of automorphisms of more general structures.

- 6 板井昌典 (東海大理) A remark on geometric isomorphism and Morita equivalence 15
 Masanori Itai (Tokai Univ.) A remark on geometric isomorphism and Morita equivalence

概要 After introducing the notion of geometric isomorphism of quantum 2-tori and the notion of Morita equivalence of coordinate algebras of quantum 2-tori, we examine the relation between the two notions.

- 7 桔梗宏孝 (神戸大システム情報) Hrushovski の「擬平面」について 15
 Hirotaka Kikyo (Kobe Univ.) On Hrushovski's "pseudoplanes"

概要 In 1988, Hrushovski constructed pseudoplanes to refute a conjecture by Lachlan. Given an irrational number α with $1/2 < \alpha < 2/3$, he defined a function f on the positive real numbers similar to log functions. He defined a class K of finite graphs using this function f , and constructed a generic structure M of K . His construction is valid for any real number α with $0 < \alpha < 1$. Our main result is the following: Suppose α is a rational number with $0 < \alpha < 1$. Let M be the generic structure described above. Then the theory of M is model complete. We are going to discuss also on the automorphism group of M .

- 8 池田宏一郎 (法政大経営) 真に安定なジェネリック構造について 15
 Koichiro Ikeda (Hosei Univ.) On strictly stable generic structures

概要 In this talk, we want to explain some result which says that if Hrushovski's pseudoplane is model complete then there is a strictly stable generic structure whose theory is not omega-categorical and has finite closures.

14:15~16:15

- 9 熊澤昌明 (箕面自由学園高) BCK-代数における可換元の存在と下限の存在の関係について 10
 Masaaki Kumazawa (Mino-Jiyu Gakuen High School) On the relationship between the existence of commutative elements and the existence of infimums in BCK-algebras

概要 In this presentation, we shall define a BCK-algebra with the condition (I), and prove some properties of this notion, and discuss the relationship between the existence of commutative elements and the existence of infimums in BCK-algebra. Then, we show the two characterizations; a BCK-algebra with Canonical Condition (I) are equivalent to a commutative BCK-algebra; and a BCK-algebra with Condition (I) are a lower semi-lattice with respect to the operation \times .

- 10 鈴木信行 (静岡大理) 中間述語論理における選言特性とその弱い変種についての注意 15
 Nobu-Yuki Suzuki (Shizuoka Univ.) Remarks on disjunction property and its weak variants in intermediate predicate logics

概要 The disjunction and existence properties in intermediate predicate logics were revealed to be independent in our previous paper. In that paper, we introduced Z-normality, which is a weak variant of disjunction property in the setting of intermediate predicate logic. In this talk, we introduce another weak variant of disjunction property called sentential disjunction property, and report relations among disjunction property, sentential disjunction property, and Z-normality in intermediate predicate logics.

- 11 倉橋太志 (木更津工高専) 様相論理 **KD** の算術的完全性 15
 Taishi Kurahashi (Nat. Inst. of Tech., Kisarazu Coll.) Arithmetical completeness of the modal logic **KD**

概要 We prove that there exists a Rosser provability predicate whose provability logic is the modal logic **KD**. Also we prove that there exists a Rosser provability predicate whose provability logic includes the logic **KD** + $(\Box p \rightarrow \Box \Diamond p)$ which is a proper extension of **KD**.

- 12 菊池 誠 (神戸大システム情報) 幾何学の基礎に関するフレーゲとヒルベルトの論争について 15
Makoto Kikuchi (Kobe Univ.) On the Frege–Hilbert controversy over the foundations of geometry

概要 The Frege–Hilbert controversy over the foundations of geometry reveals the difference between Frege’s philosophical standpoints and the basic assumptions of first-order logic, rather than the variance in their views about geometry. I will review the controversy and discuss the relationship between Frege’s philosophical standpoints and some proposals of extensions and modifications of the first-order logic.

- 13 只木孝太郎 (中部大工) アルゴリズム的ランダムネスによる量子力学の再構成 III: その物理的帰結 15
Kohtaro Tadaki (Chubu Univ.) A refinement of quantum mechanics by algorithmic randomness III: Its consequences

概要 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 investigate the consequences of our alternative rule from a physical point of view.

- 14 田中一之 (東北大理) Modal μ -calculus and its one-variable hierarchy 15
李文娟 (Nanyang Tech. Univ.)
Kazuyuki Tanaka (Tohoku Univ.) Modal μ -calculus and its one-variable hierarchy
Li Wenjuan (Nanyang Tech. Univ.)

概要 Modal μ -calculus, introduced by Kozen, is an extension of propositional modal logic by adding the least and greatest fixpoint operators. In this talk, we review the historical and latest studies on the (semantical) strictness of several alternation hierarchies with respect to various transition systems, and then investigate the variable hierarchies. Among others, we show that the simple alternation hierarchy of the one-variable fragments of modal μ -calculus is strict over finitely branching transition systems.

- 15 黒田 覚 (群馬県女大文) Forcing in bounded arithmetic for small complexity classes 15
Satoru Kuroda Forcing in bounded arithmetic for small complexity classes
(Gunma Pref. Women’s Univ.)

概要 We present Takeuti–Yasumoto style generic models of theories for classes ALOGTIME, LOGSPACE and NLOGSPACE.

- 16 重水美香 (首都大東京理) 高さが 2 の多分岐 AND-OR 木上の独立分布 15
鈴木登志雄 (首都大東京理)
宇佐美紘貴 (首都大東京理)
Mika Shigemizu (Tokyo Metro. Univ.) Independent distributions on a multi-branching AND-OR tree of height
Toshio Suzuki (Tokyo Metro. Univ.) 2
Koki Usami (Tokyo Metro. Univ.)

概要 We investigate an AND-OR tree T and a probability distribution d on the truth assignments to the leaves. Tarsi (1983) showed that if d is an independent and identical distribution (IID) such that probability of a leaf having value 0 is neither 0 nor 1 then there exists an optimal algorithm that is depth-first. We investigate the case where d is an independent distribution (ID) and probability depends on each leaf. It is known that in this general case, if height is greater than or equal to 3, Tarsi-type result does not hold. It is also known that for a complete binary tree of height 2, Tarsi-type result certainly holds. We ask whether Tarsi-type result holds for an AND-OR tree of height 2.

16:30~17:30 特別講演

- 樋口幸治郎 (日大工) Computable prestructures
 Kojiro Higuchi (Nihon Univ.) Computable prestructures

9月27日(木) 第V会場

9:00~10:50

- 17 増田 茂 (流体数理古典理論研) Poisson' "sloughs" in his final works in life, "A Study of Mathematical Physics" 15
 Shigeru Masuda Poisson' "sloughs" in his final works in life, "A Study of Mathematical
 (Res. Workshop of Classical Fluid Dynamics) Physics"

概要 We discuss the "sloughs" in A Study of Mathematical Physics by Poisson. In his books, he explodes the established theories in rivalry to Lagrange, Laplace, Fourier, Gauss, etc. who are the trailblazers of each arena and the leading scholars of mathematical physics. We think, these trials are "sloughs", and look for Poisson's thinking for newness of learning.

- 18 増田 茂 (流体数理古典理論研) The celestial mechanics in conformity to the mathematical physics by Poisson 15
 Shigeru Masuda The celestial mechanics in conformity to the mathematical physics by
 (Res. Workshop of Classical Fluid Dynamics) Poisson

概要 We discuss the verification of scientific newness on A Study of Mathematical Physics by Poisson. He belongs to the Laboratory of Longitude, and discusses the universal mechanics of about two hundred years ago, in which he emphasizes his standing arena not on the astronomy but on the mathematical physics. We introduce the then scientific-common-sense on some topics comparing with today's data.

- 19 増田 茂 (流体数理古典理論研) The Poisson's integral owing to Legendre's formulae and his own 15
 Shigeru Masuda The Poisson's integral owing to Legendre's formulae and his own
 (Res. Workshop of Classical Fluid Dynamics)

概要 We discuss Poisson's integral of ellipsoid using the Legendre's formulae in his works. He tries his method of integral beginning with the paper 1802, and until at the last work, he appreciates fully Legendre's method. Without his method, Poisson says, he couldn't have succeeded in these sort of integrals, although he tries his own of ellipsoid. He adopts Lagrange's formulae only after five years since Legendre's table 1826.

- 20 田中昭太郎 * 分数関数の展開の境界値を求める —ローラン展開と衰壊展開— 15
 Shotaro Tanaka To express fractions into power series by Suida expansion

概要 The fraction $1/(z^2 + 1)$ has two singularities $z = i, -i$. Expand in $z = 2i$. (1) Devide the domain into A: $0 \leq |z - 2i| < 1$, B: $1 < |z - 2i| < 3$, C: $3 < |z - 2i|$. (2) Decomposite it into partials: $(i/2)\{1/(z + i) - 1/(z - i)\}$. Ex. $1/(z + i) = 1/\{(z - 2i) + 3i\}$. Wada's formula: $1/(\square - \Delta)^{p+1} = \Sigma(k = 1 \rightarrow \infty)d_p(k)\square^{-p-k}\Delta^{k-1}$ ($0 < |\Delta/\square| < 1$), where integers $p \geq 0$; $k \geq 1$; $d_p(k) \equiv (k + p - 1)!/p!(k - 1)!$, named Suida expansion. If $1/\{(z - 2i) + 3i\} = 1/\{(z - 2i) - (-3i)\}^{0+1} = \Sigma(k = 1 \rightarrow \infty)d_0(k)(z - 2i)^{-0-k}(-3i)^{k-1}$ ($0 < |-3i/(z - 2i)| < 1$), then we have $\Sigma(k = 1 \rightarrow \infty) (-3i)^{k-1}(z - 2i)^{-k}$ ($3 < |z - 2i|$). If $1/\{3i - (-(z - 2i))\}^{0+1} = \Sigma(k = 1 \rightarrow \infty)d_0(k)(3i)^{-0-k}(-(z - 2i))^{k-1}$ ($0 < |-(z - 2i)/3i| < 1$), then we have $\Sigma(k = 1 \rightarrow \infty)d_0(k)(-1)^{k-1}(1/3i)^k(z - 2i)^{k-1}$ ($0 < |z - 2i| < 3$).

- 21 斎藤 憲 エウクレイデス『原論』全文の構文解析の進行状況 15
 (四日市大関孝和数学研)
 Ken Saito (Yokkaichi Univ.) Syntactic analysis of the whole text of Euclid's Elements (progress report)

概要 This is a progress report of the research presented in September 2016. Though the text of the *Elements* is extremely simple and monotonous Greek prose, it is not easy to provide all the necessary grammatical rules so that the syntactic tree of all the sentences can be constructed. We will show the results hitherto obtained.

- 22 森本光生 大成算経 首篇, 卷之一, 二, 三 15
 (四日市大関孝和数学研・上智大*)
 Mitsuo Morimoto Preliminary Volume, and Volumes 1, 2 and 3 of the Taisei Sankei
 (Yokkaichi Univ./Sophia Univ.*)

概要 The Taisei Sankei (1683–1711) is a monograph of 20 volumes written by Seki Takakazu, Takebe Kata'akira and Takebe Katahiro. Volume 1, called Five Techniques, treats five fundamental operations on numbers, that is, addition, subtraction, multiplication, division and extraction of root. Both Volumes 2 called Miscellaneous Techniques and 3 called Various Techniques treat numbers and their calculations. Besides, Preparatory Volume which is placed in front of Volume 1, considers, among others, numbers. Because of elementary character, these volumes have been overlooked by many scholars. We shall discuss the inter-dependence among these volumes.

- 23 張替俊夫 『海島算経』の比例計算について 15
 (大阪産大全学教育機構)
 Toshio Harikae (Osaka Sangyo Univ.) On proportionality in “The Sea Island Mathematical Manual”

概要 In this talk, we will give some equations in “The Sea Island Mathematical Manual” by the calculation of rectangles instead of the similarity of triangles.

11:00~12:00 特別講演

- 佐藤賢一 (電通大) 関孝和と同時代の数学者たち
 Kenichi Sato (Univ. of Electro-Comm.) SEKI Takakazu and his contemporary mathematicians

概要 This paper introduces some Japanese mathematicians' connections in 17th century who were known as disciples of SEKI Takakazu. One of them, KURU Shigezane, was the first manuscript writer of SEKI's Kaihohnpen no Ho, 1683. The author points out that KURU was not only SEKI's disciple, but that of HASHIMOTO Masakazu in Kamigata area (i.e. Kyoto and Osaka). This relation suggests us that KURU should be a candidate who bridged the gap between the both schools of SEKI and HASHIMOTO, giving us the reason of the similarity of their mathematical works. On the other hand, we could identify KURU was a distant relative of TAKEBE Katahiro, referring the description of Kansei Choshu Shokafu, 1812. (TAKEBE's cousin married with KURU's older brother.) As a conclusion, these connections could clarify their circulations of mathematical works were relatively narrow than we thought.

12:00~12:30 数学基礎論および歴史分科会総会

12:30~13:00 歴史部門懇談会

代 数 学

9月24日(月) 第VIII会場

9:15~11:45

- 1 神代真也 (千葉大理) トレース加群の遍在性からみた Gorenstein 性の解析 10
 後藤四郎 (明大*)
 磯部遼太郎 (千葉大理)
Shinya Kumashiro (Chiba Univ.) The Gorenstein property and correspondences between trace ideals and
Shiro Goto (Meiji Univ.*) birational finite extensions
Ryotaro Isobe (Chiba Univ.)

概要 The behavior of trace ideals and modules is explored in connection with the structure of the base ring and the ambient module. Firstly, over a commutative Noetherian ring, a characterization of a module for which every submodule is a trace module is given. Secondly, over an arbitrary commutative ring, correspondences between three sets, the set of trace ideals, the set of certain stable ideals, and the set of certain birational extensions of the base ring, are studied. The correspondences work very well, if the base ring is a Gorenstein ring of dimension one. As a conclusion, it is shown that with one extremal exception, the surjectivity of some correspondence characterizes the Gorenstein property of the base ring, provided the base ring is a Cohen–Macaulay local ring of dimension one.

- 2 磯部遼太郎 (千葉大理) The structure of chains of Ulrich ideals in Cohen–Macaulay local rings
 後藤四郎 (明大*) of dimension one 10
 神代真也 (千葉大理)
Ryotaro Isobe (Chiba Univ.) The structure of chains of Ulrich ideals in Cohen–Macaulay local rings
Shiro Goto (Meiji Univ.*) of dimension one
Shinya Kumashiro (Chiba Univ.)

概要 The purpose of this talk is to investigate the behavior of chains of Ulrich ideals, in a one-dimensional Cohen–Macaulay local ring, in connection with the structure of birational finite extensions of the base ring. The notion of Ulrich ideals is a generalization of stable maximal ideals, which J. Lipman started to analyze in 1971. Because Ulrich ideals are a very special kind of ideals, it seems natural to expect that, in the behavior of Ulrich ideals, there might be contained ample information on base rings, once they exist. We focus our attention on the one-dimensional case, clarifying the relationship between Ulrich ideals and the birational finite extensions of the base ring.

- 3 松井紘樹 (名大多元数理) Remarks on a conjecture of Huneke and Wiegand 10
Hiroki Matsui (Nagoya Univ.) Remarks on a conjecture of Huneke and Wiegand

概要 Huneke–Wiegand conjecture is, roughly saying, $M \otimes_R \text{Hom}_R(M, R)$ has torsion for any non-free torsion-free finitely generated module M over a commutative Noetherian ring R . This conjecture is proved for hypersurface rings by Huneke and Wiegand and it is thought to be true for complete intersection rings. However, the conjecture is very much open and not known even in the case where M is an ideal. In this talk, I will give some equivalent statements of the conjecture and give another proof of Huneke–Wiegand theorem.

- 4 土谷昭善 (阪大情報) Edge rings with 3-linear resolutions 10
 日比孝之 (阪大情報)
 松田一徳 (北見工大工)
 Akiyoshi Tsuchiya (Osaka Univ.) Edge rings with 3-linear resolutions
 Takayuki Hibi (Osaka Univ.)
 Kazunori Matsuda
 (Kitami Inst. of Tech.)

概要 In this talk, it is shown that the edge ring of a finite connected simple graph with a 3-linear resolution is a hypersurface.

- 5 土谷昭善 (阪大情報) 辺凸多面体に付随する反射的凸多面体 10
 長岡高広 (京大理)
 Akiyoshi Tsuchiya (Osaka Univ.) Reflexive polytopes arising from edge polytopes
 Takahiro Nagaoka (Kyoto Univ.)

概要 It is known that every lattice polytope is unimodularly equivalent to a face of some reflexive polytope. A stronger question is to ask whether every $(0, 1)$ -polytope is unimodularly equivalent to a facet of some reflexive polytope. A large family of $(0, 1)$ -polytopes are the edge polytopes of finite simple graphs. In this talk, it is shown that, by giving a new class of reflexive polytopes, each edge polytope is unimodularly equivalent to a facet of some reflexive polytope. Furthermore, we extend the characterization of normal edge polytopes to a characterization of normality for these new reflexive polytopes.

- 6 土谷昭善 (阪大情報) 反射的凸多面体の depth 10
 日比孝之 (阪大情報)
 Akiyoshi Tsuchiya (Osaka Univ.) The depth of a reflexive polytope
 Takayuki Hibi (Osaka Univ.)

概要 In this talk, given arbitrary integers d and r with $d \geq 4$ and $1 \leq r \leq d+1$, a reflexive polytope $\mathcal{P} \subset \mathbb{R}^d$ of dimension d with depth $K[\mathcal{P}] = r$ for which its dual polytope \mathcal{P}^\vee is normal will be constructed, where $K[\mathcal{P}]$ is the toric ring of \mathcal{P} .

- 7 東平光生 (明大研究・知財) Semi-unmixed と なる二部グラフの辺イデアルについて 10
 Hiroataka Higashidaira (Meiji Univ.) On the edge ideal of semi-unmixed bipartite graphs

概要 Let S be the polynomial ring in n variables over a field K and H a bipartite graph with n vertices. We denote by $I(H)$ the edge ideal of H . We are interested in the structure of H when $S/I(H)$ is a “good” ring. In 2005, Herzog and Hibi characterized Cohen–Macaulay bipartite graphs in terms of partially ordered sets. In 2007, Villarreal characterized unmixed bipartite graphs in terms of quasi-ordered sets.

In this talk, we introduce the notion of semi-unmixed graphs and investigate semi-unmixed bipartite graphs in terms of partially ordered sets. As an application, we investigate sequentially Cohen–Macaulay bipartite graphs. Moreover, we calculate the regularity of semi-unmixed bipartite graphs.

- 8 宮崎 充弘 (京都教育大) Canonical and anticanonical analytic spreads of a Hibi ring 10
 Mitsuhiro Miyazaki Canonical and anticanonical analytic spreads of a Hibi ring
 (Kyoto Univ. of Edu.)

概要 Let K be a field, H a finite distributive lattice, $\mathcal{R}_K[H]$ the Hibi ring defined over K on H and ω the canonical ideal of $\mathcal{R}_K[H]$. Since $\mathcal{R}_K[H]$ is a Noetherian normal domain, and ω is a divisorial ideal of $\mathcal{R}_K[H]$, we can consider the n -th power $\omega^{(n)}$ of ω in $D(\mathcal{R}_K[H])$ for each $n \in \mathbb{Z}$. We call $\omega^{(-1)}$ the anticanonical ideal of $\mathcal{R}_K[H]$. In this talk, we introduce the notion “ $q^{(n)}$ -reduced sequence with condition N” and define a convex polytope for each $q^{(\pm 1)}$ -reduced sequence with condition N. We show that the fiber cone of ω (resp. $\omega^{(-1)}$) is the sum of the Ehrhart rings defined by these convex polytopes and describe the analytic spread of ω (resp. $\omega^{(-1)}$) by the words of posets.

- 9 宮崎 充弘 (京都教育大) Limit T-complexity of Ehrhart rings and limit Frobenius complexity of
 Hibi rings 10
 Mitsuhiro Miyazaki Limit T-complexity of Ehrhart rings and limit Frobenius complexity of
 (Kyoto Univ. of Edu.) Hibi rings

概要 Lyubeznik and Smith introduced for a commutative ring R with prime characteristic and an R -module M the notion of a ring of Frobenius operators $\mathcal{F}(M)$ which is a noncommutative graded ring. Enescu and Yau noticed that the complexity of $\mathcal{F}(E)$ is an important object to study, where E is the injective hull of the residue field of R . They showed that the Frobenius complexities of the Segre product of polynomial rings with m and n variables over a field with characteristic p have limit $m - 1$ as $p \rightarrow \infty$ if $m > n \geq 2$. Page generalized this result that if a Hibi ring is anticanonical level and is not Gorenstein, then the limit of the Frobenius complexity of the Hibi rings (base field changed) converges to the analytic spread of the anticanonical module minus 1. In this talk, we report that this fact holds true for arbitrary Hibi rings which is not Gorenstein and answer the question of Page affirmatively.

- 10 柴田 孝祐 (岡山大自然) Strongly stable ideal の alternative polarization とその Alexander 双対
 柳川 浩二 (関西大システム理工) について 10
 Kohsuke Shibata (Okayama Univ.) Alternative polarizations of strongly stable ideals, and their Alexander
 Kohji Yanagawa (Kansai Univ.) duals

概要 Let $I \subset S = K[x_1, \dots, x_n]$ be a strongly stable ideal whose generators have degree at most d . It is known that I admits the *alternative polarization* $\text{b-pol}(I) \subset K[x_{i,j} \mid 1 \leq i \leq n, 1 \leq j \leq d]$. We show that the Alexander dual ideal of $\text{b-pol}(I)$ is $\text{b-pol}(I^*)$ of some strongly stable ideal $I^* \subset K[x_1, \dots, x_d]$, after switching the variable $x_{i,j} \mapsto x_{j,i}$. This duality between I and I^* is in some sense known, but our construction has some advantage. We can describe the Hilbert series of $H_m^i(S/I)$ by the graded Betti numbers of I^* . We also show that if S/I is Cohen–Macaulay then $\text{b-pol}(I)$ is a *letterplace ideal* in the sense of Fløystad.

- 11 矢澤 明喜子 (信州大総合理工) 木の母関数から構成される環の強 Lefschetz 性 10
 Akiko Yazawa (Shinshu Univ.) The Lefschetz property for an algebra constructed from a graph

概要 Let $A = \bigoplus_{i=0}^c A_i$, $A_c \neq 0$, be a graded Artinian algebra. We say that A has the strong Lefschetz property if there exists an element $L \in A_1$ such that the multiplication map $\times L^{c-2i} : A_i \rightarrow A_{c-i}$ is bijective for each $i \in \{0, 1, \dots, \lfloor \frac{c}{2} \rfloor\}$. In this presentation, we consider an algebra constructed from a graph. The algebra is defined to be the quotient algebra of the ring of the differential polynomials by the annihilator of F_Γ , where F_Γ is the weighted generating function for the spanning trees in Γ . For $n \leq 5$, we show the strong Lefschetz property for the algebra corresponding to the complete graph with n vertices.

- 12 張 間 忠 人 (新潟大教育)* 一次式の積で定義される完全交叉の強いレフシェッツ性について 10
 和 地 輝 仁 (北教大釧路)
 渡 辺 純 三 (東 海 大*)

Tadahito Harima (Niigata Univ.) The strong Lefschetz property for complete intersections defined by
 Akihito Wachi (Hokkaido Univ. of Edu.) products of linear forms
 Junzo Watanabe (Tokai Univ.*)

概要 We prove the strong Lefschetz property for certain complete intersections defined by products of linear forms, using a characterization of the strong Lefschetz property in terms of central simple modules.

- 13 小 野 舞 子 (岡山大自然) DG 加群の持ち上げについて 10
 吉 野 雄 二 (岡山大自然)

Maiko Ono (Okayama Univ.) On liftings of DG modules
 Yuji Yoshino (Okayama Univ.)

概要 Let A be a non-negatively graded differential (DG) algebra over a commutative ring R , and $B = A\langle X | dX = t \rangle$ be an extended DG algebra by the adjunction of a variable X of positive even variable n which kills a cycle t in A . Let N be a semi-free DG B -module. The aim of this talk is to explain the following our results; (1) If N is bounded below and $\text{Ext}_B^{n+1}(N, N) = 0$, then N is liftable to A , i.e., there is a DG A -module M such that $N \cong B \otimes_A M$. (2) If N is liftable to A and $\text{Ext}_B^n(N, N) = 0$, then the lifting of N is unique up to DG A -isomorphisms.

14:15~15:15 特別講演

浅 芝 秀 人 (静岡大理) 2 圏論的被覆理論と導来同値

Hideto Asashiba (Shizuoka Univ.) 2-categorical covering theory and derived equivalences

概要 Let G be a group and \mathbb{k} a commutative ring. A small category with a weak G -action is a pair (\mathcal{C}, X) of a small category \mathcal{C} and a pseudofunctor X from G as a groupoid with one object $*$ to the 2-category $\mathbb{k}\text{-Cat}$ of small \mathbb{k} -categories sending $*$ to \mathcal{C} . We will explain the facts that equivalences between the 2-category of small \mathbb{k} -categories with weak G -actions the 1-morphism (resp. the 2-morphisms) of which are G -equivariant functors (resp. natural transformations compatible with G -equivariences) and the 2-category of G -graded \mathbb{k} -categories the 1-morphisms (resp. 2-morphisms) of which are weakly degree-preserving functors (resp. natural transformations compatible with degree-preserving structures) are given by 2-functors defined by orbit category constructions and by smash product constructions that are mutually quasi-inverses and that (when \mathbb{k} is a field) the derived equivalences defined on each 2-category are preserved under these constructions. We will also talk about some generalizations of these facts.

15:30~17:10

- 14 佐 藤 眞 久 唯一の極大部分加群を持つ射影加群について 10
 (愛知大地域政策・山梨大*)

Masahisa Sato Projective module with unique maximal submodule
 (Aichi Univ./Univ. of Yamanashi*)

概要 R. Ware gave the following problem in his paper;

Endomorphism rings of projective modules, Trans. Amer. Math. Soc. **155** (1971), 233–256.

Let R be a ring and P a projective right R -module with unique maximal submodule L , then L is the largest submodule of P .

We give the affirmative answer to this Ware's problem.

To solve this problem, we generalize Nakayama–Azumaya Lemma for any projective modules.

- 15 加瀬 遼一 (岡山理大総合情報) τ -傾半順序構造からの多元環の復元 10
 Ryoichi Kase (Okayama Univ. of Sci.) From support τ -tilting posets to algebras

概要 We treat a certain class of basic algebras which contains preprojective algebras of type A, Nakayama algebras, and generalized Brauer tree algebras. We provide a necessary condition for that an algebra share the same support τ -tilting poset with a given algebra A in this class. Furthermore, we see that this necessary condition is also a sufficient condition if A is either a preprojective algebra of type A, a Nakayama algebra, or a generalized Brauer tree algebra.

- 16 百合草 寿哉 (名大多元数理) Combinatorial cluster expansion formulas from triangulated surfaces · · 10
 Toshiya Yurikusa (Nagoya Univ.) Combinatorial cluster expansion formulas from triangulated surfaces

概要 Cluster algebras are commutative algebras with a distinguished set of generators, which are called cluster variables. By Laurent phenomenon, any cluster variable is expressed by a Laurent polynomial of the initial cluster variable. An explicit formula for the Laurent polynomials of cluster variables is called a cluster expansion formula. We give a cluster expansion formula for cluster algebras defined from triangulated surfaces by using perfect matchings of angles. Moreover, they correspond bijectively with perfect matchings of snake graphs, perfect matchings of bipartite graphs, and minimal cuts of quivers with potential.

- 17 水野 有哉 (静岡大理) Torsion pairs for quivers and the Coxeter groups 10
 Yuya Mizuno (Shizuoka Univ.) Torsion pairs for quivers and the Coxeter groups

概要 Path algebras are one of the most classical and important classes of algebras. In this talk, we discuss torsion pairs for path algebras. In particular, we review a close relationship with some elements of the Coxeter group, called sortable elements, and explain how to parametrize the torsion pairs by these objects via preprojective algebras.

- 18 足立 崇英 (阪府大) Silting objects and t -structures 10
 水野 有哉 (静岡大理)
 Takahide Adachi (Osaka Pref. Univ.) Silting objects and t -structures
 Yuya Mizuno (Shizuoka Univ.)

概要 In this talk, we study a relationship between silting objects and bounded t -structures. Let A be a finite dimensional algebra over a field. Then there exists an injective map from silting objects of the bounded homotopy category of finitely generated projective A -modules to bounded t -structures on the bounded derived category of finitely generated A -modules. However, the map is not necessarily bijective (e.g., A is the path algebra of the Kronecker quiver). We give a characterization of the injective map being bijective.

- 19 浅井 聡太 (名大多元数理) 煉瓦が定める Grothendieck 群の部屋構造 10
 Sota Asai (Nagoya Univ.) The chamber structures of the Grothendieck groups coming from bricks

概要 Let A be an algebra over a field K . For the real-valued Grothendieck group $K_0(\text{proj } A)_{\mathbb{R}}$ of the projective module category $\text{proj } A$ and the real-valued Grothendieck group $K_0(\text{mod } A)_{\mathbb{R}}$ of the module category $\text{mod } A$, there exists a non-degenerate \mathbb{R} -bilinear form called Euler form. Each $\theta \in K_0(\text{proj } A)_{\mathbb{R}}$ gives a semistable subcategory \mathcal{W}_{θ} of $\text{mod } A$. \mathcal{W}_{θ} is an abelian subcategory of $\text{mod } A$, so its simple objects are bricks. In this talk, I set $\Theta_S := \{\theta \in K_0(\text{proj } A)_{\mathbb{R}} \mid S \in \mathcal{W}_{\theta}\}$ for each brick S , and consider the chamber structure of an Euclidean space $K_0(\text{proj } A)_{\mathbb{R}}$ with the walls given by Θ_S for all bricks S .

- 20 塚本真由(阪市大理) On upper bound for global dimension of Auslander–Dlab–Ringel algebras 10
 Mayu Tsukamoto (Osaka City Univ.) On upper bound for global dimension of Auslander–Dlab–Ringel algebras

概要 Lin and Xi introduced Auslander–Dlab–Ringel (ADR) algebras of semilocal modules as a generalization of original ADR algebras. In this talk, we prove that ADR algebras of semilocal modules are left-strongly quasi-hereditary algebras. As an application, we give a tightly upper bound for global dimension of an ADR algebra. Moreover, we describe characterizations of original ADR algebras to be strongly quasi-hereditary algebras which are a special class of left-strongly quasi-hereditary algebras.

- 21 馬場良始(大阪教育大) 弱余原田列による両側原田環の特徴付けについて 10
 Yoshitomo Baba (Osaka Kyoiku Univ.) On Harada rings and weak co- H -sequences

概要 We give complete characterization of two-sided Harada rings using weak co- H -sequences.

- 22 板場綾子(東京理大理) 点スキームが楕円曲線である幾何的代数の代数同型および森田同値を除く分類について 10
 Ayako Itaba (Tokyo Univ. of Sci.) Classifications of geometric algebras whose point schemes are elliptic curves
 Masaki Matsuno (Shizuoka Univ.) curves

概要 Classification of AS-regular algebras is one of the main interests in non-commutative algebraic geometry. Recently, a complete list of superpotentials (defining relations) of all 3-dimensional AS-regular algebras which are Calabi–Yau was given by Mori–Smith (the quadratic case) and Mori–Ueyama (the cubic case), however, no complete list of defining relations of all 3-dimensional AS-regular algebras has not appeared in the literature. So the purpose of this research is to give a complete list of defining relations of all 3-dimensional quadratic AS-regular algebras, to classify them up to isomorphism, and up to graded Morita equivalence in terms of their defining relations. In this talk, for the case that the point scheme is an elliptic curve, we give classifications up to isomorphism, and up to graded Morita equivalence in terms of their defining relations.

9月25日(火) 第VIII会場

9:30~12:00

- 23 辻栄周平 On chromatic symmetric functions of trivially perfect graphs and cographs 10
 (広島国際学院大情報文化)
 Shuhei Tsujie On chromatic symmetric functions of trivially perfect graphs and cographs
 (Hiroshima Kokusai Gakuin Univ.)

概要 Richard P. Stanley has conjectured that chromatic symmetric functions are complete invariants for trees. Vesselin Gasharov has conjectured that chromatic symmetric functions of claw-free graphs are s -positive. In this talk, we consider the analog for trivially perfect graphs and cographs.

- 24 松村朝雄(岡山理大理) A tableau formula of the double Grothendieck polynomials associated to 321 avoiding permutations 10
 Tomoo Matsumura A tableau formula of the double Grothendieck polynomials associated to 321 avoiding permutations
 (Okayama Univ. of Sci.)

概要 The double Grothendieck polynomials introduced by Lascoux–Schützenberger represent the equivariant K-theory Schubert classes for the type A flag varieties. Their explicit formulas have been known for vexillary (2143 avoiding) permutations in the form of determinants or set-valued tableaux. Recently Anderson–Chen–Tarasca (2017) obtained the determinant formula in the case of 321 avoiding permutations. Motivated by this result, we obtained their tableau formula too. I will report on this new formula with its combinatorial proof.

- 25 堀口達也(阪大情報) 正則な冪零ヘッセンバーグ多様体のコホモロジー環とシューベルト多項式 10
 Tatsuya Horiguchi (Osaka Univ.) The cohomology rings of regular nilpotent Hessenberg varieties and Schubert polynomials

概要 Hessenberg varieties are subvarieties of a full flag variety. Its topology makes connection with other research areas such as geometric representation of Weyl groups, the quantum cohomology of flag varieties, hyperplane arrangements, and the chromatic quasisymmetric functions in graph theory. In this talk, we consider polynomials which determine the fundamental relation in the cohomology of a regular nilpotent Hessenberg variety, and I will explain that each of the polynomials can be written as an alternating sum of certain Schubert polynomials.

- 26 黒澤恵光(沼津工高専) \mathbb{B} 型の重み付きクイバーに付随する概均質ベクトル空間の相対不変式の構成 10
 Yoshiteru Kurosawa Construction of relative invariants of prehomogeneous vector spaces associated with valued quivers of type \mathbb{B}
 (Numazu Nat. Coll. of Tech.)

概要 We construct all relative invariants of prehomogeneous vector spaces associated with valued quivers of type \mathbb{B} .

- 27 渋川元樹(神戸大理) The Fibonacci numbers and Kostka numbers 10
 Genki Shibukawa (Kobe Univ.) The Fibonacci numbers and Kostka numbers

概要 We obtain a summation formula of a generalization of the Fibonacci numbers which is special values of the homogenous complete symmetric polynomials. We also give an expression formula of our Fibonacci numbers.

- 28 柴田大樹(岡山理大理) On centers of Chevalley supergroups 10
 Taiki Shibata (Okayama Univ. of Sci.) On centers of Chevalley supergroups

概要 It is well-known that the center of a Chevalley groups (or a split and connected reductive algebraic group) can be described in terms of its root datum. In this talk, we generalize the result to the super situation. We give an explicit description of centers of Chevalley supergroups.

- 29 米澤康好 (名大多元数理) Categorification of Howe representations of $U_q(\mathfrak{gl}_m)$ and the quiver Hecke algebra 10
 Yasuyoshi Yonezawa (Nagoya Univ.) Categorification of Howe representations of $U_q(\mathfrak{gl}_m)$ and the quiver Hecke algebra

概要 Categorifying the symmetric or skew Howe representation of $U_q(\mathfrak{gl}_m)$, we construct a 2-representation of the quiver Hecke (KLR) algebra of $U_q(\mathfrak{gl}_m)$. In the skew case, the 2-representation is realized in a category of matrix factorizations (a joint work with Mackaay). In the symmetric case, the 2-representation is realized in a bimodule category over a deformation of Webster algebra of type A_1 (a joint work with Khovanov, Lauda, and Sussan). As a consequence, we obtain a braid group action on the homotopy category of each of the above categories.

- 30 中岡宏行 (鹿児島大理工) On a unification of exact categories and triangulated categories 10
 Hiroyuki Nakaoka (Kagoshima Univ.) On a unification of exact categories and triangulated categories

概要 In this talk I will give a candidate notion to unify exact categories and triangulated categories. This talk is partly based on a joint work with Yann Palu. If the time permits, I will also introduce recent developments on this class of categories.

- 31 速水孝夫 (北海学園大工) On Hochschild cohomology ring and integral cohomology ring for the semidihedral group 10
 Takao Hayami (Hokkai-Gakuen Univ.) On Hochschild cohomology ring and integral cohomology ring for the semidihedral group

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

- 32 若竹昌洋 (近畿大総合理工) The unit group of a partial Burnside ring of a reducible Coxeter group of type A 10
 Masahiro Wakatake (Kindai Univ.) The unit group of a partial Burnside ring of a reducible Coxeter group of type A

概要 In this talk, I give a generalization of Matsuda's theorem and some results. In particular, I give isomorphism between partial Burnside rings of different groups. Moreover, I consider the relationship between an image of Frobenius–Wielandt homomorphism, a partial Burnside ring, and a structure of a group.

- 33 佐々木洋城 (信州大教育)* ブロック・イデアルのソース多元環の加群構造について 10
 Hiroki Sasaki (Shinshu Univ.) On module structures of source algebras of block ideals

概要 Let k be a field of prime characteristic p and G a finite group. We shall give a theorem on direct summands of a source algebra of a block ideal of the group algebra kG . Let b be a block ideal of kG with P as a defect group. If an element x in G satisfies some conditions, which cannot be written down here although, then the (kP, kP) -bimodule $k[PxP]$ is isomorphic with a direct summand of the source algebra of the block ideal with the multiplicity congruent to 1 modulo p .

- 34 澤 正 憲 (神戸大システム情報) 古典準直交多項式の判別式の明示公式とその応用 10
 内 田 幸 寛 (首都大東京理)
 Masanori Sawa (Kobe Univ.) Compact formulas for discriminants of classical quasi-orthogonal poly-
 Yukihiro Uchida (Tokyo Metro. Univ.) nomials, with their applictaions

概要 We derive explicit formulas for the discriminants of classical quasi-orthogonal polynomials, as a full generalization of the result of Dilcher and Stolarsky (2005). We consider a certain system of Diophantine equations, originally designed by Hausdorff (1909) as a simplification of Hilbert's solution (1909) of Waring's problem, and then create the relationship to quadrature formulas and quasi-Hermite polynomials. We reduce these equations to the existence problem of rational points on a hyperelliptic curve associated with discriminants of quasi-Hermite polynomials, and thereby show a nonexistence theorem for solutions of Hausdorff-type equations.

13:00~14:00 特別講演

- 山 崎 義 徳 (愛 媛 大 理) Schur 多重ゼータ関数について
 Yoshinori Yamasaki (Ehime Univ.) On Schur multiple zeta functions

概要 In this talk, we introduce what we call a Schur multiple zeta function. This is a zeta-function analogue of Schur function and interpolates both the multiple zeta and multiple zeta-star functions of Euler-Zagier type. We first show some combinatorial relations among Schur multiple zeta functions coming from theory of Schur functions such as Jacobi-Trudi and Giambelli formulas and then give some explicit formulas for special values at positive integers of them such as 1-3 formulas, which are analogues of those for above-mentioned multiple zeta functions. The former is a joint work with Maki Nakasuji and Ouamporn Phuksuwan and the latter is with Henrik Bachmann.

9月26日(水) 第VIII会場

9:15~11:25

- 35 矢 城 東 (東京電機大先端) L字型 windowに関する離散トモグラフィ 10
 南 綾 寧 (東京電機大理工)
 Tabane Yashiro (Tokyo Denki Univ.) Discrete tomography for the L-shaped window
 Ayane Minami (Tokyo Denki Univ.)

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

- 36 小 塚 和 人 (都城工高専)* p 進 Dedekind 和の modular 行列に関連した相互関係式 10
 Kazuhito Kozuka Reciprocity relations for p -adic Dedekind sums related to modular ma-
 (Miyakonojo Nat. Coll. of Tech.) trices

概要 In this talk, by making use of a modular matrix, we consider a generalization of the p -adic reciprocity formula for p -adic Dedekind sums due to Snyder.

- 37 D. Banerjee (IISER)* Mean square of the double zeta function 10
 南出 真 (山口大理)
 谷川 好男

Debika Banerjee (IISER) Mean square of the double zeta function
 Makoto Minamide (Yamaguchi Univ.)
 Yoshio Tanigawa

概要 We show mean square theorems of the double zeta function.

- 38 井上 翔太 (名大多元数理) A relation between the estimate of $S(t)$ and the zero density estimate
 in short intervals 10
 Shota Inoue (Nagoya Univ.) A relation between the estimate of $S(t)$ and the zero density estimate
 in short intervals

概要 The speaker studied on a function $S(t)$ which is related to the zero distribution of the Riemann zeta-function. This function has a well-known estimate under the assumption of the Riemann Hypothesis. The speaker has proved that this assumption can be weaken and is going to report the result in this talk.

- 39 中筋 麻貴 (上智大理工) Hook Schur 型多重ベルヌーイ数 10
 中村 直樹 (上智大理工)
 Maki Nakasuji (Sophia Univ.) Hook Schur type poly-Bernoulli numbers
 Naoki Nakamura (Sophia Univ.)

概要 The poly-Bernoulli numbers and its relative are defined by the generating series using the polylogarithm series, and we call them type B and C , respectively. As a generalization of these poly-Bernoulli numbers, we introduce hook Schur type Bernoulli numbers, which has relation with Schur multiple zeta functions of hook type. We obtain the relation between hook Schur type poly-Bernoulli numbers of type B and that of type C . Furthermore, we define a generalization of Arakawa–Kaneko multiple zeta functions and Kaneko–Tsumura type multiple zeta functions to hook Schur type, and obtain their expression using hook Schur type Bernoulli numbers.

- 40 広瀬 稔 (九大数理) 多重ゼータ値に対する正規化定理の多項式拡張 10
 村原 英樹 (中村学園大)
 齋藤 新悟 (九大基幹教育院)
 Minoru Hirose (Kyushu Univ.) Polynomial generalization of the regularization theorem for multiple
 zeta values
 Hideki Murahara (Nakamura Gakuen Univ.)
 Shingo Saito (Kyushu Univ.)

概要 Ihara, Kaneko, and Zagier defined two regularizations of multiple zeta values and proved the regularization theorem that describes the relation between those regularizations. We show that the regularization theorem can be generalized to polynomials whose coefficients are regularizations of multiple zeta values and that specialize to symmetric multiple zeta values defined by Kaneko and Zagier.

- 41 梅澤 瞭太 (名大多元数理) 多重ゼータ値と log-sine 積分について 10
 Ryota Umezawa (Nagoya Univ.) On multiple zeta values and log-sine integrals

概要 In 2001, J. M. Borwein, D. J. Broadhurst and J. Kamnitzer proved a formula including one multiple zeta value and values of multiple polylogarithms at $e^{\frac{\pi}{3}i}$. We show that this formula can be regarded as the formula including one multiple zeta value and values of log-sine integrals at $\pi/3$. Moreover, we introduce some applications of this formula to the theory of multiple zeta values.

- 42 飯高 茂 (学習院大*) スーパー完全数の平行移動 10
Shigeru Itaka (Gakushuin Univ.*) Super perfect numbers with translation parameters m

概要 Here, given an integer m , a is said to be a super perfect number with translation parameter m , if $\sigma(\sigma(a) + m) = 2a + m$. For $m = -28, -18, -14$, structure of super perfect numbers with translation parameters m are investigated in detail.

- 43 松田 康雄 (久留米工高専) 対称的な漸化式 10
Yasuo Matsuda On the symmetric recurrent formula
(Kurume Nat. Coll. of Tech.)

概要 We shall consider the radii of circles which are tangential to each other and to the quadratic curves. These radii are derived from ‘the symmetric recurrent formula’. The solutions of Pell’s equation and every other Fibonacci sequence are also derived from the symmetric recurrent formula. We shall research the characters of the symmetric recurrent formula and express the radii of circles in the quadratic curves by the symmetric recurrent formula uniformly. And more we shall express the solutions of Pell’s equation and the every other Fibonacci sequence as the radii of the circles in the hyperbola.

- 44 齋藤 耕太 (名大多元数理) 小湾曲列中の等差数列 10
吉田 裕哉 (名大多元数理)
Kota Saito (Nagoya Univ.) Arithmetic progressions in the graphs of slightly curved sequences
Yuuya Yoshida (Nagoya Univ.)

概要 This short talk gives that the graph of an increasing positive integer sequence approximated by a function whose second derivative goes to zero faster than or equal to $1/x^\alpha$ for some $\alpha > 0$, contains arbitrarily long arithmetic progressions. As a corollary, it follows that the graph of the sequence of the integer parts of $\{n^a\}_{n=1}^\infty$ contains arbitrarily long arithmetic progressions for every $1 \leq a < 2$. We also prove that the graph of the same form sequence does not contain any arithmetic progressions of length 3 for every $a \geq 2$.

- 45 丸山 文綱^b On the cardinality of subsets of the matrix ring over certain residue ring
出口 洋三 10
豊泉 正男 (東洋大理工)
Fumitsuna Maruyama On the cardinality of subsets of the matrix ring over certain residue ring
Yozo Deguchi
Masao Toyozumi (Toyo Univ.)

概要 We investigate the cardinality of subsets of the matrix ring over certain residue ring.

11:30~12:00 代数学分科会総会

14:15~15:15 特別講演

- 山崎 隆雄 (東北大理) モジュラス付きモチーフと混合 Hodge 構造
Takao Yamazaki (Tohoku Univ.) Motives and mixed Hodge structures with modulus

概要 We shall overview how the notion of modulus enables us to generalize many aspects of motive theory. One of the earliest examples can be seen in Laumon’s generalization of the theory of Deligne 1-motives. Another example is given by our work with Kahn and Saito on a modulus version of Voevodsky’s triangulated category of motives. Recently, in our joint work with Ivorra, we have introduced a Hodge theoretic counterpart that generalizes the classical notion of mixed Hodge structures. As an application, we generalize Kato–Russell’s construction of Albanese varieties with modulus to 1-motives.

15:30~17:40

- 46 渡辺文彦 (防衛大)* テータ因子の補集合の基本群 10
 Humihiko Watanabe Fundamental group of the complement of theta divisors
 (Nat. Defense Acad. of Japan)

概要 Let X be an abelian surface, and $D^{(n)}$ be the sum of n distinct theta divisors having normal crossings. A set of defining relations of the fundamental group of $X - D^{(n)}$ is determined.

- 47 武田 渉 (名大多元数理) The finiteness of solutions of Diophantine equation over number fields 10
 Wataru Takeda (Nagoya Univ.) The finiteness of solutions of Diophantine equation over number fields

概要 We consider a Diophantine equation about the factorial function over number fields. It is not known whether or not there exist infinitely many solutions of it. We give a necessary and sufficient condition for the existence of trivial solution and show the finiteness of trivial solutions. In addition we give an explicit upper bound for trivial solutions.

- 48 小関祥康 (神奈川大理) アーベル多様体のねじれ部分群と Lubin–Tate 拡大 10
 Yoshiyasu Ozeki (Kanagawa Univ.) Torsion of abelian varieties and Lubin–Tate extensions

概要 We show that, for an abelian variety defined over a p -adic field K which has potential good reduction, its torsion subgroup with values in the composite field of K and a certain Lubin–Tate extension over a p -adic field is finite.

- 49 兒玉浩尚 A note on the Sturm bound for Siegel modular forms of type $(k, 2)$... 10
 (工学院大学学習支援センター)
 Hirotaka Kodama (Kogakuin Univ.) A note on the Sturm bound for Siegel modular forms of type $(k, 2)$

概要 We consider a question about congruences for the Fourier coefficients of vector valued Siegel modular forms of type $(k, 2)$, which was answered by Sturm in the case of an elliptic modular form and by Choi–Choi–Kikuta, Poor–Yuen and Raum–Richter in the case of scalar valued Siegel modular form.

- 50 境 優一 Modular linear differential equations in general form 10
 (九大多重ゼータ研究センター)
 Yuichi Sakai (Kyushu Univ.) Modular linear differential equations in general form

概要 It is well known that modular linear differential equations (MLDEs) appear as one of tools in studies related to supersingular elliptic curves and classifications of characters of vertex operator algebras (VOAs). In some cases, MLDEs give a certain correspondence between modular forms and characters of VOAs. In this talk, we determine the properties of coefficients of MLDEs of any order. Furthermore, we give a general expression of MLDEs under the natural assumption for the ring structure of (quasi)modular forms.

- 51 河本史紀 (学習院大理) 偶数周期の最小元の性質について 10
 岸康弘 (愛知教育大教育)
 鈴木浩志 (名大多元数理)
 富田耕史 (名城大理工)
 Fuminori Kawamoto (Gakushuin Univ.) On some properties of the minimal elements with even period
 Yasuhiro Kishi (Aichi Univ. of Edu.)
 Hiroshi Suzuki (Nagoya Univ.)
 Koshi Tomita (Meijo Univ.)

概要 For an even positive integer ℓ , d'_ℓ denotes the smallest integer d such that the minimal period of the simple continued fraction expansion of \sqrt{d} is equal to ℓ , where d runs through non-square positive integers with d congruent to 2 or 3 modulo 4. We can observe some characteristic phenomena from numerical data; especially, for each even positive integer ℓ less than or equal to 83552, the class number of a real quadratic field $\mathbb{Q}(\sqrt{d'_\ell})$ is equal to 1. In this talk, we investigate partial quotients of the continued fraction expansions of \sqrt{d} , and then consider some properties of that of $\sqrt{d'_\ell}$.

- 52 河本史紀 (学習院大理) ある実2次体の系列における類数の下からの評価 10
 岸康弘 (愛知教育大教育)
 鈴木浩志 (名大多元数理)
 富田耕史 (名城大理工)
 Fuminori Kawamoto (Gakushuin Univ.) A lower bound for the class number of certain real quadratic fields
 Yasuhiro Kishi (Aichi Univ. of Edu.)
 Hiroshi Suzuki (Nagoya Univ.)
 Koshi Tomita (Meijo Univ.)

概要 The aim of this talk is to give a lower bound for the class number of real quadratic fields $\mathbb{Q}(\sqrt{d})$ of minimal type such that the primary symmetric part of the simple continued fraction expansion of \sqrt{d} is of ELE type. By applying this lower bound to a sequence $\langle 2, \dots, 2, 2, 1 \rangle$ of pre-ELE type, we get an infinite family of real quadratic fields with non-trivial class number.

- 53 塩見大輔 (山形大理) 2次の導手を持つ cyclotomic function field の類数の p 可除性について 10
 Daisuke Shiomi (Yamagata Univ.) On the p -divisibility of class numbers of cyclotomic function fields with conductor of degree two

概要 Let \mathbb{F}_q be the finite field with q elements. For a monic $m \in \mathbb{F}_q[T]$, let h_m be the class number of the m th cyclotomic function field. The goal of this talk is to determine the p -divisibility of h_m when $\deg m = 2$.

- 54 山本康太 (名工大) 二次多項式写像から生じる代数体の反復拡大について 10
 Kota Yamamoto (Nagoya Inst. of Tech.) On iterated extensions of number fields arising from quadratic polynomial maps

概要 A post-critically finite rational map ϕ of prime degree p yields a sequence of finitely ramified iterated extensions of number fields, and sometimes provides an arboreal Galois representation with a p -adic Lie image. In this talk, regarding such sequences by $\phi(x) = x^2 - 2$ as analogues of \mathbb{Z}_2 -extensions, we study the size of 2-part of ideal class groups along the sequences or 2-adic Lie extensions.

- 55 菅本 守 (アプリズム) ガロア理論を適用した量子力学…………… 10
菅本 晶夫
 (お茶の水女大理・放送大)
 Mamoru Sugamoto (aprrhythm inc.) Galois theory and quantum mechanics
 Akio Sugamoto
 (Ochanomizu Univ./Open Univ. of Japan)

概要 Quantization is studied from a viewpoint of Galois theory, in which the field in mathematics to which a partition function or a wave function in physics belongs, be the algebraic extension of the field in mathematics to which an action and fields of a system in physics belong. This viewpoint was proposed by Y. Nambu three decades ago. Here, choosing quantum mechanics (one dimensional field theory) as an example, it is shown that the different Galois extension corresponds to the different quantization scheme in physics. Although one type of Galois' extension reproduces the usual quantization scheme, there exist other schemes of quantization, if we follow Galois and Nambu.

- 56 金子 元 (筑波大数理物質) ベキ級数に代数的整数を代入した値の超越性…………… 10
 Hajime Kaneko (Univ. of Tsukuba) On the transcendence of the values of power series at algebraic integer points

概要 Many mathematicians have researched the transcendence of the values of power series at algebraic point α . In particular, Bailey, Borwein, Crandall, and Pomerance gave remarkable criterion for transcendence in the case where $\alpha = 1/2$. Consequently, we deduce that $\sum_{n=1}^{\infty} 2^{-\lfloor n^{\log n} \rfloor}$ is transcendental, which cannot be proved by early methods. Their result was generalized for the case of $\alpha = \beta^{-1}$, where β is a Pisot or Salem number. In this talk, we investigate partial results on the transcendence of the values of power series in the case where β is a more general algebraic integer.

9月27日(木) 第VIII会場

9:15~12:00

- 57 鳥居 猛 (岡山大自然) 3次行列環の部分代数のモジュライ (2)…………… 10
中本 和典 (山梨大医)
 Takeshi Torii (Okayama Univ.) On the moduli of subalgebras of the full matrix ring of degree 3 (Part II)
 Kazunori Nakamoto
 (Univ. of Yamanashi)

概要 We describe the moduli of 3-dimensional subalgebras of the full matrix ring of degree 3.

- 58 鳥居 猛 (岡山大自然) An application of Hochschild cohomology to the moduli of subalgebras
中本 和典 (山梨大医) of the full matrix ring…………… 10
 Takeshi Torii (Okayama Univ.) An application of Hochschild cohomology to the moduli of subalgebras
 Kazunori Nakamoto of the full matrix ring
 (Univ. of Yamanashi)

概要 Let $\text{Mold}_{n,d}$ be the moduli of d -dimensional subalgebras of the full matrix ring of degree n over \mathbb{Z} . We describe the dimension of the Zariski tangent space $T_x \text{Mold}_{n,d}$ and the smoothness of $\text{Mold}_{n,d} \rightarrow \mathbb{Z}$ at x by using Hochschild cohomology.

- 59 佐藤 悠介 (名大 多元数理) Hilb $^G(\mathbb{C}^4)$ and crepant resolutions of certain abelian group in $SL(4, \mathbb{C})$ 10
 Yusuke Sato (Nagoya Univ.) Hilb $^G(\mathbb{C}^4)$ and crepant resolutions of certain abelian group in $SL(4, \mathbb{C})$

概要 Let G be a finite subgroup of $SL(n, \mathbb{C})$, then the quotient \mathbb{C}^n/G has a singularity. $\text{Hilb}^G(\mathbb{C}^n)$ is known to be related to crepant resolutions of the quotient singularity. If $n = 2$ or 3 , $\text{Hilb}^G(\mathbb{C}^n)$ is crepant resolutions. But when n is greater than or equal to four, it is not in general cases. We will show the existence of a crepant resolutions for series of finite abelian subgroup of $SL(4, \mathbb{C})$ via $\text{Hilb}^G(\mathbb{C}^4)$.

- 60 泊 昌孝 (日大 文理)* n 次元 weighted homogeneous 正規特異点の座標系が被約元を与えるひとつの条件について 10
 Masataka Tomari (Nihon Univ.) A condition for a weighted homogeneous singularity to have a reduced coordinate function

概要 Let $R = \bigoplus_{k \geq 0} R_k$ be a n -dimensional normal graded ring with an algebraically closed field R_0 , and x_1, \dots, x_s be a minimal homogeneous generator x_1, \dots, x_s of the homogeneous maximal ideal R_+ . We will discuss a condition on the reducedness of x_i in terms of $\deg(x_i)$.

Theorem. (1) Let $i \in \{1, \dots, s\}$. If $c_i := \gcd(\deg(x_1), \dots, \deg(x_s)) \geq 2$, then $R/x_i R$ is reduced. (2) Let $i, j \in \{1, \dots, s\}$ and $i \neq j$. If $c_i \geq 2$ and $c_j \geq 2$, then x_i, x_j is a part of parameter system.

- 61 柴田 崇広 (京大 理)* Ample canonical heights for endomorphisms on projective varieties 10
 Takahiro Shibata (Kyoto Univ.) Ample canonical heights for endomorphisms on projective varieties

概要 Given a smooth projective variety on a number field and an endomorphism on it, we would like to know how the height of a point grows by iteration of the action of the endomorphism. When the endomorphism is polarized, Call and Silverman construct the canonical height, which is an important tool for the calculation of growth of heights. In this talk, we will give a generalization of the Call–Silverman canonical heights for not necessarily polarized endomorphisms, ample canonical heights, and propose an analogue of the Northcott finiteness theorem as a conjecture. We will see that the conjecture holds when the variety is an abelian variety or a surface.

- 62 山形 颯 (北大 理) Braid 配置の一般化とその組合せ論的構造について 10
 So Yamagata (Hokkaido Univ.) Generalization of braid arrangement and its combinatorics

概要 Hyperplane arrangement i.e., a finite set of hyperplanes relates to many mathematics and is studied widely. Representative example is the braid arrangement and a fundamental group of its complement coincides with the pure braid group. In 1989 Manin and Schechtman defined the discriminantal arrangement which is a generalization of braid arrangement. So far its combinatorial structure is studied mainly when original arrangement is in a Zariski open set in the space of general position arrangements. In this talk the speaker would talk about study of combinatorics of discriminantal arrangement when the original arrangement is not in the Zariski open set, and a related topic, Pappus's theorem.

- 63 工藤 陸 (早大理工) About counterexamples for Generalized Zariski Cancellation Problem
 10
 Riku Kudou (Waseda Univ.) About counterexamples for Generalized Zariski Cancellation Problem

概要 Generalized Zariski Cancellation Problem asks when $V \times_k \mathbb{A}^1 \simeq W \times_k \mathbb{A}^1$ implies $V \simeq W$. In general, this is not true, and many of counterexamples for this problem are constructed as principal \mathbb{G}_a -bundles over integral schemes of finite type over \mathbb{C} , so-called “prevariety”. In this talk, we show that for varieties V, W which has a principal \mathbb{G}_a -bundle structure over a prevariety X, Y , respectively, if a prevariety Y has a dominant morphism to a variety with nonnegative logarithmic kodaira dimension, then $V \times \mathbb{A}^1 \simeq W \times \mathbb{A}^1$ if and only if $X \simeq Y$. To prove this, We slightly generalize Fujita–Iitaka’s cancellation theorem (1977) and a generalized version of it by T. Nishimura (2017).

- 64 榎園 誠 (阪大理) 種数4の Eisenbud–Harris 特殊なファイバー曲面のスロープ等式 10
 Makoto Enokizono (Osaka Univ.) Slope equality of Eisenbud–Harris special fibrations of genus 4

概要 A non-hyperelliptic fibered surface $f: S \rightarrow B$ of genus 4 is called Eisenbud–Harris special (resp. Eisenbud–Harris general) if the general fiber of f has a unique trigonal pencil (resp. exactly two trigonal pencils). It is known that the slope equality holds for Eisenbud–Harris general fibrations of genus 4. In this talk, I will explain that the slope equality also holds for relatively minimal Eisenbud–Harris special fibrations of genus 4.

- 65 藤原 宏道 (早大理工) $(2, 2, 2, 2, 2; \lambda_1, \lambda_2)$ 型重み付き射影直線上の階数2直既約ベクトル束に関して 10
 Hiromichi Fujiwara (Waseda Univ.) On indecomposable vector bundles of rank two on a wighted projective line of type $(2, 2, 2, 2, 2; \lambda_1, \lambda_2)$

概要 We study the several properties on indecomposable vector bundles of rank two on a weighted projective line \mathbb{X} of type $(2, 2, 2, 2, 2; \lambda_1, \lambda_2)$. Since \mathbb{X} has the negative Euler characteristic, all vector bundles are not necessarily semi-stable. First, we check the stability of indecomposable vector bundles of rank two. Next, we check the exceptionality of all of them in the category of coherent sheaves $\text{coh}(\mathbb{X})$ and the exceptionality of some of them in the stable category of vector bundles $\text{vect}(\mathbb{X})$.

- 66 山田紀美子 (岡山理大理) Obstructed stable sheaves on elliptic surfaces —canonical singularities—
 10
 Kimiko Yamada Obstructed stable sheaves on elliptic surfaces —canonical singularities—
 (Okayama Univ. of Sci.)

概要 Let E be an obstructed stable sheaf on some elliptic surfaces with Kodaira dimension one, and we consider its deformation space over Artin rings. Suppose the number of multiple fibers is relatively few. If E_η has no sub line bundle with fiber degree zero (Case I), then E is a canonical singularity of moduli of stable sheaves.

- 67 山田紀美子 (岡山理大理) Obstructed stable sheaves on elliptic surfaces —not determined by degree-
 two terms— 10
 Kimiko Yamada Obstructed stable sheaves on elliptic surfaces —not determined by degree-
 two terms—
 (Okayama Univ. of Sci.)

概要 Let E be an obstructed stable sheaf on some elliptic surfaces with Kodaira dimension one, and we consider its deformation space over Artin rings. Suppose the number of multiple fibers is relatively few. If E_η has a sub line bundle with fiber degree zero, but not decomposable (Case II), then the defining equation of the deformation space of E is not always determined by degree-two terms.

- 68 須山 雄介 (阪大 理) Building set に伴うトーリック Fano 多様体 10
 Yusuke Suyama (Osaka Univ.) Toric Fano varieties associated to building sets

概要 We give a necessary and sufficient condition for the nonsingular projective toric variety associated to a building set to be Fano or weak Fano in terms of the building set.

- 69 須山 雄介 (阪大 理) Graph cubeahedron に伴うトーリック Fano 多様体 10
 Yusuke Suyama (Osaka Univ.) Toric Fano varieties associated to graph cubeahedra

概要 We give a necessary and sufficient condition for the nonsingular projective toric variety associated to the graph cubeahedron of a finite simple graph to be Fano or weak Fano in terms of the graph.

14:15~15:15 特別講演

- 阿部 拓郎 (九大 I M I) 超平面配置の対数的ベクトル場とその自由性
 Takuro Abe (Kyushu Univ.) Logarithmic vector fields and freeness of hyperplane arrangements

概要 A hyperplane arrangement \mathcal{A} is a finite set of linear hyperplanes in a fixed vector space. We may associate to an arrangement, the module of logarithmic vector fields $D(\mathcal{A})$ which is a graded reflexive module. We say that an arrangement is free if $D(\mathcal{A})$ is a free module. Free arrangements and logarithmic vector fields relates its algebraic structure with the topological and combinatorial aspects of arrangements. In particular, when \mathcal{A} is free, we can describe the topological Poincaré polynomial of the complement of \mathcal{A} in terms of the splitting type of $D(\mathcal{A})$ by Terao's factorization. However, to determine the freeness is difficult in general, and whether the freeness depends only on the combinatorial structure of an arrangement is an open problem, called the conjecture of Terao. We explain recent developments on this problem, mainly from the combinatorial point of view. Also, we will describe a recently found relation with logarithmic derivation modules and the cohomology ring of a regular nilpotent Hessenberg variety.

15:30~16:40

- 70 Eunjeong Lee ^b Generic torus orbit closures in Schubert varieties 10
 (KAIST・韓国基礎科研)
 柘田 幹也 (阪市大 理)
 Eunjeong Lee (KAIST/IBS) Generic torus orbit closures in Schubert varieties
 Mikiya Masuda (Osaka City Univ.)

概要 The closure of a torus orbit in the flag variety of type A is known to be normal, so that it is a toric variety. When the orbit is generic, its closure is known to be a permutohedral variety which is smooth. In this talk we introduce the notion of a generic orbit in a Schubert variety and give a criterion of the smoothness of its closure in terms of graphs associated to permutations.

- 71 川口 良 (奈良県医大) トーリック多様体における Castelnuovo 多様体の性質 10
 Ryo Kawaguchi (Nara Medical Univ.) The properties of toric Castelnuovo varieties

概要 For the geometrical sectional genus $g(X, L)$ of a polarized variety (X, L) has the well-known upper bound established by Fujita. Polarized varieties are called Castelnuovo varieties if $g(X, L)$ attains the upper bound, which are a higher-dimensional extension of extremal curves. In this talk, we consider polarized toric varieties, and provide some properties of toric Castelnuovo varieties. From the viewpoint of the theory of polytopes, these properties give the formulae for the volume and the boundary volume of the polytope associated to a Castelnuovo variety.

- 72 南 範彦 (名 工 大) Covering Higher Fano varieties by rational varieties 10
 Norihiko Minami Covering Higher Fano varieties by rational varieties
 (Nagoya Inst. of Tech.)

概要 We shall report k -Fano varieties, as was studied by de Jong–Starr and Araujo–Castravet, with appropriately large pseudo-index are covered by rational k -folds. We shall also report a similar claim for weak k -Fano varieties, as was studied by Taku Suzuki, with slightly larger pseudo-index.

- 73 鈴木 拓 (宇都宮大教育) ファノ多様体上の高階直線族 10
 Taku Suzuki (Utsunomiya Univ.) Higher order families of lines on Fano manifolds

概要 For an embedded Fano manifold X , we introduce chains of higher order families of lines and define a new invariant S_X as the maximal length of such chains. This invariant S_X is related to the dimension of covering linear spaces. Our goal is to classify Fano manifolds X which have large S_X .

- 74 岩見 智宏 (九 工 大 工)* Bogomolov–Miyaoka–Yau type inequality for a coherent system associated to certain 3-fold 10
 Tomohiro Iwami (Kyushu Inst. of Tech.) Bogomolov–Miyaoka–Yau type inequality for a coherent system associated to certain 3-fold

概要 This talk is a sequel to the previous one at the MSJ annual meeting (March, 2018), in which the author gave an analogue of Miyaoka–Yau type inequality for three-dimensional extremal contraction $(X, C) \rightarrow (Z, o)$ of type (IIA) with regarding to the associated third Chern class, and also showed that the existence of a kind of Harder–Narasimhan (HN) filtration about c_2, c_3 appearing in (X, C) , is a condition for such a analogous inequality with the third Chern class to be held. In this talk, the author will talk about an explicit formulation about such HN-filtration, and moreover, will give a realization about the pencil structure associated to (X, C) by the moduli space of a coherent system (Le Potier, Trautmann) associated to (X, C) based on such filtration.

- 75 土基 善文 (高知大理) Non-commutative Kähler projective varieties 10
 Yoshifumi Tsuchimoto (Kochi Univ.) Non-commutative Kähler projective varieties

概要 We define non-commutative Kähler projective varieties. Some cohomological features are examined.

幾何学

9月24日(月) 第VII会場

9:40~11:40

- 1 齋藤三郎 (群馬大*・再生核研)* Division by zero calculus in figures —Our new space since Euclid—
奥村博 (Draft) 10
Saburou Saitoh Division by zero calculus in figures —Our new space since Euclid—
(Gunma Univ.* / Inst. of Reproducing Kernels) (Draft)
Hiroshi Okumura

概要 In this talk, we will introduce new space results from the viewpoint of geometry from the book manuscript of division by zero calculus in figures —Our new space since Euclid— (Draft).

- 2 齋藤三郎 (群馬大*・再生核研)* Applications of the division by zero calculus to Wasan geometry 10
奥村博
Saburou Saitoh Applications of the division by zero calculus to Wasan geometry
(Gunma Univ.* / Inst. of Reproducing Kernels)
Hiroshi Okumura

概要 From the viewpoint of the division by zero ($0/0=1/0=z/0=0$) and the division by zero calculus, we will show interesting applications to Wasan geometry that show unexpected new discovery for some extreme cases. As a typical example, we will show a typical result for the old Japanese geometry, clearly.

- 3 古場一 (阪大基礎工) Double bubble 内の濃度拡散の数理モデリング 12
Hajime Koba (Osaka Univ.) Mathematical modeling of diffusion system on an evolving double bubble

概要 We consider the diffusion system on an evolving double bubble from an energetic point of view. We employ an energetic variational approach to make a mathematical model of the diffusion system on the double bubble. Moreover, we study the boundary conditions for our system to investigate both conservation and energy laws of the system.

- 4 佐藤雄一郎 (首都大東京理) 3次元特異擬ユークリッド空間 $\mathbb{R}^{0,2,1}$ 内の d -極小曲面 15
Yuichiro Sato (Tokyo Metro. Univ.) d -minimal surfaces in three-dimensional singular semi-Euclidean space
 $\mathbb{R}^{0,2,1}$

概要 In this talk, we investigate surfaces in singular semi-Euclidean space $\mathbb{R}^{0,2,1}$ endowed with a degenerate metric. We define d -minimal surfaces, and give a representation formula of Weierstrass type. Moreover, we show that d -minimal surfaces in $\mathbb{R}^{0,2,1}$ and spacelike flat zero mean curvature (ZMC) surfaces in four-dimensional Minkowski space are in one-to-one correspondence.

- 5 Joseph Cho (神戸大理) 平均曲率一定曲面とポジットン型解 15
緒方勇太 (沖縄工高専)
Joseph Cho (Kobe Univ.) Constant mean curvature surfaces and positon-like solutions
Yuta Ogata
(Okinawa Nat. Coll. of Tech.)

概要 The classical Bianchi–Bäcklund transformation for constant mean curvature surfaces in Euclidean 3-space has been studied by many researchers. In this talk, we introduce the method to construct positon-like solution of elliptic sinh-Gordon equation via successive Bianchi–Bäcklund transformations with a single spectral parameter. We also show the recipe of the corresponding constant mean curvature surfaces of positon-like solutions.

- 6 赤嶺新太郎 (名大多元数理) 時間的 Thomsen 曲面の分類と変形について 15
 Joseph Cho (神戸大理)
 緒方勇太 (沖縄工高専)
 Shintaro Akamine (Nagoya Univ.) Classification of timelike Thomsen surfaces and their deformations
 Joseph Cho (Kobe Univ.)
 Yuta Ogata
 (Okinawa Nat. Coll. of Tech.)

概要 Minimal surfaces with planar curvature lines and minimal surfaces which are also affine minimal in the Euclidean space have been studied since the late 19th century and early 20th century. In this talk, we reveal that timelike minimal surfaces in the Minkowski space which are also affine minimal consist of timelike minimal surfaces with planar curvature lines and their conjugates, and they are generated by null curves with constant lightlike curvature. We also give a classification, including results of deformations and singularities, of such surfaces.

- 7 榎吉奏子 Principal curvatures of homogeneous hypersurfaces in a Grassmann
 (お茶の水女大人間文化創成) manifold $\widetilde{Gr}_3(\text{Im}\mathbb{O})$ by the G_2 -action 15
 Kanako Enoyoshi (Ochanomizu Univ.) Principal curvatures of homogeneous hypersurfaces in a Grassmann
 manifold $\widetilde{Gr}_3(\text{Im}\mathbb{O})$ by the G_2 -action

概要 We compute principal curvatures of homogeneous hypersurfaces in a Grassmann manifold $\widetilde{Gr}_3(\text{Im}\mathbb{O})$ by the G_2 -action. As applications, we find an orbit which is an austere submanifold and orbits which are proper biharmonic homogeneous hypersurfaces. We also show that an orbit is a weakly reflective submanifold.

- 8 塚田和美 (お茶の水女大理) Examples of transversally complex submanifolds of the associative Grass-
 榎吉奏子 mann manifold 10
 (お茶の水女大人間文化創成)
 Kazumi Tsukada (Ochanomizu Univ.) Examples of transversally complex submanifolds of the associative Grass-
 Kanako Enoyoshi (Ochanomizu Univ.) mann manifold

概要 We consider the Grassmann manifold of associative subspaces in the space of imaginary octonions, which we call the associative Grassmann manifold. It is known that the associative Grassmann manifold is an eight-dimensional compact symmetric quaternionic Kähler manifold. We construct interesting examples of four-dimensional complex submanifolds of the associative Grassmann manifold.

14:15~16:15

- 9 前田陽一 (東海大理) 実特殊線形変換群 $SL(2, \mathbb{R})$ の3次元球面への埋め込みと, $SL(2, \mathbb{Z})$ の対
 称行列が形作る双曲的パターン 10
 Yoichi Maeda (Tokai Univ.) Embedding of $SL(2, \mathbb{R})$ into the three-dimensional sphere and a hyper-
 bolic pattern of symmetric matrices of $SL(2, \mathbb{Z})$

概要 Real special linear group $SL(2, \mathbb{R})$ is embedded into the three-dimensional sphere. We can see the three-dimensional sphere by the stereographic projection. Through this visualization, every matrix in $SL(2, \mathbb{R})$ is realized as a point in the three-dimensional Euclidean space. The set of symmetric matrices is on a Euclidean plane, and on this plane $SL(2, \mathbb{Z})$ makes a certain hyperbolic pattern.

- 10 島本直弥 (東大数理) Description of infinite orbits on multiple flag varieties: projective space case 15
 Naoya Shimamoto (Univ. of Tokyo) Description of infinite orbits on multiple flag varieties: projective space case

概要 Let G be a reductive group, P be its parabolic subgroup, and H be a closed subgroup of G . There are several studies on the orbit decomposition of the flag variety G/P by the H -action, and these studies are expected to play an important role in various problems such as branching problem of G with respect to H . These studies were mostly based on the cases where H has only finitely many orbits on the flag variety. We focus on explicit descriptions of the orbit decomposition of a multiple flag variety $(G \times G \times \cdots \times G)/(P_1 \times P_2 \times \cdots \times P_m)$ by the diagonal action of G with infinitely many orbits.

- 11 前多啓一 (東大数理) コンパクト Clifford–Klein 形を持つ分解不可能な符号 $(2, 2)$ の擬 Riemann 対称空間の分類 15
 Keiichi Maeta (Univ. of Tokyo) The classification of indecomposable pseudo Riemannian symmetric spaces with signature $(2, 2)$ which admit compact Clifford–Klein forms

概要 I will talk about the existence problem of compact Clifford–Klein forms for pseudo Riemannian symmetric spaces. I will show that in the class of indecomposable pseudo Riemannian symmetric space with signature $(2, 2)$, only one space up to isomorphism admits compact Clifford–Klein forms. To elucidate that, I have divided this problem into two cases – the first case in which the symmetric space G/H is completely solvable type and the second case is not. In the first case, for a compact Clifford–Klein form $\Gamma \backslash G/H$, there exists a connected and closed subgroup L which includes Γ cocompactly. Therefore, we can give the existence condition by using Lie algebra. In the second case, there is not necessarily such subgroup, I define a non-connected but ‘almost’ connected subgroup, and simplify the existence problem of compact Clifford–Klein forms into that of the subgroup.

- 12 権藤暁則 (広島大理) 非連結リー群による非コンパクト型対称空間への余等質性 1 作用 10
 Akinori Gondo (Hiroshima Univ.) Cohomogeneity one actions of disconnected Lie groups on symmetric spaces of noncompact type

概要 Cohomogeneity one actions of connected Lie groups on irreducible symmetric spaces of noncompact type have been classified into three types. In this talk, we study cohomogeneity one actions of disconnected Lie groups, and extend the above classification. We also study some relationships between the conditions for existence of such actions and geometry of their orbits.

- 13 大野晋司 (日大文理) 球面内の等質二重調和部分多様体 15
 Shinji Ohno (Nihon Univ.) Homegeneous biharmonic submanifolds in spheres

概要 In this talk, we give a necessary and sufficient condition for orbits of linear isotropy representations of Riemannian symmetric spaces are biharmonic submanifolds in hyperspheres. In particular, we obtain examples of biharmonic submanifolds in hyperspheres whose co-dimension is greater than one.

- 14 大野晋司 (日大文理) 一般化された s 多様体の対蹠集合 15
酒井高司 (首都大東京理)
寺内泰紀
 Shinji Ohno (Nihon Univ.) Antipodal sets of generalized s -manifolds
 Takashi Sakai (Tokyo Metro. Univ.)
 Yasunori Tereuchi

概要 In this talk, we give the definition of generalized s -manifolds as a generalization of symmetric spaces. Moreover, for a generalized s -manifolds, we introduce the notions of polars and antipodal sets, and define the antipodal number as the supremum of the cardinalities of antipodal sets.

We give s -structures on Flag manifolds, and determine maximal antipodal sets and the antipodal number.

- 15 田中真紀子 (東京理大理工) 古典型コンパクト対称空間の極大対蹠集合 I 15
田崎博之 (筑波大数理物質)
 Makiko Sumi Tanaka Maximal antipodal sets of classical compact symmetric spaces I
 (Tokyo Univ. of Sci.)
 Hiroyuki Tasaki (Univ. of Tsukuba)

概要 In previous MSJ meetings we gave the classification of maximal antipodal subgroups of the quotient groups of classical compact Lie groups. Using this classification we show the classification of maximal antipodal sets of classical compact symmetric spaces.

16:30~17:30 特別講演

- 森田陽介 (京大理) 非 Riemann 等質空間のコンパクト商のコホモロジー
 Yosuke Morita (Kyoto Univ.) On the cohomology of compact quotients of non-Riemannian homogeneous spaces

概要 If a discrete subgroup Γ of a Lie group G acts properly and freely on a homogeneous space G/H , the quotient space $\Gamma \backslash G/H$ becomes a manifold locally modelled on G/H , and is called a Clifford–Klein form. Since the initial work by T. Kobayashi (1989), the global geometry and topology of Clifford–Klein forms in the non-Riemannian case (i.e. the case when H is noncompact) has been studied by various methods. In this talk, I will explain some necessary conditions for the existence of compact Clifford–Klein forms obtained by comparing relative Lie algebra cohomology and de Rham cohomology. I will also discuss their reinterpretations in terms of invariant polynomials and Sullivan algebras.

9月25日(火) 第VII会場

10:10~10:25 2018年度日本数学会幾何学賞授賞式

10:30~11:30 2018年度日本数学会幾何学賞受賞特別講演 (トポロジー分科会と合同)

- 本多正平 (東北大理) Ricci 曲率が下に有界な特異空間上の幾何解析
 Shouhei Honda (Tohoku Univ.) Geometric analysis on metric measure spaces with Ricci bounds from below

概要 In this talk we will discuss the recent developments on the study of metric measure spaces with Ricci bounds from below and applications to Riemannian geometry. In particular it is explained how to construct nontrivial geometric/analytic quantities which are continuous with respect to measured Gromov–Hausdorff convergence.

13:15~14:15 特別講演

久本智之 (名大多元数理) 変分法から見た Kähler–Einstein 問題

Tomoyuki Hisamoto (Nagoya Univ.) A variational aspect of the Kähler–Einstein problem

概要 A Fano manifold admits a Kähler–Einstein metric if and only if it is K-polystable. This theorem was established by Chen–Donaldson–Sun around 2012. Such a standard metric is characterized as the critical point of the canonical energy functional and in fact the existence is equivalent to the proper growth condition of the energy, which implies that the modulus of stability can be taken uniformly in test configurations of the manifold. The idea is also for the purpose of attacking general constant scalar curvature metric problem and even in the Kähler–Einstein case it leads Berman–Boucksom–Jonsson to a new simple proof of the existence. More recently the unstable case attracts people’s interest and we expect the parabolic version of the theorem of Chen–Donaldson–Sun. Namely, the gradient flow of the energy functional should produce a unique test configuration which optimally destabilizes the manifold. In collaboration with T. Collins and R. Takahashi we showed the long-time existence of the flow. The relevant soliton metric and stability will be also discussed.

9月26日(水) 第VII会場

10:00~11:40

- 16 大鳥羽暢彦 (Univ. Regensburg)* スカラー曲率一定計量の分岐と調和な Riemann 沈め込み 15
J. Petean (CIMAT)

Nobuhiko Ooba (Univ. Regensburg) Bifurcation for the constant scalar curvature equation and harmonic
Jimmy Petean (CIMAT) Riemannian submersions

概要 We study bifurcation for the constant scalar curvature equation along a one-parameter family of Riemannian metrics on the total space of a harmonic Riemannian submersion. We provide an existence theorem for bifurcation points and a criterion to see that the conformal factors corresponding to the bifurcated metrics must be indeed constant along the fibers. In the case of the canonical variation of a Riemannian submersion with totally geodesic fibers, we characterize discreteness of the set of all degeneracy points along the family and give a sufficient condition to guarantee that bifurcation necessarily occurs at every point where the linearized equation has a nontrivial solution. In the model case of quaternionic Hopf fibrations, we show that symmetry-breaking bifurcation does not occur except at the round metric.

- 17 大鳥羽暢彦 (Univ. Regensburg) 直積 Riemann 多様体の多重共形類とスカラー曲率 15
S. Roos (MPIM)

Nobuhiko Ooba (Univ. Regensburg) Scalar curvature and the multiconformal class of a direct product Rie-
Saskia Roos (MPIM) mannian manifold

概要 For a closed, connected direct product Riemannian manifold $(M, g) = (M_1 \times \cdots \times M_l, g_1 \oplus \cdots \oplus g_l)$, we define its multiconformal class $\llbracket g \rrbracket$ as the totality $\{f_1^2 g_1 \oplus \cdots \oplus f_l^2 g_l\}$ of all metrics obtained from multiplying each g_i by a function $f_i^2 > 0$ on the total space M . A multiconformal class $\llbracket g \rrbracket$ contains not only all warped product type deformations of g but also the whole conformal class $[\tilde{g}]$ of every $\tilde{g} \in \llbracket g \rrbracket$. We prove that $\llbracket g \rrbracket$ carries a metric of positive scalar curvature if and only if the conformal class of some factor (M_i, g_i) does, under the technical assumption $\dim M_i \geq 2$. We also show that, even in the case where every factor (M_i, g_i) has positive scalar curvature, $\llbracket g \rrbracket$ carries a metric of scalar curvature constantly equal to -1 and with arbitrarily large volume, provided $l \geq 2$ and $\dim M \geq 3$. In this case, we observe that such negative scalar curvature metrics within $\llbracket g \rrbracket$ cannot be of any warped product type, provided $l = 2$.

- 18 池田 薫 (慶大経済)^b Heisenberg 群に関する symplectic 構造と実係数の特性類について 15
 Kaoru Ikeda (Keio Univ.) The symplectic structures on the Heisenberg groups and real characteristic classes

概要 We consider the quotient space of the Heisenberg group by its center. The Heisenberg group itself is the principal bundle of the quotient space. Thus one can define the line bundle over the quotient space by using the character of the center. The symplectic structure of the quotient space is defined by the curvature of the line bundle whose characteristic class is integral. We consider the symplectic structures of the quotient space of non integral classes and the relationship to the Stone–von Neumann theorem.

- 19 小澤龍ノ介 (阪大理) Stability of Riemannian curvature dimension condition under concentration topology 15
 横田 巧 (京大数理研)
 Ryunosuke Ozawa (Osaka Univ.) Stability of Riemannian curvature dimension condition under concentration topology
 Takumi Yokota (Kyoto Univ.)

概要 We talk about the stability of the Riemannian curvature dimension condition introduced by Ambrosio–Gigli–Savaré under the concentration of metric measure spaces introduced by Gromov. This is an analogue of the result of Funano–Shioya for the curvature dimension condition of Lott–Villani and Sturm. These conditions are synthetic lower Ricci curvature bound for metric measure spaces.

- 20 高津飛鳥 (首都大東京理)^b 退化した circle pattern に収束するトーラス上の組合せリッチ流 15
 Asuka Takatsu (Tokyo Metro. Univ.) Convergence of combinatorial Ricci flows on tori to degenerated circle patterns

概要 We investigate the combinatorial Ricci flow on a torus when the necessary and sufficient condition for the convergence of the combinatorial Ricci flow is not valid. This observation addresses one of questions raised by B. Chow and F. Luo.

14:15~16:15

- 21 伊敷喜斗 (筑波大数理物質) カントール距離空間の擬対称不変性質 15
 Yoshito Ishiki (Univ. of Tsukuba) Quasi-symmetric invariant properties of Cantor metric spaces

概要 For metric spaces, the doubling property, the uniform disconnectedness, and the uniform perfectness are known as quasi-symmetric invariant properties. The David–Semmes uniformization theorem states that if a compact metric space satisfies all the three properties, then it is quasi-symmetrically equivalent to the middle-third Cantor set. We say that a Cantor metric space is standard if it satisfies all the three properties; otherwise, it is exotic. In this talk, we conclude that for each of exotic types the class of all the conformal gauges of Cantor metric spaces exactly has continuum cardinality.

- 22 竹内 秀 (東北大理) 距離空間上のカレントと \flat 距離 15
 Shu Takeuchi (Tohoku Univ.) Currents in metric spaces and flat distances

概要 A triplet (X, d, T) is called an integral current space if (X, d) is a complete separable metric space and T is an integral current on (X, d) . In 2011, Sormani and Wenger defined the intrinsic flat distance between two integral current spaces, and proved a compactness theorem with respect to that distance. We generalize these results to the setting of locally integral current spaces, which may have infinite mass, by introducing the pointed intrinsic flat distance.

- 23 國川慶太 (東北大 AIMR) トランスレーティングソリトンの安定性とトポロジー 15
齋藤俊輔 (東北大 AIMR)
Keita Kunikawa (Tohoku Univ.) Stability and topology of translating solitons
Shunsuke Saito (Tohoku Univ.)

概要 Translating solitons (translators for short) are hypersurfaces in Euclidean space defined as critical points of some weighted volume functional. The notion of stability for translators is naturally introduced with respect to the weighted measure.

In this talk, we show a topological result for stable translators. Roughly speaking, a stable translator must have simple shape. To be more precise, a complete stable translator admits no codimension one cycle which does not disconnect the translator. In particular, for a two dimensional surface case, this result means that a stable translator has no genus.

- 24 只野 誉 (東京理大理) Some Cheeger–Gromov–Taylor type theorems for Finsler manifolds ... 15
Homare Tadano (Tokyo Univ. of Sci.) Some Cheeger–Gromov–Taylor type theorems for Finsler manifolds

概要 We establish some Cheeger–Gromov–Taylor type theorems for forward complete Finsler manifolds via Bakry–Émery Ricci curvature. Our results generalize the Myers type theorem for forward complete Finsler manifolds due to S.-i. Ohta.

- 25 澤井 洋 (沼津工高専) LCK 可解多様体における Vaisman 構造と複素構造について 15
Hiroshi Sawai
 (Numazu Nat. Coll. of Tech.) Vaisman structures and complex structures on LCK solvmanifolds

概要 In this talk, we give a necessary and sufficient condition of a LCK structure on a solvmanifold is a Vaisman structure. Thus, we see that Inoue surfaces and O–T manifolds has no Vaisman structures.

- 26 橋本義規 Twisted constant scalar curvature Kähler metrics with a large twist ... 15
 (Univ. degli Studi di Firenze)
Yoshinori Hashimoto Twisted constant scalar curvature Kähler metrics with a large twist
 (Univ. degli Studi di Firenze)

概要 Whether a constant scalar curvature Kähler (cscK) metric exists on a compact Kähler manifold is a question that attracted much attention in recent years. A continuity method for finding such metrics was proposed by X. X. Chen, which involves a twisted cscK metric that is an interesting object in its own right. We prove the openness for this continuity method, and quickly survey some relevant results.

- 27 本間泰史 (早大理工) The kernel of the Rarita–Schwinger operator on Riemannian spin man-
U. Semmelmann (Univ. Stuttgart) ifolds 15
Yasushi Homma (Waseda Univ.) The kernel of the Rarita–Schwinger operator on Riemannian spin man-
Uwe Semmelmann (Univ. Stuttgart) ifolds

概要 We study the Rarita–Schwinger operator on compact Riemannian spin manifolds. In particular, we find examples of compact Einstein manifolds with positive scalar curvature where the Rarita–Schwinger operator has a non-trivial kernel. For positive quaternion Kähler manifolds and symmetric spaces with spin structure we give a complete classification of manifolds admitting Rarita–Schwinger fields. In the case of Calabi–Yau, hyperkähler, G_2 and $Spin(7)$ manifolds we find an identification of the kernel of the Rarita–Schwinger operator with certain spaces of harmonic forms. We also give a classification of compact irreducible spin manifolds admitting parallel Rarita–Schwinger fields.

16:30～17:30 特別講演

藤田 玄 (日本女大理) シンプレクティック多様体上のディラック型作用素の指数とその局所化について

Hajime Fujita (Japan Women's Univ.) Index of Dirac-type operator on symplectic manifolds and its localization

概要 In this talk I will talk about developments of index theory of Dirac-type operator on symplectic manifolds. In particular I will focus on localization phenomena of index and localization technique using perturbation by Dirac-type operator along fibers. I am planning to talk about the following contents.

1. A motivation: geometric quantization
2. Localization formula of index: perturbation by Dirac-type operator along fibers
3. Applications
4. Further developments

函数論

9月24日(月) 第II会場

9:00~11:50

- 1 齋藤三郎 (群馬大*・再生核研)* Division by zero calculus 15
 Saburoou Saitoh Division by zero calculus
 (Gunma Univ.*/Inst. of Reproducing Kernels)

概要 In this talk, we will present the basic idea and results in connection with Complex Analysis from the book manuscript of division by zero calculus.

- 2 齋藤三郎 (群馬大*・再生核研)* The Descartes circles theorem and division by zero calculus 15
 奥村博
 Saburoou Saitoh The Descartes circles theorem and division by zero calculus
 (Gunma Univ.*/Inst. of Reproducing Kernels)
 Hiroshi Okumura

概要 From the viewpoint of the division by zero ($0/0=1/0=z/0=0$) and the division by zero calculus, we will show that the very beautiful theorem by descartes on three touching circles is valid for lines and points for circles except for one case. However, for the exceptional case, we can obtain interesting results from the division by zero calculus.

- 3 須川敏幸 (東北大情報) 双曲的穴あき球面の最短閉測地線の長さについて 15
 張坦然 (蘇州大)
 Toshiyuki Sugawa (Tohoku Univ.) On the length of the shortest closed geodesics in a hyperbolic punctured
 Tanran Zhang (Soochow Univ.) sphere

概要 Let X be a hyperbolic punctured sphere with n punctures. We will show that the number of possible partitions of the set of punctures with certain modulus greater than a universal constant is at most $n - 3$ and this number is the best possible. We also establish an analog of a collar lemma in hyperbolic geometry.

- 4 米谷文男 挙動 Span について 15
 Fumio Maitani Spans of meromorphic differentials restricted by boundary behavior

概要 We consider some generalizations of span and period circles related to period matrix. They are characterized by behavior spaces. By variational formulas of these quantities, as those of Hamano, but in the view of holomorphic quasiconformal deformation, sup or sub harmonicity of various spans are given.

- 5 柴雅和 (広島大*) 開リーマン面の closings —周期行列の複素正規化と方向モジュラスおよびそれらの応用 15
 Masakazu Shiba (Hiroshima Univ.*) Closings of an open Riemann surface —Hydrodynamic period matrices,
 directional moduli and their applications

概要 Let R be an open Riemann surface of genus g ($0 < g < \infty$) and $\chi = \{A_j, B_j\}_{j=1}^g$ be a fixed canonical homology basis of R modulo dividing cycles. Let $\Sigma^t(R)$ be the space of holomorphic hydrodynamic differentials on R , $t \in (-1, 1]$ being a parameter. The conventionally used subspace $\{\phi_j \text{ whose } A_k\text{-period is equal to } \delta_{jk} (j, k = 1, 2, \dots, g)\}$ of $\Sigma^t(R)$ is obviously incomplete, for $\dim_{\mathbb{R}} \Sigma^t(R) = 2g$. To get rid of this insufficiency we take, in addition to $\{\phi_j\}_{j=1}^g$ as above, $\phi_{g+j} \in \Sigma^t(R), j = 1, 2, \dots, g$ whose A_k -period is equal to $i\delta_{jk}$. The matrix formed by the B_k -periods of $\{\phi_j\}_{j=1}^{2g}$ is studied and some applications will be exhibited.

- 6 石崎克也 (放送大) Entire and meromorphic solutions of the functional equation $f^n + g^n + h^n = 1$ and differential equations 15
 木村直文 (放送大) $h^n = 1$ and differential equations 15
Katsuya Ishizaki (Open Univ. of Japan) Entire and meromorphic solutions of the functional equation $f^n + g^n + h^n = 1$ and differential equations
Naofumi Kimura (Open Univ. of Japan) $h^n = 1$ and differential equations

概要 The Fermat type functional equations $(*) f^n + g^n + h^n = 1$ are considered in the complex plane. Alternative proofs for the known results for entire and meromorphic solutions to $(*)$ are given. Moreover, some conditions on degrees of polynomial solutions are given.

- 7 松崎克彦 (早大教育) Myrberg limit set and horospheric limit set 15
 K. Falk
 (Christian-Albrechts-Univ. zu Kiel)
Katsuhiko Matsuzaki (Waseda Univ.) Myrberg limit set and horospheric limit set
 Kurt Falk
 (Christian-Albrechts-Univ. zu Kiel)

概要 It is proved that the Myrberg limit set of a non-elementary Kleinian group is contained in the horospheric limit set of any non-trivial normal subgroup.

- 8 平田賢太郎 (広島大理) 半線形楕円型問題の正值解に対する評価 15
 Kentaro Hirata (Hiroshima Univ.) An estimate for positive solutions of a semilinear elliptic problem

概要 In this talk, we give two sided estimates for positive solutions of a semilinear elliptic equation with zero Dirichlet boundary value.

- 9 神本 丈 (九大数理) Non-polar singularities of local zeta functions in some smooth case ... 15
 野瀬敏洋 (福岡工大)
Joe Kamimoto (Kyushu Univ.) Non-polar singularities of local zeta functions in some smooth case
 Toshihiro Nose (Fukuoka Inst. of Tech.)

概要 It is known that local zeta functions associated with real analytic functions can be analytically continued as meromorphic functions to the whole complex plane. In this talk, the case of specific (non-real analytic) smooth functions is precisely investigated. Indeed, asymptotic limits of the respective local zeta functions at some singularities in one direction are explicitly computed. Surprisingly, it follows from these behaviors that these local zeta functions have singularities different from poles.

- 10 野瀬敏洋 (福岡工大) Meromorphy of local zeta functions in smooth model cases 15
 神本 丈 (九大数理)
Toshihiro Nose (Fukuoka Inst. of Tech.) Meromorphy of local zeta functions in smooth model cases
 Joe Kamimoto (Kyushu Univ.)

概要 It has been announced in the previous talk that local zeta functions associated with some specific smooth functions have singularities different from poles. In connection with the investigation of such singularities, we consider the meromorphy of local zeta functions in the case of smooth models represented as the summation of a monomial term and some flat terms. Then we obtain certain regions depending only on the above monomial terms to which local zeta functions can be meromorphically continued, and their poles are contained in arithmetic progressions constructed of negative rational numbers. From the results of the previous talk, it is expected that our result relating to the above regions is optimal for the model cases in some sense.

14:15~15:15 特別講演

- 中村 豪 (愛知工大) 極値的円板を許容する閉リーマン面
 Gou Nakamura (Aichi Inst. of Tech.) Closed Riemann surfaces admitting extremal disks

概要 On the moduli space \mathcal{M}_g of closed Riemann surfaces of genus $g \geq 2$ we define the function r_{\max} which maps each surface to its maximal injectivity radius. A surface attaining the maximum of r_{\max} is called an extremal surface. There are finitely many extremal surfaces in \mathcal{M}_g for every g . A Riemann surface is said to be symmetric if it admits an anti-conformal involution. It is known that the set of all symmetric Riemann surfaces in \mathcal{M}_g is connected. A study of symmetric Riemann surfaces is related to that of Klein surfaces. Extremality is defined for closed Klein surfaces as well as for closed Riemann surfaces. In this talk we study some properties of extremal Riemann surfaces with respect to symmetricity and complex doubles of extremal Klein surfaces.

15:30~16:20

- 11 中根 静男 (東京工芸大) Fiber Julia sets for maps with super-saddle fixed points 15
 Shizuo Nakane Fiber Julia sets for maps with super-saddle fixed points
 (Tokyo Polytechnic Univ.)

概要 We investigate the behavior of fiber Julia sets for polynomial skew products with super-saddle fixed points. It turns out that the Lavaurs map is identically equal to zero. We will show that the fiber Julia sets converge to the fiber Julia–Lavaurs set defined by the zero Lavaurs map.

- 12 松谷 茂樹 (佐世保工高専) Jacobi inversion formulae for a compact Riemann surface via Weierstrass normal form 15
 米田 二良 (神奈川工大) E. Previato (Boston Univ.)
 Shigeki Matsutani Jacobi inversion formulae for a compact Riemann surface via Weierstrass normal form
 (Sasebo Nat. Coll. of Tech.)
 Jiryo Komeda (Kanagawa Inst. of Tech.)
 Emma Previato (Boston Univ.)

概要 In this talk, we show the Jacobi inversion formulae of a compact Riemann surface X of genus g via the Weierstrass normal form (WNF). As a curve given by the WNF naturally appears in Weierstrass' elliptic function theory, its generalization to a general curve also behaves naturally, which was proposed by Weierstrass. Using the WNF, we give the explicit expressions of meromorphic functions of $S^k X$ ($k < g$) in terms of theta function for the related Jacobi variety.

- 13 松谷 茂樹 (佐世保工高専) On σ function for the curve, $y^3 = x(x-s)(x-b_1)(x-b_2)$ and its limit
 米田 二良 (神奈川工大) of $s \rightarrow 0$ 15
 E. Previato (Boston Univ.)
 Shigeki Matsutani On σ function for the curve, $y^3 = x(x-s)(x-b_1)(x-b_2)$ and its limit
 (Sasebo Nat. Coll. of Tech.) of $s \rightarrow 0$
 Jiryo Komeda (Kanagawa Inst. of Tech.)
 Emma Previato (Boston Univ.)

概要 In this talk, we show the behaviors of σ function and its related variables of an affine curve X_s given by $y^3 = x(x-s)(x-b_1)(x-b_2)$ for a limit $s \rightarrow 0$. Since X_0 is singular, its normalized curve \widehat{X}_0 naturally appears. We have investigated the σ functions of both X_s ($s \neq 0$) and \widehat{X}_0 for a decade. Using these results, we report the behaviors.

16:35~17:35 特別講演

泊 昌 孝 (日 大 文 理)* 2次元正規複素特異点の特異点解消過程による最近の研究

Masataka Tomari (Nihon Univ.) On recent studies on normal two-dimensional complex singularities via resolution process

概要 We will report recent developments on the studies of normal two-dimensional complex singularities by means of resolution of singularities. According to special conditions, we can construct several resolution of singularities which reflects its own characteristic properties.

Main Theme is the identification of the maximal ideal cycle by the Artin fundamental cycle.

This is one of famous and old theme in this field. Here, we will discuss the following special cases.

(1) Case with C^* -action, and more generally, normal two-dimensional singularities with star-shaped resolution

(2) About the condition of the normalized tangent cone; if it is reduced, this is a Kodaira singularity, we also general case in the relation with this class

(3) Case with star-shaped resolution where the central curve is a nonsingular rational curve. This is a special case of (1). We can talk about more precise characterization about $Z=M$

(4) Case of the form $z^2 - f(x, y) = 0$. We can characterize the situation with $Z^2 = -1$. As a result, we obtain the characterization of $f(x, y)$ with $M = Z$ in terms of Puiseux pairs.

Here many parts are based on the joint work with Tadashi Tomaru.

9月25日(火) 第II会場

9:00~11:45

14 岩井 雅 崇 (東 大 数 理) 多重随伴束の順像に関する大域切断生成性について 15

Masataka Iwai (Univ. of Tokyo) On the global generation of direct images of pluri-adjoint line bundles

概要 We study the Fujita-type conjecture proposed by Popa and Schnell. We obtain an effective bound on the global generation of direct images of pluri-adjoint line bundles on the regular locus. We also obtain an effective bound on the generic global generation for a Kawamata log canonical \mathbb{Q} -pair. We use analytic methods such as L^2 estimates, L^2 extensions and injective theorems of cohomology groups.

15 岩井 雅 崇 (東 大 数 理) ベクトル束の特異エルミート計量に関する消滅定理 15

Masataka Iwai (Univ. of Tokyo) Vanishing theorems of vector bundles with singular Hermitian metrics

概要 We study a singular Hermitian metric of a vector bundle. we prove the sheaf of locally square integrable holomorphic sections of a vector bundle with a singular Hermitian metric, which is a higher rank analogy of a multiplier ideal sheaf, is coherent under some assumptions. Moreover, we prove a Nadel–Nakano type vanishing theorem of a vector bundle with a singular Hermitian metric.

16 岩井 雅 崇 (東 大 数 理) 特異エルミート計量を用いたねじれない接続層の弱正値性の特徴付け 15

Masataka Iwai (Univ. of Tokyo) Characterization of weakly positive torsion-free coherent sheaves by singular Hermitian metrics

概要 We give complex geometric descriptions of the notions of algebraic geometric positivity of torsion-free coherent sheaves, such as dd-ample at some point and weakly positive, by using singular Hermitian metrics.

- 17 丸 亀 泰 二 (台湾中研院) Self-dual Einstein ACH metric and CR GJMS operators in dimension three 15
 Taiji Marugame (Academia Sinica) Self-dual Einstein ACH metric and CR GJMS operators in dimension three

概要 Let M be a three dimensional strictly pseudoconvex CR manifold. By refining Matsumoto's construction, we construct a one parameter family of ACH metrics $g_{I\bar{J}}^\lambda$ ($\lambda \in \mathbb{R}$) on $M \times [0, \infty)_\rho$, which solve the Einstein equation to infinite order. When $\lambda = 0$, the metric $g_{I\bar{J}}^0$ is also self-dual to infinite order. As an application, we give another proof of the fact that a three dimensional CR manifold admits CR invariant powers of the sublaplacian of all orders, which was shown by Gover–Graham.

- 18 足 立 真 訓 (静岡大理) 非定数有界正則関数を持たない超凸多様体 10
 Masanori Adachi (Shizuoka Univ.) On a hyperconvex manifold without non-constant bounded holomorphic functions

概要 An example is given of a hyperconvex manifold without non-constant bounded holomorphic functions, which is realized as a domain with real-analytic Levi-flat boundary in a projective surface.

- 19 千 葉 優 作 (お茶の水女大基幹) Cohomology of non-pluriharmonic loci 15
 Yusaku Tiba (Ochanomizu Univ.) Cohomology of non-pluriharmonic loci

概要 Let D be a pseudoconvex domain in \mathbb{C}^n for $n \geq 4$. Let φ be an exhaustive plurisubharmonic function on D . Our main theorem is the following: The direct limit of the cohomology of open sets which contain the support of $i\partial\bar{\partial}\varphi$ is equal to the cohomology of D in low degrees. This theorem may be regarded as a pseudoconvex counterpart of the Lefschetz hyperplane theorem.

- 20 大 沢 健 夫 (名大多元数理)^b 西野の剛性定理の L^2 拡張定理による別証 15
 Takeo Ohsawa (Nagoya Univ.) L^2 proof of Nishino's rigidity theorem

概要 Applying an L^2 extension theorem, an alternate proof of the following is given. Theorem (T. Nishino, 1969) Let X be a two dimensional Stein manifold and let π be a holomorphic submersion from X onto the unit disc $\mathbb{D} = \{t \in \mathbb{C}; |t| < 1\}$. Assume that every fiber of π is homomorphically equivalent to \mathbb{C} . Then π is homomorphically equivalent to the projection $\mathbb{C} \times \mathbb{D} \rightarrow \mathbb{D}$.

- 21 阿 部 幸 隆 (富山大理工)^b Geometrically simple quasi-abelian varieties 15
 Yukitaka Abe (Univ. of Toyama) Geometrically simple quasi-abelian varieties

概要 We define the geometric simpleness for toroidal groups. We give an example of quasi-abelian variety which is geometrically simple, but not simple. We show that any quasi-abelian variety is isogenous to a product of geometrically simple quasi-abelian varieties. We also show that the \mathbb{Q} -extension of the ring of all endomorphisms of a geometrically simple quasi-abelian variety is a division algebra over \mathbb{Q} .

- 22 児 玉 秋 雄 (金 沢 大*)^b A group-theoretic characterization of the Fock–Bargmann–Hartogs domains 15
 Akio Kodama (Kanazawa Univ.*) A group-theoretic characterization of the Fock–Bargmann–Hartogs domains

概要 Let M be a connected Stein manifold of dimension N and let D be a Fock–Bargmann–Hartogs domain in \mathbb{C}^N . In this talk, we announce the following result: If the identity component of $\text{Aut}(M)$ is isomorphic to $\text{Aut}(D)$ as topological groups, then M is biholomorphically equivalent to D . As a consequence of this, we obtain a fundamental result on the topological group structure of $\text{Aut}(D)$.

- 23 清水 悟 (東北大理) ^b 等質有界領域の準局所的特徴付け 15
Satoru Shimizu (Tohoku Univ.) A semi-local characterization of homogeneous bounded domains

概要 In geometry of complex bounded domains, it is an interesting theme to characterize locally the domains with some global characteristic. In this talk, we give a semi-local characterization of homogeneous bounded domains. As applications, we obtain a characterization of bounded symmetric domains as well as a characterization of certain nonsymmetric homogeneous bounded domains.

13:15~14:20

- 24 正岡 弘 照 (京都産大理) 開 Riemann 面上の Heins 型定理について 15
Hiroaki Masaoka (Kyoto Sangyo Univ.) On a Heins-type theorem on open Riemann surfaces

概要 Let F be an open Riemann surface which admits Green's function on F , Δ_1 the minimal Martin boundary of F , and D a non-compact and regular subdomain of F whose relative boundary ∂D of D is not compact. $\Delta_1(D) := \{\zeta \in \Delta_1 \mid F \setminus D \text{ is minimally thin at } \zeta\}$. Suppose that every difference between two non-negative harmonic functions on D vanishing ∂D has the same minimal fine limit at every point $\Delta_1(D)$. Then, we prove that $\Delta_1(D)$ consists of only one point.

- 25 濱田 英 隆 (九州産大理工) A Schwarz lemma at the boundary for pluriharmonic mappings 10
Hidetaka Hamada A Schwarz lemma at the boundary for pluriharmonic mappings
(Kyushu Sangyo Univ.)

概要 In this talk, we give a simple proof for the boundary Schwarz lemma for pluriharmonic mappings between Euclidean unit balls. We also give some generalization to C^1 -mappings between domains with smooth boundaries.

- 26 濱田 英 隆 (九州産大理工) A Schwarz lemma at the boundary on finite dimensional irreducible bounded symmetric domains 15
Hidetaka Hamada A Schwarz lemma at the boundary on finite dimensional irreducible bounded symmetric domains
(Kyushu Sangyo Univ.)

概要 In this talk, we prove a Schwarz lemma at the boundary for holomorphic self-mappings f of finite dimensional irreducible bounded symmetric domains without assuming the boundary regularity of f . Our result generalizes the previous results obtained for holomorphic self-mappings f of the Euclidean unit ball, or of the classical Cartan domains of type I and of type II which are smooth up to the boundary.

- 27 I. Graham (Univ. of Toronto) A Schwarz lemma at the boundary on complex Hilbert balls and applications to starlike mappings 15
濱田 英 隆 (九州産大理工) G. Kohr (Babeş-Bolyai Univ.)
Ian Graham (Univ. of Toronto) Hidetaka Hamada (Kyushu Sangyo Univ.) Gabriela Kohr (Babeş-Bolyai Univ.)
A Schwarz lemma at the boundary on complex Hilbert balls and applications to starlike mappings

概要 In this talk, we first generalize the boundary Schwarz lemma for holomorphic mappings f to infinite dimension by assuming the existence of the radial limit $\lim_{r \rightarrow 1-0} Df(rz_0)z$ for each $z \in H_1$. Next, by applying the boundary Schwarz lemma for holomorphic mappings between the Euclidean unit balls, we obtain two distortion theorems for various subclasses of the class of normalized starlike mappings.

- 28 I. Graham (Univ. of Toronto) A boundary rigidity theorem for holomorphic self-mappings of Hilbert
濱田英隆 (九州産大理工) balls 5
G. Kohr (Babeş-Bolyai Univ.)
Ian Graham (Univ. of Toronto) A boundary rigidity theorem for holomorphic self-mappings of Hilbert
Hidetaka Hamada balls
(Kyushu Sangyo Univ.)
Gabriela Kohr (Babeş-Bolyai Univ.)

概要 In this talk, we obtain a boundary rigidity theorem for holomorphic self-mappings of Hilbert balls in the case that there exists an interior fixed point.

函数方程式論

9月24日(月) 第I会場

9:15~12:00

- 1 小川原弘士(熊本大先端) 三角作用素と関数方程式系の解について 10
 Hiroshi Ogawara (Kumamoto Univ.) On solutions for a system of functional equations with triangular operators

概要 Poincaré investigated relationships between analytic properties of a system of q -difference equations and that of its solutions. In this talk, we extend the relationships to a system of functional equations with more general operators called convergent triangular operators, which act on formal power series as infinite triangular matrices.

- 2 松原幸栄(神戸大理) 時間遅れ付き定数係数線形偏微分方程式系の Ehrenpreis–Malgrange 型定理に対する留数 current による接近法 10
 Saiei-Jaeyeong Matsubara-Heo Residue current approach to Ehrenpreis–Malgrange type theorem for linear partial differential equations with constant coefficients and commensurate time lags
 (Kobe Univ.)

概要 We consider a system of linear linear partial differential equations with constant coefficients and commensurate time lags ($D\Delta$ -system) and show that compatibility condition is the necessary and sufficient for the solvability of the system. Moreover, we show that solutions of a homogeneous $D\Delta$ -system can be approximated by exponential polynomial solutions. The proof is essentially reduced to a problem in complex harmonic analysis: division with bounds. The key technique is the division formula of M. Andersson whose integration kernel is expressed by residue currents. Another important tool is the use of a non-Nötherian ring of $D\Delta$ -operators introduced by H. Glüsing-Lürßen.

- 3 松原幸栄(神戸大理) GKZ 超幾何函数の Euler 型積分表示とねじれサイクルの交点理論 10
 Saiei-Jaeyeong Matsubara-Heo Euler integral representations of GKZ hypergeometric functions and intersection theory of twisted cycles
 (Kobe Univ.)

概要 Regular GKZ hypergeometric functions are known to have Euler integral representations. In this talk, we give a basis of twisted cycles under a generic assumption of parameters with the aid of regular triangulations. Since this basis can easily be related to a basis consisting of Γ -series, we can also determine intersection matrix when the regular triangulation is unimodular.

- 4 広田高輝(立命館大理工)^b Real eigenvalues of the semiclassical Zakharov–Shabat operator with \mathcal{PT} -like symmetry 10
 Koki Hirota (Ritsumeikan Univ.) Real eigenvalues of the semiclassical Zakharov–Shabat operator with \mathcal{PT} -like symmetry

概要 We study the eigenvalues of the self-adjoint Zakharov–Shabat operator corresponding to the defocusing nonlinear Schrödinger equation in the inverse scattering method. Real eigenvalues exist when the square of the potential has a simple well. We derive two types of quantization condition for the eigenvalues by using the exact WKB method, and show, moreover, that the eigenvalues stay real for a sufficiently small non-self-adjoint perturbation when the potential has some \mathcal{PT} -like symmetry.

- 5 松永秀章 (阪府大理) ある2次元分数型差分方程式の解の漸近挙動の分類 10
鈴木理菜
Hideaki Matsunaga (Osaka Pref. Univ.) Classification of global behavior of a system of rational difference equations
Rina Suzuki

概要 This talk deals with a two-dimensional rational difference system which is related to the Riccati difference equation. The purpose of this talk is to give a representation formula of solutions and to classify global behavior of solutions when no initial values belong to the forbidden set of the system.

- 6 宇佐美広介 (岐阜大工)* 一般化サイクロイドに関する逆問題 10
青木一央 (郡上高)
Hiroyuki Usami (Gifu Univ.) Inverse problems for generalized cycloids
Kazuhiro Aoki (Gujo High School)

概要 Let C be a given smooth planar curve, and let us roll a unit circle around it. Then a point on the perimeter of the circle traces a new curve G . We call such G a generalized cycloid generated by C . We consider the following inverse problems: (i) what kind of planar curves are realized as generalized cycloids? and (ii) for a given curve G how can we find the curve which generates G as a generalized cycloid?

- 7 佐野めぐみ (東工大理) 単調減少ではない球対称ポテンシャル関数をもつ臨界 Hardy 不等式に関連した最小化問題 10
Megumi Sano (Tokyo Tech) Minimization problems related to the critical Hardy inequalities with radial potential functions which are not monotone decreasing.

概要 We consider minimization problems associated with best constants of the generalized critical Hardy inequalities. Especially, we consider an open problem mentioned by Horiuchi and Kumlin in 2012, and give a partial answer to it. Note that we can not apply the rearrangement technique since our potential functions are not radially decreasing in general.

- 8 濱本直樹 (阪市大理) Curl-free ベクトル場に対する Hardy–Leray 及び Rellich–Leray 不等式
高橋太 (阪市大理) について 10
Naoki Hamamoto (Osaka City Univ.) Hardy–Leray and Rellich–Leray inequalities for curl-free vector fields
Futoshi Takahashi (Osaka City Univ.)

概要 We report on the Hardy–Leray and the Rellich–Leray inequalities with best constants for curl-free vector fields. Costin–Maz’ya proved the sharp Hardy–Leray inequality for axisymmetric divergence-free vector-fields. In two dimensional case the optimal constant coincides with that for curl-free vector fields. Our aim is to see how the best constant changes in higher dimensions if the condition of divergence-free is replaced by that of curl-free.

- 9 高橋太 (阪市大理) 一般有界領域上での臨界 Hardy 不等式について 10
Jaeyoung Byeon (KAIST)
Futoshi Takahashi (Osaka City Univ.) Hardy’s inequality in a limiting case on general bounded domains
Jaeyoung Byeon (KAIST)

概要 We study Hardy’s inequality in a limiting case on a bounded domain Ω in \mathbb{R}^N with $R = \sup_{x \in \Omega} |x|$. We study the attainability/non-attainability of the best constant in the inequality in several cases.

- 10 猪奥倫左 (愛媛大理)^b Attainability of the best Sobolev constants in a ball 10
 Norisuke Ioku (Ehime Univ.) Attainability of the best Sobolev constants in a ball

概要 The best constant of the Sobolev inequality in the whole space is attained by the Aubin–Talenti function, but not in bounded domains since the dilation invariance is breaking. We investigate a new scale invariant form of the Sobolev inequality in a ball, and show that its best constant is attained by Aubin–Talenti type functions.

- 11 柴田将敬 (東工大) Asymptotic property of ground states for a class of quasilinear Schrödinger
 足達慎二 (静岡大工) equation with H^1 -critical growth 10
 渡辺達也 (京都産大理)
 Masataka Shibata (Tokyo Tech) Asymptotic property of ground states for a class of quasilinear Schrödinger
 Shinji Adachi (Shizuoka Univ.) equation with H^1 -critical growth
 Tatsuya Watanabe
 (Kyoto Sangyo Univ.)

概要 In this talk, we consider ground states for a class of quasilinear Schrödinger equation. We give the precise asymptotic behavior of ground states when the nonlinearity has H^1 -critical growth.

- 12 豊田洋平 (阪大基礎工) 2D Trudinger–Moser inequality for Boltzmann–Poisson equation with
 鈴木貴 (阪大 MMS) continuously distributed multi-intensities 10
 Yohei Toyota (Osaka Univ.) 2D Trudinger–Moser inequality for Boltzmann–Poisson equation with
 Takashi Suzuki (Osaka Univ.) continuously distributed multi-intensities

概要 In this talk we study a functional associated with the mean field limit of the point vortex distribution, that is,

$$J_\lambda(v) = \frac{1}{2} \|\nabla v\|_2^2 - \lambda \int_{I_+} \log \left(\int_\Omega e^{\alpha v} dx \right) \mathcal{P}(d\alpha), \quad v \in H_0^1(\Omega)$$

where $\lambda > 0$ is a constant, $\Omega \subset \mathbb{R}^2$ is a smooth bounded domain and $\mathcal{P}(d\alpha)$ is a Borel probability measure on $I_+ = [0, 1]$. We show the boundedness of J_λ from below with the extremal case for λ when $\mathcal{P}(d\alpha)$ is continuous and satisfies the suitable assumptions.

- 13 大塚厚二 鞍点型変分問題での形状感度解析と一般 J 積分 10
 (広島国際学院大情報文化)
 V. A. Kovtunenکو (Karl-Franzens-Univ. Graz)
 Kohji Ohtsuka Shape sensitivity analysis via min-max differentiability and Generalized
 (Hiroshima Kokusai Gakuin Univ.) J-integral
 Victor A. Kovtunenکو (Karl-Franzens-Univ. Graz)

概要 Generalized J-integral is the tool which is effective to study the shape optimization of singular points (containing boundary) with respect to various cost functions in boundary value problems for partial differential equations. I will talk shape sensitivity analysis of the energy using the sensitivity analysis of saddle point and propose Generalized J-integral in Stokes problem.

14:15~16:15

- 14 西口純矢 (東北大RACMaS) 遅延微分方程式に対する岡村の距離関数と解の一意性のための十分条件
 10
 Junya Nishiguchi (Tohoku Univ.) Okamura's distance function and a sufficient condition for the uniqueness of solutions for delay differential equations

概要 The uniqueness of solutions for a given initial value problem is one of the fundamental problems in the theory of differential equations. For ordinary differential equations without time lag, Okamura gave a necessary and sufficient condition for the uniqueness by using the so-called "Okamura's distance function." The important fact is the following: the function is continuously differentiable, and therefore, the condition for the uniqueness is given by information of the differential equation. In this talk, I give a condition for Okamura's distance function for delay differential equations in view of a unified theory of well-posedness by prolongations given by the author. A concrete function is also given under the assumption of local Lipschitz about C^1 -prolongations. We also consider the relationship with Winston's uniqueness claim.

- 15 上田好寛 (神戸大海事) Stability analysis for a general system of linear differential equations
 桐侑也 (アズビル) with discrete delays 10
 Yoshihiro Ueda (Kobe Univ.) Stability analysis for a general system of linear differential equations
 Yuya Kiri (Azbil Corp.) with discrete delays

概要 In this talk, we deal with a system of linear differential equations with discrete delays. We derive the necessary and sufficient conditions concerned with the absolutely stable for the stability problem of the system.

- 16 A. Rodríguez Mulet 非一様な断面を持つ細い柱状型弾性体の固有振動の漸近挙動 10
 (北大理)
 Albert Rodríguez Mulet Asymptotic behavior of eigenfrequencies of a thin elastic rod with non-uniform cross-section
 (Hokkaido Univ.)

概要 We study the eigenvalue problem of the second order elliptic operator which arises in the linearized model of the periodic oscillations of a homogeneous and isotropic elastic body. The square of the frequency agrees to the eigenvalue. Therefore, analyzing the properties of the eigenvalue we can retrieve information on the frequency of the oscillations. Particularly, we deal with a thin rod with non-uniform connected cross-section in several cases of boundary conditions. We see that there appear many small eigenvalues corresponding to the bending mode of vibrations of the thin body. We investigate the asymptotic behavior of these eigenvalues and obtain a characterization formula of the limit equation when the thinness parameter tends to 0.

- 17 竹内慎吾 L^q -Lyapunov inequality for the one-dimensional p -Laplacian 10
 (芝浦工大システム理工)
 Shingo Takeuchi L^q -Lyapunov inequality for the one-dimensional p -Laplacian
 (Shibaura Inst. of Tech.)

概要 This talk is concerned with L^q -Lyapunov inequality for the one-dimensional p -Laplacian. We have known the best inequalities for $q = 1$ or $p = 2$, and we will deal with the case $q > 1$ and $p \neq 2$. In particular, we will calculate the best constant of this inequality by the generalized trigonometric functions with two parameters.

- 18 柴田 徹太郎 (広島大工) Global and local structures of oscillatory bifurcation curves 10
Tetsutaro Shibata (Hiroshima Univ.) Global and local structures of oscillatory bifurcation curves

概要 We study the asymptotic behavior of bifurcation diagrams of nonlinear ordinary differential equations, which contain some oscillatory nonlinearities. In our case, λ is a continuous function of the maximum norm $\alpha = \|u_\lambda\|_\infty$ of the solution u_λ associated with λ . So we write $\lambda = \lambda(\alpha)$. In this talk, we consider the case where $\lambda(\alpha) \rightarrow \pi^2/4$ as $\alpha \rightarrow \infty$. Then the precise asymptotic formulas for $\lambda(\alpha)$ as $\alpha \rightarrow \infty$ and $\alpha \rightarrow 0$ with the exact second terms are established. By these formulas, the global and local structures of the bifurcation curves are clearly understood.

- 19 長谷川 翔一 (東工大理) Intersection property of solutions to semilinear elliptic equations and its application to a Liouville-type result 10
Shoichi Hasegawa (Tokyo Tech) Intersection property of solutions to semilinear elliptic equations and its application to a Liouville-type result

概要 In this talk, we shall study intersection and separation properties of solutions to semilinear elliptic equations. In particular, in order to investigate the properties of solutions, we make use of the stability of solutions. Indeed, for unstable solutions, including non-radial solutions, we obtain an intersection property of solutions. Moreover, focusing stable radial solutions, we derive a separation property of radial solutions. Furthermore, applying the result on the intersection property of solutions, we shall show a Liouville-type result for positive solutions.

- 20 田中 敏 (岡山理大理) Symmetry-breaking bifurcation of positive solutions to the Moore–Nehari differential equation 10
梶木屋 龍治 (佐賀大理工) I. Sim (蔚山大)
Satoshi Tanaka (Okayama Univ. of Sci.) Symmetry-breaking bifurcation of positive solutions to the Moore–Nehari differential equation
Ryuji Kajikiya (Saga Univ.)
Inbo Sim (Univ. of Ulsan)

概要 The bifurcation problem of positive solutions for the Moore–Nehari differential equation $u'' + h(x, \lambda)u^p = 0$ in $(-1, 1)$ with $u(-1) = u(1) = 0$ is considered, where $p > 1$, $h(x, \lambda) = 0$ for $|x| < \lambda$ and $h(x, \lambda) = 1$ for $\lambda \leq |x| \leq 1$ and $\lambda \in (0, 1)$ is a bifurcation parameter. The problem has a unique even positive solution $U(x, \lambda)$ for each $\lambda \in (0, 1)$. It is shown that there exists a unique $\lambda_* \in (0, 1)$ such that a non-even positive solution bifurcates at λ_* from the curve $(\lambda, U(x, \lambda))$, where λ_* is explicitly represented as a function of p .

- 21 内藤 雄基 (愛媛大理) Singular extremal solutions for supercritical elliptic equations in a ball
宮本 安人 (東大数理) 10
Yūki Naito (Ehime Univ.) Singular extremal solutions for supercritical elliptic equations in a ball
Yasuhito Miyamoto (Univ. of Tokyo)

概要 We study positive singular solutions to the Dirichlet problem for the semilinear elliptic equation in the unit ball. We first show the uniqueness of the singular solution to the problem, and then study the existence of the singular extremal solution. In particular, we show a necessary and sufficient condition for the existence of the singular extremal solution in terms of the weak eigenvalue of the linearized problem.

- 22 石井裕太 (首都大東京理) 空間非一様な係数を持つ Schnackenberg model の対称な 1-ピーク定常解
 倉田和浩 (首都大東京理) の構成と安定性解析 10
 Yuta Ishii (Tokyo Metro. Univ.) Construction and stability analysis of one-peak symmetric stationary
 Kazuhiro Kurata (Tokyo Metro. Univ.) solutions for the Schnackenberg model with heterogeneity

概要 In this talk, we consider stationary solutions of the one-dimensional Schnackenberg model with heterogeneity. We are interested in the effect of the heterogeneity on the stability. First we construct symmetric one-peak stationary solutions. Furthermore, we give stability analysis of the solutions in details and reveal the effect of heterogeneity on the stability.

16:30~17:30 特別講演

- 三町勝久 (阪大情報) 古典超幾何函数とその周辺
 Katsuhisa Mimachi (Osaka Univ.) Classical hypergeometric functions and related topics

概要 The classical hypergeometric functions here include Appell's hypergeometric functions F_1, F_2, F_3, F_4 , Lauricella's hypergeometric functions F_A, F_B, F_C, F_D , and the generalized hypergeometric function ${}_{n+1}F_n$. The corresponding differential equations will be denoted by $E_1, E_2, E_3, E_4, E_A, E_B, E_C, E_D$, and ${}_{n+1}E_n$. We talk about the recent development of the study on the systems of differential equations associated with the classical hypergeometric functions and their related topics — monodromy representations, connection formulas, Wronskian formulas, reducibility and irreducibility, invariant Hermitian forms, rigid Fuchsian systems, integral representations of solutions, regularizations of twisted cycles, intersection forms, Even-Odd family, Yokoyama-list, Dotsenko–Fateev equation, Knizhnik–Zamolodchikov equations, twisted de Rham theory etc.

9月25日(火) 第I会場

9:15~12:00

- 23 P. van Meurs Evolutionary convergence of positive and negative dislocations in 2D
 (金沢大国際基幹教育院) 10
 Patrick van Meurs (Kanazawa Univ.) Evolutionary convergence of positive and negative dislocations in 2D

概要 The starting point is the gradient flow of non-locally interacting particles. Our main result is the rigorous limit passage as the number of particles goes to infinity. The limiting model is a non-local and nonlinear PDE. The proof relies on the theory of Wasserstein gradient flows and embedding results of Orlicz spaces.

- 24 館山翔太 (東北大理) On L^p -viscosity solutions of bilateral obstacle problems with unbounded
 小池茂昭 (東北大理) ingredients 10
 Shota Tateyama (Tohoku Univ.) On L^p -viscosity solutions of bilateral obstacle problems with unbounded
 Shigeaki Koike (Tohoku Univ.) ingredients

概要 The global Hölder continuity estimates on L^p -viscosity solutions of bilateral obstacle problems with unbounded ingredients is established when obstacles are merely continuous. The existence of L^p -viscosity solutions is obtained for continuous obstacles. The local Hölder continuity estimates on the first derivatives of L^p -viscosity solutions is shown when the obstacles belong to $C^{1,\alpha}$, and $p > n$.

- 25 井上 順平 (電通大) 定常ロジスティック方程式における最適棲息分布 10
 久藤 衡介 (電通大)
 Junpei Inoue (Univ. of Electro-Comm.) Optimal distribution of a species in the stationary logistic equation
 Kousuke Kuto
 (Univ. of Electro-Comm.)

概要 We discuss a stationary diffusive logistic equation in an interval. In particular, this talk focuses on Ni's conjecture that the supremum of the ratio of a total population to total resources is 3. Recently, Bai-He-Li settled the conjecture by finding a special sequence of diffusion coefficients and carrying functions. The main question is the following: What is a profile of the solution corresponding to the special sequences? We give a partial answer to this question.

- 26 久藤 衡介 (電通大情報理工) Bifurcation from infinity in a shadow system for the Shigesada-Kawasaki-
 Yaping Wu (首都師範大) Teramoto model 10
 Kousuke Kuto Bifurcation from infinity in a shadow system for the Shigesada-Kawasaki-
 (Univ. of Electro-Comm.) Teramoto model
 Yaping Wu (Capital Normal Univ.)

概要 This talk is concerned with the Neumann problem of a shadow system for the Lotka-Volterra competition model with cross-diffusion (the so-called SKT model). We study the global bifurcation structure of positive solutions. Among other things, we show that a bifurcation curve blows up as a parameter approaches the least positive eigenvalue of the minus Laplacian with homogeneous Neumann boundary condition.

- 27 松澤 寛 (沼津工高専) Spreading and vanishing in a free boundary problem for nonlinear dif-
 兼子 裕大 (早大理工) fusion equations with a given forced moving boundary 10
 Hiroshi Matsuzawa Spreading and vanishing in a free boundary problem for nonlinear dif-
 (Numazu Nat. Coll. of Tech.) fusion equations with a given forced moving boundary
 Yuki Kaneko (Waseda Univ.)

概要 We will study a free boundary problem of the nonlinear diffusion equations of the form $u_t = u_{xx} + f(u)$, $t > 0$, $ct < x < h(t)$, where f is C^1 function satisfying $f(0) = 0$, $c > 0$ is a given constant and $h(t)$ is a free boundary which is determined by a Stefan condition.

When $f(u) = u(1 - u)$ (logistic nonlinearity), this problem was considered by [Matsuzawa, 2018].

In this talk, we will extend the results in the previous work to general monostable, bistable and combustion types nonlinearities. We show that the long-time dynamical behavior of solutions can be expressed by unified fashion, that is, for any initial data, the unique solution exhibits exactly one of the behaviors, spreading, vanishing and transition. We also give the asymptotic profile of the solution over the whole domain when spreading happens. The approach here is quite different from that used in the previous work.

- 28 兼子 裕大 (早大理工) 反応拡散方程式の自由境界問題における spreading 解の漸近形状と漸近
 山田 義雄 (早大理工) 速度 10
 Yuki Kaneko (Waseda Univ.) Asymptotic profiles and speeds on spreading solutions to a free bound-
 Yoshio Yamada (Waseda Univ.) ary problem for a reaction-diffusion equation

概要 We consider a free boundary problem for a reaction-diffusion equation modeling the spreading of species, where unknown functions are population density and spreading front of species. Moreover, the dynamical behavior of the free boundary is determined by a Stefan-like condition. The purpose of this talk is to show sharp estimates of the asymptotic profile of solutions and the spreading speed of the free boundary.

- 29 國谷紀良 (神戸大システム情報) 非局所的な拡散を伴う SIR 感染症モデルの漸近挙動 10
 Jinliang Wang (黒竜江大)
 Toshikazu Kuniya (Kobe Univ.) Asymptotic behavior of an SIR epidemic model with nonlocal diffusion
 Jinliang Wang (Heilongjiang Univ.)

概要 In this study, we formulate an SIR epidemic model with nonlocal diffusion and study the asymptotic behavior of it. We define the basic reproduction number R_0 by the spectral radius of the next generation operator, and show that the trivial equilibrium is globally asymptotically stable if $R_0 < 1$. Furthermore, under an additional assumption that only infective individuals can diffuse, we prove that a positive equilibrium is globally asymptotically stable if $R_0 > 1$. This is a collaborative work with Dr. Jinliang Wang in Heilongjiang University.

- 30 大西勇 (広島大理) リーゼガング現象の一次元ケラー=ルビノウモデルに対する数理解析 .. 10
 Isamu Ohnishi (Hiroshima Univ.) A mathematical study of the one-dimensional Keller and Rubinow model for Liesegang bands

概要 The purpose is to start understanding from a mathematical viewpoint a famous regularized structures with spatially distinct bands or rings of precipitated material are exhibited, with clearly visible scaling properties. Such patterns are known as Liesegang bands or rings. In this paper, we study a one-dimensional version of the Keller and Rubinow model and present conditions ensuring the existence of Liesegang bands.

- 31 大西勇 (広島大理) On mathematical standard structure of a binary digit of memory in a cell and its application to biological or life science phenomena 10
 Isamu Ohnishi (Hiroshima Univ.) On mathematical standard structure of a binary digit of memory in a cell and its application to biological or life science phenomena

概要 A mathematical standard structure of a binary digit of memory in a cell is presented. This is based on a kind of frequency model with scale effect. This model has ability of “on-off” switching property, and moreover, this is affected by scale effect to make the memorable ability be reinforced. This property is derived from multiple covalent modification sites inducing important enzyme reaction, which is represented by the Michaelis–Menten type nonlinearity.

[1] “Standard model of a binary digit of memory with multiple covalent modifications in a cell”, J. Pur Appl Math Vol 2 No 1 April (2018) [2] “Memory Reinforcement with Scale Effect and its Application to Mutual Symbiosis among Terrestrial Cyanobacteria of Nostochineae, Feather Mosses and Old Trees in Boreal Biome in Boreal Forests”, Global Science Chronicle, Vol 1(1): 1–7 (2017)

- 32 下條昌彦 (岡山理大理) 特異性をもつ被食–捕食型シャドーシステム 10
 郭忠勝 (淡江大)
 A. Ducrot (Univ. de Bordeaux)
 Masahiko Shimojyou Shadow system of a singular prey-predator system
 (Okayama Univ. of Sci.)
 Jong Shenq Guo (Tamkang Univ.)
 Arnaud Ducrot (Univ. de Bordeaux)

概要 We study the asymptotic behaviors and quenching of the solutions to the shadow system of a two-component reaction-diffusion system modeling prey-predator interactions in an insular environment. First, we give a global existence result for the solutions. Then, by constructing some suitable Lyapunov functionals, we characterize the asymptotic behaviors of global solutions. Also, we give a finite time quenching result.

- 33 下 條 昌 彦 (岡山 理 大 理) 特異性被食-捕食モデルの時間大域解の漸近挙動 10

郭 忠 勝 (淡 江 大)

Masahiko Shimojyou

(Okayama Univ. of Sci.)

Jong Shenq Guo (Tamkang Univ.)

Asymptotic behavior of global solutions to a singular prey-predator model

概要 We study an initial boundary value problem for a reaction-diffusion system arising in the study of a singular predator-prey system. First, convergence to a stationary solution of global solution under some parameter condition is given. Next, under an assumption on the growth rates and initial data, we show that the unique co-existence state is a center for the kinetic system by the method of Darboux's theory of algebraic integrability. Then we prove that solutions of the diffusion system with equal diffusion become spatially homogeneous and are subject to the kinetic part asymptotically.

- 34 谷 口 雅 治 (岡山 大 自 然) Axially non-symmetric traveling fronts in balanced bistable reaction-diffusion equations 10

Masaharu Taniguchi (Okayama Univ.)

Axially non-symmetric traveling fronts in balanced bistable reaction-diffusion equations

概要 For a balanced bistable reaction-diffusion equation, axially symmetric traveling fronts have been recently studied. For this equation, the existence of axially non-symmetric traveling fronts with non-zero speed has been an interesting open problem. This work proves that axially non-symmetric traveling fronts with non-zero speed exist in balanced bistable reaction-diffusion equations.

13:15~14:15 特別講演

川 上 竜 樹 (龍 谷 大 理 工) 動的境界条件付き半線形楕円型方程式

Tatsuki Kawakami (Ryukoku Univ.)

A semilinear elliptic equation with a dynamical boundary condition

概要 We consider a semilinear elliptic equation with a dynamical boundary condition in a unbounded domain Ω . In this talk we first consider the case Ω is the N -dimensional half-space and discuss results on existence, nonexistence and large time behavior of small positive solutions. Furthermore, we show that local solvability of this problem is equivalent to global solvability of this problem and solvability of the stationary problem. Next we consider the case Ω is the exterior of the unit ball and discuss the effects of the change of the domain. Finally, as preparation for nonlinear problem of diffusion equations, we consider the large diffusion limit for the heat equation on a half-space with a dynamical boundary condition.

This talk is based on series of joint works with M. Fila and K. Ishige.

9月26日(水) 第I会場

9:15~12:00

- 35 梶 原 直 人 (東 大 数 理) 力学的境界条件を持つ Cahn-Hilliard 方程式の大域可解性 10

Naoto Kajiwara (Univ. of Tokyo)

Global solvability of the Cahn-Hilliard equations with dynamic boundary conditions

概要 We consider the strong solutions of the Cahn-Hilliard equations in a bounded domain with permeable walls, which is a dynamic boundary conditions. From the maximal L_p regularity result of the linear equations with the dynamic boundary conditions, the fixed point theorem and a priori estimate, we prove that the solution exists uniquely and globally in time.

- 36 尾上文彦 (東大数理) A varifold formulation of mean curvature flow with Dirichlet or dynamic
儀我美一 (東大数理) boundary conditions 10
高棹圭介 (京大理)
- Fumihiko Onoue (Univ. of Tokyo) A varifold formulation of mean curvature flow with Dirichlet or dynamic
Yoshikazu Giga (Univ. of Tokyo) boundary conditions
Keisuke Takasao (Kyoto Univ.)

概要 We consider the sharp interface limit of the Allen–Cahn equation with Dirichlet or dynamic boundary conditions and give a varifold characterization of its limit which is formally a mean curvature flow with Dirichlet or dynamic boundary conditions. In order to show the existence of the limit, we apply the phase field method under the assumption that the discrepancy measure vanishes on the boundary. For this purpose, we extend the usual Brakke flow under these boundary conditions by the first variations for varifolds on the boundary.

- 37 中村恒平 (埼玉大理工) 平面閉曲線に対する等周比を用いた補間不等式とその非局所曲率流への
長澤壯之 (埼玉大理工) 応用 10
Kohei Nakamura (Saitama Univ.) Interpolation inequalities between the deviation of curvature and the
Takeyuki Nagasawa (Saitama Univ.) isoperimetric ratio with applications to geometric flows

概要 Several inequalities concerning the isoperimetric ratio for plane curves are derived. In particular, we obtain interpolation inequalities between the deviation of curvature and the isoperimetric ratio. These hold only for functions representing closed plane curves, but give better estimates than Gagliardo–Nirenberg inequalities. As applications, we study the large-time behavior of some geometric flows of closed plane curves without a convexity assumption. We do not assume convexity of the initial curve, instead we assume global existence of the flow. A global solution of non-local curvature flow considered by Jiang–Pan converges exponentially to a circle. The same result still holds for the area-preserving curvature flow and the length-preserving curvature flow.

- 38 猪奥倫左 (愛媛大理)^b Critical dissipative estimate for a heat semigroup with the inverse square
小川卓克 (東北大理) potential 10
Norisuke Ioku (Ehime Univ.) Critical dissipative estimate for a heat semigroup with the inverse square
Takayoshi Ogawa (Tohoku Univ.) potential

概要 We consider critical dissipative estimates for a heat semigroup with the inverse square potential. It is proved by Metafune–Okazawa–Sobajima–Spina that the Schrödinger operator generates a semigroup under suitable restriction on its domain. Ioku–Metafune–Sobajima–Spina proved decay estimates of the semigroup in Lebesgue spaces. However the endpoint case is remained. In this talk we use Lorentz spaces instead of Lebesgue spaces, and show the endpoint decay estimate in a suitable Lorentz space.

- 39 向井晨人 (東大数理) Large time behavior of solutions of the heat equation with inverse square
potential 10
Asato Mukai (Univ. of Tokyo) Large time behavior of solutions of the heat equation with inverse square
potential

概要 Let $L := -\Delta + V$ be a nonnegative Schrödinger operator on $L^2(\mathbf{R}^N)$, where $N \geq 2$ and V is a radially symmetric inverse square potential. In this paper we assume either L is subcritical or null-critical and we establish a method for obtaining the precise description of the large time behavior of $e^{-tL}\varphi$, where $\varphi \in L^2(\mathbf{R}^N, e^{|x|^2/4} dx)$.

- 40 比佐幸太郎 (東北大理) Existence of solutions for a fractional semilinear parabolic equation with singular initial data 10
石毛和弘 (東大数理)
Kotaro Hisa (Tohoku Univ.) Existence of solutions for a fractional semilinear parabolic equation with singular initial data
Kazuhiro Ishige (Univ. of Tokyo)

概要 In my talk, we obtain necessary conditions and sufficient conditions on the initial data for the solvability of the Cauchy problem

$$\partial_t u + (-\Delta)^{\frac{\theta}{2}} u = u^p, \quad x \in \mathbf{R}^N, t > 0, \quad u(0) = \mu \geq 0 \quad \text{in } \mathbf{R}^N,$$

where $N \geq 1$, $0 < \theta \leq 2$, $p > 1$ and μ is a Radon measure or a measurable function in \mathbf{R}^N . Our necessary conditions and sufficient conditions lead the strongest singularity of the initial data for the solvability.

- 41 関行宏 (九大数理) On type II blow-up mechanisms in a semilinear heat equation with supercritical nonlinearity 10
Yukihiro Seki (Kyushu Univ.) On type II blow-up mechanisms in a semilinear heat equation with supercritical nonlinearity

概要 I will report recent results on blow-up of a semilinear heat equation $u_t = \Delta u + u^p$ with $p > 1$, focusing on the supercritical nonlinearity in the Sobolev sense. Blow-up of solution is called of Type I if the blow-up rate is the same as of the self-similar solutions and of Type II otherwise. The previous results on classification of Type II blow-up solutions is restricted in the case where a certain linearized operator doesn't have neutral eigenvalues due to the lack of a particular solution whose blow-up is driven by a neutral eigenvalue. Based on matched asymptotics, we prove the existence of particular solutions associated to a neutral eigenvalue in the most representative case where $p = 1 + 6/(N - 10)$, so called, Lepin exponent.

- 42 山本征法 (新潟大自然) 準地衡近似方程式の解の空間遠方での減衰について 10
杉山裕介 (滋賀県大工)
Masakazu Yamamoto (Niigata Univ.) Spatial decay of solutions to the quasi-geostrophic equation
Yuusuke Sugiyama
(Univ. of Shiga Pref.)

概要 The initial value problem for the quasi-geostrophic equation is studied. Particularly, the critical and the super-critical dissipation is considered. For those problems, far field asymptotics of solutions are given.

- 43 T. Black (Univ. Paderborn) Global generalized solutions of a Keller–Segel–Stokes system with singular sensitivity 10
J. Lankeit (Univ. Paderborn)
水上雅昭 (東京理大理)
Tobias Black (Univ. Paderborn) Global generalized solutions of a Keller–Segel–Stokes system with singular sensitivity
Johannes Lankeit (Univ. Paderborn)
Masaaki Mizukami
(Tokyo Univ. of Sci.)

概要 In this talk we consider a Keller–Segel–fluid system with singular sensitivity. In the system existence of global classical solutions was shown under some conditions in the previous work (Black–Lankeit–M., J. Evol. Equ.). In this talk we address the question, what conditions derives existence of global generalized solutions, which is one of weak concepts?

- 44 少林文孝 (早大理工) The Keller–Segel system of parabolic-parabolic type in Morrey space
 10
 Fumitaka Wakabayashi (Waseda Univ.) The Keller–Segel system of parabolic-parabolic type in Morrey space

概要 We show the existence of global-in-time solutions depending on the initial data in the Morrey space to the Keller–Segel system of parabolic-parabolic type. We solve this system by the successive approximation based on the estimation of the heat semigroup in the Morrey space and on the fractional power of the Laplace operator.

- 45 岡田晃 (京大人間環境) 斉次 Besov 空間に初期値をとる drift-diffusion 方程式の解の解析性について 10
 Akira Okada (Kyoto Univ.) Spatial analyticity of solutions to the drift-diffusion equation with initial data in homogeneous Besov space

概要 We show the solutions to the drift-diffusion equation with initial data in homogeneous Besov space is in L^p . Moreover it is analytic by use of Hölder condition of solutions

- 46 和久井洋司 (東北大理) 質量優臨界指数における退化移流拡散方程式の解の非有界性 10
 Hiroshi Wakui (Tohoku Univ.) Unboundedness for solutions to a degenerate drift-diffusion equation with the mass supercritical exponent

概要 We consider large time behavior of weak solutions to a degenerate drift-diffusion system related to Keller–Segel system with the mass supercritical cases under relaxed weight condition. It is known that the large time behavior of solutions is classified by the invariant norms of initial data. For the mass supercritical case, the sufficient condition for unboundedness is given by Kimijima–Nakagawa–Ogawa with the initial data decaying fast at spacial infinity. In this talk, we prove unboundedness of solutions to our problem with more slowly decaying initial data under same assumptions in Kimijima–Nakagawa–Ogawa.

- 47 吉田夏海 (立命館大 OIC 総合研究機構) Global asymptotic stability of rarefaction waves to the Cauchy problem for the generalized Korteweg–de Vries–Burgers–Kuramoto equation 10
 Natsumi Yoshida (Ritsumeikan Univ.) Global asymptotic stability of rarefaction waves to the Cauchy problem for the generalized Korteweg–de Vries–Burgers–Kuramoto equation

概要 We study the large time asymptotics of solutions to the Cauchy problem for the generalized Korteweg–de Vries–Burgers–Kuramoto equation where the far field states are prescribed. Especially, we deal with the case when the convective flux is fully convex. Then the Cauchy problem has a unique global in time solution which tends toward a rarefaction wave as time goes to infinity. The proof is given by a technical energy method.

- 48 吉田夏海 (立命館大 OIC 総合研究機構) Decay structure of solutions toward rarefaction waves to the Cauchy problem for the scalar conservation law with nonlinear viscosity 10
 Natsumi Yoshida (Ritsumeikan Univ.) Decay structure of solutions toward rarefaction waves to the Cauchy problem for the scalar conservation law with nonlinear viscosity

概要 We study the decay structure of solutions to the Cauchy problem for a one-dimensional scalar conservation law with nonlinear viscosity where the far field states are prescribed. Especially, we deal with the case when the convective flux is fully convex, and also the viscosity is a nonlinearly degenerate one. Then the Cauchy problem has a unique global in time solution which tends toward a rarefaction wave as time goes to infinity. We investigate that the decay rate in time of the corresponding solutions. The proof is given by a technical time-weighted energy method.

14:15~16:15

- 49 廣澤史彦(山口大理) On the energy estimate for Klein–Gordon type equations with time dependent singular mass 10

Fumihiko Hirosawa (Yamaguchi Univ.) On the energy estimate for Klein–Gordon type equations with time dependent singular mass

概要 We consider the energy estimate of the solution to the Cauchy problem of Klein–Gordon type equation with time dependent mass $M(t)$, in particular $M(t)$ has a singularity. The main purpose of this paper is to give sufficient conditions to $M(t)$ for the energy to be asymptotically stable.

- 50 道久寛載(広島大理) 強摩擦項をもつ波動方程式の発展作用素の展開に関して 10
Hironori Michihisa (Hiroshima Univ.) Expanding methods for evolution operators of strongly damped wave equations

概要 We obtain asymptotic profiles of solutions to the linear strongly damped wave equations in \mathbf{R}^n ($n \geq 1$) by expanding evolution operators in the low frequency regions in the Fourier space.

- 51 高村博之(東北大理)* 強い時間減衰を伴う消散項付き非線形波動方程式に対する解の波動的な
頼宇安(麗水学院) 爆発と lifespan 評価 10
Hiroyuki Takamura (Tohoku Univ.) Wave-like blow-up and lifespan estimate for solutions of nonlinear wave
Ning-An Lai (Lishui Univ.) equations with strong time-decaying damping

概要 We are focusing on the upper bound of the lifespan of solutions of nonlinear wave equations with the scattering damping. All the result should be wave-like, namely the same as non-damped case. In this talk, I will introduce new results which cover most part of the expected one in semilinear case.

- 52 側島基宏(東京理大理工) On a test function method for blowup of solutions to semilinear damped
池田正弘(理化学研・慶大理工) wave equations 10
Motohiro Sobajima On a test function method for blowup of solutions to semilinear damped
(Tokyo Univ. of Sci.) wave equations
Masahiro Ikeda (RIKEN/Keio Univ.)

概要 In this talk, we consider sharp upper bounds of lifespan of solutions to the semilinear damped wave equation with nonlinearity $|u|^p$. Here we introduce an “improved” test function method to derive sharp upper bounds for the critical case $p = 1 + 2/N$. Several applications of this technique will be also discussed.

- 53 側島基宏(東京理大理工) Sharp lifespan estimates for solutions to two-dimensional semilinear heat
equation in exterior domains 10
Motohiro Sobajima Sharp lifespan estimates for solutions to two-dimensional semilinear heat
(Tokyo Univ. of Sci.) equation in exterior domains

概要 In this talk, we consider global existence and blowup of solutions to the semilinear heat equation with the nonlinearity u^p in two-dimensional exterior domain. We give sharp lifespan estimates of blowup solutions in the case of two-dimensional exterior domain, which is quite different from that in the case of $N \geq 3$.

- 54 佐々木多希子(明大理工) The blow-up curve for semilinear wave equations with small spatial ve-
locity 10
Takiko Sasaki (Meiji Univ.) The blow-up curve for semilinear wave equations with small spatial ve-
locity

概要 We study one dimensional wave equation $\partial_t^2 u - \epsilon^2 \partial_x^2 u = F(\partial_t u)$. The solution blows-up on a curve $t = T_\epsilon(x)$. We define the blow-up curve corresponding to $v'' = F(v')$ by $t = T(x)$. It is proven that $|T_\epsilon(x) - T(x)| \rightarrow 0$ as $\epsilon \rightarrow 0$.

- 55 水谷治哉 (阪大 理) Strichartz estimates for Schrödinger equations with slowly decaying potentials 10
 Haruya Mizutani (Osaka Univ.) Strichartz estimates for Schrödinger equations with slowly decaying potentials

概要 We prove global-in-time Strichartz estimates for the Schrödinger equation with positive real-valued potentials which decay slowly and satisfy a virial type condition at infinity. The repulsive Coulomb potential in three space dimensions is particularly included in our admissible class of potentials.

- 56 深谷法良 (東京理大理) Strong instability of standing waves for nonlinear Schrödinger equations
 太田雅人 (東京理大理) with attractive inverse power potential 10
 Noriyoshi Fukaya (Tokyo Univ. of Sci.) Strong instability of standing waves for nonlinear Schrödinger equations
 Masahito Ohta (Tokyo Univ. of Sci.) with attractive inverse power potential

概要 We study the strong instability of standing waves $e^{i\omega t}\phi_\omega(x)$ for nonlinear Schrödinger equations with an attractive inverse power potential, where $\omega \in \mathbb{R}$ and $\phi_\omega \in H^1(\mathbb{R}^N)$ is a ground state of the corresponding stationary equation. In this talk, we prove that if $\partial_\lambda^2 S_\omega(\phi_\omega^\lambda)|_{\lambda=1} \leq 0$, then the standing wave is strongly unstable, where S_ω is the action, and $\phi_\omega^\lambda(x) := \lambda^{N/2}\phi_\omega(\lambda x)$ is the L^2 -invariant scaling.

- 57 平山浩之 非線形 4 階シュレディンガー方程式の適切性について 10
 (宮崎大テニュアトラック推進機構)
 池田正弘
 (理化学研 AIP・慶大理工)

Hiroyuki Hirayama (Univ. of Miyazaki) Well-posedness for the nonlinear fourth order Schrödinger equations
 Masahiro Ikeda (RIKEN/Keio Univ.)

概要 We consider the Cauchy problem of the nonlinear fourth order Schrödinger equations with derivative nonlinearity, which contains second derivative with respect to the spatial variable. The well-posedness of this equation in the Sobolev space H^s is obtained by Hao, Hisao, and Wang (2006) for general settings. We improve this result by using the maximal function norm introduced by Pornnoppapath (preprint). Our results contain the well-posedness of the model of the vortex filament treated by Segata (2003, 2004).

16:30~17:30 特別講演

- べズ ニール (埼玉大理工)^b Geometric estimates arising in the analysis of Zakharov systems
 Neal Bez (Saitama Univ.) Geometric estimates arising in the analysis of Zakharov systems

概要 In recent years, certain multilinear convolution estimates have arisen and played an important role in the development of the well-posedness theory of Zakharov systems. In 2008, Bejenaru, Herr and Tataru observed that if one is given three transversal hypersurfaces in \mathbb{R}^3 , then the convolution of two L^2 functions supported on two of these hypersurfaces has a well-defined restriction to the third hypersurface as an L^2 function. For three coordinate hyperplanes, this fact follows from the Loomis–Whitney inequality in \mathbb{R}^3 , which is not difficult to prove. However, curved hypersurfaces cause substantial difficulty, and one is led to the nonlinear Loomis–Whitney inequality first proved by Bennett, Carbery and Wright in 2004. In 2009, Bejenaru, Herr, Holmer and Tataru used quantitative forms of such singular convolution estimates in their work on the Zakharov system in two spatial dimensions, where a local well-posedness result was established for large data in very low regularity Sobolev spaces. Similar use of multilinear singular convolution estimates has appeared in work of Bejenaru and Herr on the three-dimensional Zakharov system (2010), and more recently in work of Kinoshita on a Klein–Gordon–Zakharov system (2016) and Hirayama and Kinoshita on a system of quadratic derivative nonlinear Schrödinger equations (2018). This talk will include discussion of recent progress on the nonlinear Brascamp–Lieb inequality which substantially extends earlier work on the nonlinear Loomis–Whitney inequality.

9月27日(木) 第I会場

9:15~12:00

- 58 浜野 大 (埼玉大理工) 空間5次元における2次の非線形項をもつシュレディンガー方程式系の解の時間大域挙動について 10

Masaru Hamano (Saitama Univ.) Long time behavior of the solutions for the Schrödinger system with quadratic nonlinear terms in 5d

概要 We consider the nonlinear Schrödinger system with quadratic interaction in five dimensions. We determine the long time behavior of the solutions to this system with data below the ground state. More precisely, we give conditions for the solutions scatter and conditions for the solutions blow-up or grow-up. Under the condition blowing-up or growing-up, if we additionally assume some conditions, we can prove that the solutions blow-up.

- 59 田中 智之 (名大多元数理) 3次 Benjamin-Ono 方程式の時間局所適切性について 10

Tomoyuki Tanaka (Nagoya Univ.) On the local well-posedness of the third order Benjamin-Ono equation

概要 In this talk, we prove that the third order Benjamin-Ono equation on the torus

$$\partial_t u - 4\partial_x^3 u + 3u^2 \partial_x u - 3H\partial_x(u\partial_x u) - 3\partial_x(uH\partial_x u) = 0, \quad x \in \mathbb{T}$$

is locally well-posed in $H^s(\mathbb{T})$ for $s \in \mathbb{N}$ and $s \geq 3$. Here, H is the Hilbert transform. The above equation arises from the Benjamin-Ono hierarchy. Nonlinearities in the equation may yield two derivative losses, which is one difficulty of this problem. The proof is based on the energy method, adding a correction term into the energy so as to overcome the difficulty.

- 60 岡本 葵 (信州大工) Asymptotic behavior of solutions to a higher-order KdV-type equation with critical nonlinearity 10

Mamoru Okamoto (Shinshu Univ.) Asymptotic behavior of solutions to a higher-order KdV-type equation with critical nonlinearity

概要 We consider the Cauchy problem of a higher-order KdV-type equation with critical nonlinearity in the sense of long-time behavior. Using the method of testing by wave packets, we prove that there exists a unique global solution of the Cauchy problem satisfying the same time decay estimate as that of linear solutions. Moreover, we show that the long-time behavior of the solution is determined by a self-similar solution.

- 61 F. Linares (IMPA) 低次のべきの非線形項を持つ一般化 KdV 方程式の初期値問題について
宮崎 隼人 (津山工高専) 10
G. Ponce (UCSB)

Felipe Linares (IMPA) The initial value problem for the generalized KdV equation with low degree of nonlinearity

Hayato Miyazaki
(Tsuyama Nat. Coll. of Tech.)

Gustavo Ponce (UCSB)

概要 We consider the initial value problem for the generalized KdV equation with lower degree of nonlinearity than that of the KdV equation. The nonlinearity of our equation is non-Lipschitz continuous in the Sobolev spaces or the weighted Sobolev spaces which are basically considered as the class of solutions, so that the local well-posedness can not be established in these classes. In this talk, we prove the local well-posedness in an appropriate class, and give properties for the propagation of regularity in the right hand side of the data for positive times of real valued solutions in the class.

- 62 山崎陽平(広島大理) Zakharov–Kuznetsov 方程式の線状進行波の周りの中心安定多様体について 10
 Yohei Yamazaki (Hiroshima Univ.) Center stable manifolds around line solitary waves of Zakharov–Kuznetsov equation

概要 We consider the Zakharov–Kuznetsov equation on a cylindrical space which is one of a high dimensional generalization of KdV equation. The orbital and asymptotic stability of the one soliton of KdV equation on the energy space was proved by Benjamin'72, Pego and Weinstein'92, Martel and Merle'01. We regard the one soliton as a line solitary wave of Zakharov–Kuznetsov equation on a two dimensional space. In the case of the cylindrical space, I showed the stability of the line solitary wave with the traveling speed less than the critical speed c_* and the instability with the traveling speed larger than c_* . In this talk, we show the existence of a center stable manifolds around unstable line solitary wave.

- 63 木下真也(名大多元数理) 非線形シュレディンガー方程式系に対する双線形評価とその適切性への
 平山浩之 応用 10
 (宮崎大テニュアトラック推進機構)
 Shinya Kinoshita (Nagoya Univ.) Sharp bilinear estimates and its application to a system of quadratic
 Hiroyuki Hirayama (Univ. of Miyazaki) derivative nonlinear Schrödinger equations

概要 We consider the Cauchy problem of the system of quadratic derivative nonlinear Schrödinger equations for the spatial dimension $d = 2$ and 3 . This system was introduced by M. Colin and T. Colin (2004). The well-posedness of this system in the Sobolev space H^s was obtained by Hirayama (2014). But under some condition for the coefficient of Laplacian, this result is not optimal. We improve the bilinear estimate by using a nonlinear version of the classical Loomis–Whitney inequality and prove well-posedness in H^s for $s \geq 1/2$ if $d = 2$, and $s > 1/2$ if $d = 3$.

- 64 上田好寛(神戸大海事) Dissipative structures for thermoelastic plate equations with Cattaneo's
 R. Racke (Univ. Konstanz) law 10
 Yoshihiro Ueda (Kobe Univ.) Dissipative structures for thermoelastic plate equations with Cattaneo's
 Reinhard Racke (Univ. Konstanz) law

概要 We consider the Cauchy problem of quasilinear thermoelastic Kirchhoff-type plate equations where the heat conduction is modeled by either the Cattaneo law or by the Fourier law. Additionally, we take into account possible inertial effects. The main task consists in proving sophisticated a priori estimates leading to obtaining the global existence of solutions for small data.

- 65 上田好寛(神戸大海事) Optimal decay estimates of a regularity-loss type system with constraint
 condition 10
 Yoshihiro Ueda (Kobe Univ.) Optimal decay estimates of a regularity-loss type system with constraint
 condition

概要 To analyze the dissipative structure of the regularity-loss type, we need more concrete examples and have to study more detailed properties. To this end, we consider the Cauchy problem for a couple of wave and heat equations as one concrete example in this talk.

- 66 上田好寛 (神戸大 海事) New structural condition on decay property for symmetric hyperbolic systems with relaxation 10
Renjun Duan (香港中文大)
川島秀一 (早大 理工)
Yoshihiro Ueda (Kobe Univ.) New structural condition on decay property for symmetric hyperbolic systems with relaxation
Renjun Duan
 (Chinese Univ. of Hong Kong)
Shuichi Kawashima (Waseda Univ.)

概要 This talk is concerned with the weak dissipative structure for linear symmetric hyperbolic systems with relaxation. We had already known the new dissipative structure called the regularity-loss type. Compared with the dissipative structure of the standard type, the regularity-loss type possesses a weaker structure in the high-frequency region in the Fourier space. Under this situation, we introduce new concepts and extend our previous results to cover complicated models.

- 67 上田好寛 (神戸大 海事) New stability criterion for the dissipative linear system 10
Yoshihiro Ueda (Kobe Univ.) New stability criterion for the dissipative linear system

概要 In this talk, we introduce a new approach to obtain the property of the dissipative structure for a system of differential equations. If the system has a viscosity or relaxation term which possesses symmetric property, Shizuta and Kawashima in 1985 introduced the suitable stability condition for the corresponding eigenvalue problem and derived the detailed relation between the coefficient matrices of the system and the eigenvalues. However, there are some complicated physical models which possess a non-symmetric viscosity or relaxation term and we can not apply this condition to these models. Under this situation, our purpose is to extend classical stability condition for complicated models.

- 68 古川賢 (東大 数理) Primitive 方程式における静水圧近似の正当化 10
儀我美一 (東大 数理)
A. Hussein (TU Darmstadt)
M. Hieber (TU Darmstadt)
柏原崇人 (東大 数理)
M. Wrona (TU Darmstadt)
Ken Furukawa (Univ. of Tokyo) On justification of hydrostatic approximation on the Primitive equation
Yoshikazu Giga (Univ. of Tokyo)
Amru Hussein (TU Darmstadt)
Matthias Hieber (TU Darmstadt)
Takahito Kashiwabara (Univ. of Tokyo)
Marc Wrona (TU Darmstadt)

概要 We will talk on the hydrostatic approximation on the Primitive equation and its justification from the Navier–Stokes equations. First we will introduce some previous results on the Primitive equation and the Navier–Stokes equations. After that we will show our results and essence of the proof.

- 69 古場一 (阪大 基礎工) 境界を持つ時間発展する曲面上における熱の伝わりや濃度拡散の数理モデリング 10
Hajime Koba (Osaka Univ.) Mathematical modeling of diffusion and heat systems on an evolving surface with boundaries

概要 We consider the diffusion and heat systems on an evolving surface with boundaries from an energetic point of view. We employ an energetic variational approach to derive our diffusion and heat systems on the evolving surface. Moreover, we study the boundary conditions for our systems to investigate both conservation and energy laws of the systems.

- 70 古場 一 (阪大基礎工) 境界を持つ時間発展する曲面上における圧縮性流体の流れの数値モデリング 10

Hajime Koba (Osaka Univ.) Mathematical modeling of compressible fluid system on an evolving surface with boundaries

概要 We consider compressible fluid flow on an evolving surface with boundaries from an energetic point of view. We employ both an energetic variational approach and the first law of thermodynamics to derive our compressible fluid systems on the evolving surface. Moreover, we investigate the boundary conditions in co-normal direction for our system to study conservation and energy laws of the system.

- 71 佐藤 一輝 (阪大基礎工) エネルギー変分法を用いた非ニュートン流体の数値モデリング 10
古場 一 (阪大基礎工)

Kazuki Sato (Osaka Univ.) Energetic variational approaches for non-Newtonian fluid systems
Hajime Koba (Osaka Univ.)

概要 We consider the dominant equations for the motion of the non-Newtonian fluid in a domain from an energetic point of view. A non-Newtonian fluid is a fluid that does not follow Newton's law of viscosity. In this lecture, we focus on several energies dissipation due to the viscosities of the non-Newtonian fluid to study the dominant equations for the motion of the fluid. We apply our energetic variational approaches to make a mathematical model of the non-Newtonian fluid flow. Although the system is abstract, our results make it possible to give some previous models of non-Newtonian fluid flow to a mathematical validity.

14:15~16:15

- 72 中里 亮介 (東北大理) 臨界 Besov 空間における密度依存型磁気流体方程式系の解の正則性判定条件について 10

Ryosuke Nakasato (Tohoku Univ.) A regularity criterion for the density-dependent magnetohydrodynamics system in critical Besov spaces

概要 Density-dependent magnetohydrodynamics system describes the coupling between the density-dependent Navier–Stokes equation and the Maxwell equation. For the Euler equation, Beale–Kato–Majda proved the regularity criterion for the local solutions. That is a smooth solution of the Euler equation u in \mathbb{R}^3 on $[0, T)$ is regular after $t \geq T$, provided that $\text{rot } u \in L^1(0, T; L^\infty(\mathbb{R}^3))$. In this talk, we study the Beale–Kato–Majda type criterion for the solution of density-dependent magnetohydrodynamics system.

- 73 阿部 健 (阪市大理) 軸対称流の零粘性極限 10

Ken Abe (Osaka City Univ.) Vanishing viscosity of axisymmetric flows

概要 We report some result on existence of global weak solutions of the Euler equations in an infinite cylinder.

- 74 金丸 諒 (早大理工) Brezis–Gallouet–Wainger 型不等式と Navier–Stokes 方程式の時間局所的強解のアプリオリ評価 10

Ryo Kanamaru (Waseda Univ.) Brezis–Gallouet–Wainger type inequalities and a priori estimates of time local strong solutions to Navier–Stokes equations

概要 We shall find the largest normed space (or the weakest norm) that satisfies the Brezis–Gallouet–Wainger type inequality. As an application of such an inequality, we shall establish the new a priori estimate of strong solutions to Navier–Stokes equations which has an almost single exponential growth form with respect to the scaling invariant quantity of the vorticity. Our method is based on the double logarithmic type inequality by means of the Morrey space.

- 75 檜垣 充朗 (京大理) On stationary two-dimensional flows around a fast rotating disk 10
 前川 泰則 (京大理)
 I. Gallagher (École Norm. Sup.)
 Mitsuo Higaki (Kyoto Univ.) On stationary two-dimensional flows around a fast rotating disk
 Yasunori Maekawa (Kyoto Univ.)
 Isabelle Gallagher (École Norm. Sup.)

概要 We study the two-dimensional stationary Navier–Stokes equations describing flows around a rotating disk. The existence of unique solutions is established for any rotating speed, and qualitative effects of a large rotation are described by exhibiting a boundary layer structure and an axisymmetrization of the flow.

- 76 鶴見 裕之 (早大理工) Ill-posedness of the stationary Navier–Stokes equations in scaling invariant homogeneous Besov spaces 10
 Hiroyuki Tsurumi (Waseda Univ.) Ill-posedness of the stationary Navier–Stokes equations in scaling invariant homogeneous Besov spaces

概要 We consider the stationary Navier–Stokes equations in \mathbb{R}^n for $n \geq 3$ in the scaling invariant Besov spaces. It is proved that if $n < p \leq \infty$ and $1 \leq q \leq \infty$, or $p = n$ and $2 < q \leq \infty$, then some sequence of external forces converging to zero in $\dot{B}_{p,q}^{-3+\frac{n}{p}}$ can admit a sequence of solutions which never converges to zero in $\dot{B}_{\infty,\infty}^{-1}$, especially in $\dot{B}_{p,q}^{-1+\frac{n}{p}}$. Our result may be regarded as showing the borderline case between ill-posedness and well-posedness, the latter of which Kaneko–Kozono–Shimizu proved when $1 \leq p < n$ and $1 \leq q \leq \infty$.

- 77 神保 秀一 (北大理) フリクション付きスリップ境界条件を課したストークス方程式の多重度
 牛越 恵理佳 (横浜国大環境情報) のある固有値に対するアダマル変分公式について 10
 Shuichi Jimbo (Hokkaido Univ.) Hadamard variational formula for the multiple eigenvalue of the Stokes
 Erika Ushikoshi (Yokohama Nat. Univ.) equations with friction slip boundary conditions

概要 We consider the eigenvalue problem of the Stokes equations with slip boundary conditions. More precisely, under a smooth domain perturbation, we analyze the domain dependency of the multiple eigenvalue of the Stokes equations with such a boundary condition. We succeeded to prove the differentiability of the eigenvalues for the perturbation parameter, and to clarify the representation for that.

- 78 齋藤 平和 (東京理大基礎工) Local solvability of the Navier–Stokes–Korteweg equations in the maximal regularity class 10
 Hirokazu Saito (Tokyo Univ. of Sci.) Local solvability of the Navier–Stokes–Korteweg equations in the maximal regularity class

概要 In this talk, we would like to consider the Navier–Stokes–Korteweg equations on general domains under the non-slip boundary condition. We prove the local solvability of the Navier–Stokes–Korteweg equations in the maximal regularity class.

- 79 柴田 良弘 (早大理工) Navier–Stokes–Korteweg 方程式の全空間における時間大域的適切性につ
 村田 美帆 (神奈川大工) いて 10
 Yoshihiro Shibata (Waseda Univ.) Global well-posedness for the Navier–Stokes–Korteweg system in \mathbb{R}^N
 Miho Murata (Kanagawa Univ.)

概要 In this talk, we consider the compressible fluid model of Korteweg type which was introduced by J. E. Dunn and J. Serrin in 1985. It is shown that the system admits a unique, global strong solution for small initial data in \mathbb{R}^N , $N \geq 2$. For the purpose, the main tools are the maximal L_p - L_q regularities and L_p - L_q decay properties to the linearized equations. This talk is based on a joint work with Professor Yoshihiro Shibata in Waseda University.

- 80 高田 了 (九大数理) Strongly stratified limit for the 3D inviscid Boussinesq equations ····· 10
Ryo Takada (Kyushu Univ.) Strongly stratified limit for the 3D inviscid Boussinesq equations

概要 We consider the initial value problem of the 3D inviscid Boussinesq equations for stably stratified fluids. We prove the long time existence of classical solutions for large initial data when the buoyancy frequency is sufficiently high. Furthermore, we consider the singular limit of the strong stratification, and show that the long time classical solution converges to that of 2D incompressible Euler equations in some space-time Strichartz norms.

16:30~17:30 特別講演

- 福泉麗佳 (東北大情報) Bose-Einstein 凝縮モデルにおける温度効果
Reika Fukuizumi (Tohoku Univ.) Temperature effects in Bose-Einstein condensation

概要 The stochastic Gross-Pitaevskii equation is used as a model to describe Bose-Einstein condensation at positive temperature. The equation is a complex Ginzburg-Landau equation with a trapping potential and an additive space-time white noise. In this talk, we present an answer to two important questions for this system: the global existence of solutions in the support of the Gibbs measure, and the convergence of those solutions to the equilibrium for large time. In order to prove the convergence to equilibrium, we use the associated purely dissipative equation as an auxiliary equation, for which the convergence may be obtained using standard techniques. Global existence is obtained for all initial data, and not almost surely with respect to the invariant measure.

実 函 数 論

9月26日(水) 第II会場

9:00~12:00

- 1 伊東由文(徳島大*) 測度と積分の公理的方法(III). ルベール測度の定義と存在定理 15
 Yoshifumi Ito (Tokushima Univ.*) Axiomatic method of measure and integration (III). Definition and existence theorem of the Lebesgue measure

概要 This paper is the part III of the series of the articles of the axiomatic method of measure and integration. In this paper, we define the Lebesgue measure on \mathbf{R}^d , ($d \geq 1$) by prescribing the complete system of axioms. Then we prove the uniqueness and existence theorem of the Lebesgue measure. This is a new result.

- 2 伊東由文(徳島大*) 測度と積分の公理的方法(IV). ルベール積分の定義とその基本性質 15
 Yoshifumi Ito (Tokushima Univ.*) Axiomatic method of measure and integration (IV). Definition of the Lebesgue integral and its fundamental properties

概要 This paper is the part IV of the series of the articles of the axiomatic method of measure and integration. In this paper, we define the Lebesgue integral of the Lebesgue measurable functions on \mathbf{R}^d , ($d \geq 1$). Then we study the method of calculation of the Lebesgue integral. Further we clarify the convergence properties of the Lebesgue integral completely. These facts are the new results.

- 3 山崎洋平 C^0 級での無向の広さと無向積分 15
 Yōhei Yamasaki Non-oriented volume and non-oriented integral in the C^0 class

概要 The author discussed the oriented and non-oriented volumes in the C^0 class. It was found, however, an example which violates the property, “The non-oriented volume exceeds the oriented volume”. This definition estimates the desired value of the non-oriented volume too small, if it exists. So this talk proposes a new definition of the non-oriented volume to avoid this counter example. Our new definition gives an upper estimate for the desired value, if it does exist. We may conclude that it is not the fault of this definition, even if the property above does not hold.

- 4 山崎洋平 Minkowski content, 直積原理をみたす低次元の広さ 15
 Yōhei Yamasaki Minkowski content, the volume that admits the cartesian product property

概要 Minor dimensional measures were proposed by many authors for a subset of an euclidean space. These measures, however, did not assure the property, “The value of product set is given by the product of the value of it's component”. This talk points out that this property holds for Minkowski content, though it is not sigma-additive.

- 5 福田 亮 治 (大分大理工) Pan 積分, Lehrer 積分の収束定理 15
 本田 あ お い (九工大情報工)
 岡 崎 悦 明 (フuzzyシステム研)
Ryoji Fukuda (Oita Univ.) Convergence theorems for Pan and Lehrer integrals
Aoi Honda (Kyushu Inst. of Tech.)
Yoshiaki Okazaki
 (Fuzzy Logic Systems Inst.)

概要 In this talk we discuss some convergence theorems for Pan and Lehrer integrals. A fuzzy measure is a monotone set function, and this may be non-additive. There are several integrals with respect to fuzzy measures and some of them are defined using distribution functions. For such integrals, a unified discussion was given by J. Kawabe. Our target Integrals: Pan and Lehrer integrals are not defined using distribution functions. We give some sufficient conditions for some convergence theorems.

- 6 福田 亮 治 (大分大理工) 代数積包除積分の収束定理 15
 本田 あ お い (九工大情報工)
 岡 崎 悦 明 (フuzzyシステム研)
Ryoji Fukuda (Oita Univ.) Convergence theorem of algebraic product inclusion-exclusion integral
Aoi Honda (Kyushu Inst. of Tech.)
Yoshiaki Okazaki
 (Fuzzy Logic Systems Inst.)

概要 In this talk, we discuss a convergence theorem for the algebraic product inclusion-exclusion integral, which is a non-linear integral with respect to a non-additive measure. We show a monotone uniform convergence theorem for this integral under the assumption that the measure is continuous from below.

- 7 鈴木 智 成 (九 工 大 工) 距離空間上の写像に関する縮小条件 15
Tomonari Suzuki
 (Kyushu Inst. of Tech.) Contractive conditions on mappings on metric spaces

概要 We will talk about contractive conditions on mappings on metric spaces.

- 8 木 村 泰 紀 (東 邦 大 理) 測地距離空間における均衡問題とリゾルベント 15
Yasunori Kimura (Toho Univ.) Equilibrium problems on geodesic spaces and their resolvents

概要 The equilibrium problem is one of the nonlinear problems including various problems in convex analysis, and a large number of researchers has been investigating it in the setting of Hilbert and Banach spaces. In this work, we deal with this problem defined on a complete geodesic space and consider the existence of the resolvent operator and its properties with several results concerning the approximation to the solutions of this problem.

- 9 笠 原 健 吾 (東 邦 大 理) 完備 CAT(1) 空間上の 2 つのリゾルベント作用素による Mann 型近似列
木 村 泰 紀 (東 邦 大 理) 15
Kengo Kasahara (Toho Univ.) Mann type iterative sequence for two resolvents in a complete CAT(1)
Yasunori Kimura (Toho Univ.) space

概要 Convex minimization problem is one of the nonlinear optimization problems. We study this problem by using various approaches in the setting of a complete CAT(1) space. It is known that the set of fixed points of the resolvent of a convex function coincides with its minimizers. Hence we find a fixed point of the resolvent instead of a minimizer of the convex function. To find a solution to this problem, we consider Mann type iteration for two resolvents, and prove its convergence property. We introduce this theorem and several properties of the resolvents.

- 10 渡辺 俊一 (東京情報大総合情報) Boundary value problems involving a fractional differential equation ··· 15
 Toshikazu Watanabe Boundary value problems involving a fractional differential equation
 (Tokyo Univ. of Information Sci.)

概要 We prove the existence and uniqueness of solutions of boundary value problems for differential equations of order α where $3 < \alpha \leq 4$.

- 11 厚芝 幸子 (山梨大教育) Attractive point, fixed point and convergence theorems for generalized hybrid-type mappings ··········· 15
 Sachiko Atsushiba Attractive point, fixed point and convergence theorems for generalized hybrid-type mappings
 (Univ. of Yamanashi)

概要 In this talk, we study attractive points of normally generalized hybrid mappings. Using the idea of attractive points, we prove weak convergence theorems for the mappings. We also prove some convergence theorems for nonlinear mappings.

14:15~16:30

- 12 齋藤 耕太 (名大多元数理) 漸近的に任意の方向に等差数列を含むがフラクタル次元が 1 である集合の構成 ··········· 10
 Kota Saito (Nagoya Univ.) Construction of a one-dimensional set which asymptotically and omnidirectionally contains arithmetic progressions

概要 We construct a subset of \mathbb{R}^d which asymptotically and omnidirectionally contains arithmetic progressions but has Assouad dimension 1. More precisely, we say that F asymptotically and omnidirectionally contains arithmetic progressions if we can find an arithmetic progression of length k and gap length $\Delta > 0$ with direction $e \in S^{d-1}$ inside the $\epsilon\Delta$ neighbourhood of F for all $\epsilon > 0$, $k \geq 3$ and $e \in S^{d-1}$. Moreover, the dimension of our constructed example is the lowest-possible because we prove that a subset of \mathbb{R}^d which asymptotically and omnidirectionally contains arithmetic progressions must have Assouad dimension greater than or equal to 1. We also get the same results for arithmetic patches, which are the higher dimensional extension of arithmetic progressions.

- 13 飯田 毅士 (福島工高専) Orlicz-fractional maximal operators on weighted L^p spaces ······· 15
 澤野 嘉宏 (首都大東京理)
 Takeshi Iida Orlicz-fractional maximal operators on weighted L^p spaces
 (Fukushima Nat. Coll. of Tech.)
 Yoshihiro Sawano (Tokyo Metro. Univ.)

概要 In this talk, we consider the weak-boundedness of the fractional Orlicz maximal operators $M_{B,\alpha}$. If $\alpha = 0$, the weak-boundedness for the Orlicz maximal operator M_B is characterized by condition $B(t) \leq Ct^p$. Condition $B(t) \leq Ct^p$ characterizes the weak-boundedness for the fractional cases too. Amazingly, the condition unifies the Hardy–Littlewood–Sobolev type and the Sawyer type: Given the appropriate conditions of indices, the weak-boundedness of the Hardy–Littlewood–Sobolev type is equivalent to the weak-boundedness of the Sawyer type.

- 14 石 明 磊 (茨城大理工) Campanato spaces and commutators of generalized fractional integral
新井龍太郎 (茨城大理工) operators on Orlicz spaces 15
中井英一 (茨城大理工)
- Minglei Shi (Ibaraki Univ.) Campanato spaces and commutators of generalized fractional integral
Ryutaro Arai (Ibaraki Univ.) operators on Orlicz spaces
Eiichi Nakai (Ibaraki Univ.)

概要 Let \mathbb{R}^n be the n -dimensional Euclidean space. Let $b \in \text{BMO}(\mathbb{R}^n)$ and T be a Calderón–Zygmund singular integral operator. In 1976 Coifman, Rochberg and Weiss proved that the commutator $[b, T] = bT - Tb$ is bounded on $L^p(\mathbb{R}^n)$ ($1 < p < \infty$), that is, $\|[b, T]f\|_{L^p} = \|bTf - T(bf)\|_{L^p} \leq C\|b\|_{\text{BMO}}\|f\|_{L^p}$, where C is a positive constant independent of b and f . For the fractional integral operator I_α , Chanillo proved the boundedness of $[b, I_\alpha]$ in 1982. These results were extended to Orlicz spaces by Fu, Yang and Yuan. In this talk we discuss the boundedness of the commutator $[b, I_\rho]$ on Orlicz spaces, where I_ρ is a generalized fractional integral operator and b is a function in generalized Campanato spaces.

- 15 川 澄 亮 太 Pointwise multipliers on weak Orlicz spaces 15
中井英一 (茨城大理工)
- Ryota Kawasumi Pointwise multipliers on weak Orlicz spaces
Eiichi Nakai (Ibaraki Univ.)

概要 In this talk we give the characterization of pointwise multipliers on weak Orlicz spaces. To do this we first prove a generalized Hölder’s inequality for the weak Orlicz spaces. Next, to characterize the pointwise multipliers, we use the fact that all pointwise multipliers from a weak Orlicz space to another weak Orlicz space are bounded operators

- 16 新井龍太郎 (茨城大理工) Fractional integrals on martingale Orlicz spaces 15
中井英一 (茨城大理工)
貞末 岳 (大阪教育大)
- Ryutaro Arai (Ibaraki Univ.) Fractional integrals on martingale Orlicz spaces
Eiichi Nakai (Ibaraki Univ.)
Gaku Sadasue (Osaka Kyoiku Univ.)

概要 It is well known as the Hardy–Littlewood–Sobolev theorem that the fractional integral operators I_α on the Euclidean space \mathbb{R}^n is bounded from L_p to L_q for $1 < p < q < \infty$, $0 < \alpha < n$ and $-n/p + \alpha = -n/q$. In martingale theory, based on the result by Watari (1964), Chao and Ombe (1985) proved the boundedness of the fractional integrals for H_p , L_p , BMO and Lipschitz spaces of the dyadic martingales. These fractional integrals were defined for more general martingales by Sadasue (2011). On the other hand, martingale Morrey spaces and their generalization were introduced by Nakai and Sadasue (2012) and Nakai, Sadasue and Sawano (2013), respectively, and the boundedness of fractional integrals as martingale transforms were established. In this talk we investigate the boundedness of fractional integrals on martingale Orlicz spaces.

- 17 鶴見 裕 之 (早大理工) Counter examples of the bilinear estimates of the Hölder type inequality
in homogeneous Besov spaces 10
- Hiroyuki Tsurumi (Waseda Univ.) Counter examples of the bilinear estimates of the Hölder type inequality
in homogeneous Besov spaces

概要 We consider the bilinear estimates of a product of functions in homogeneous Besov spaces showed by Bony. It is seen that if we change the condition of indices denoting differential orders, then we can find examples of functions that never satisfy the bilinear estimates. Such examples can be constructed due to those used in the ill-posedness problem of the Navier–Stokes equations, such as Bourgain–Pavlović and Yoneda.

- 18 笠原雪夫 (北大理) Matricial Baxter's theorem with a Nehari sequence 10
 N. H. Bingham
 (Imperial Coll. London)
 Yukio Kasahara (Hokkaido Univ.) Matricial Baxter's theorem with a Nehari sequence
 Nicholas H. Bingham
 (Imperial Coll. London)

概要 In the theory of orthogonal polynomials, (non-trivial) probability measures on the unit circle are parametrized by the Verblunsky coefficients. Baxter's theorem asserts that such a measure is absolutely continuous and has positive density with summable Fourier coefficients if and only if its Verblunsky coefficients are summable. This talk presents a version of Baxter's theorem in the matrix case from a view point of the Nehari problem.

- 19 齋藤洋樹 (日大理工) Composition of maximal operators with weighted Hausdorff content .. 15
 田中 仁 (筑波技術大)
 渡辺 俊一 (東京情報大総合情報)
 Hiroki Saito (Nihon Univ.) Composition of maximal operators with weighted Hausdorff content
 Hitoshi Tanaka
 (Tsukuba Univ. of Tech.)
 Toshikazu Watanabe
 (Tokyo Univ. of Information Sci.)

概要 In this talk, we investigate the composition of the fractional maximal operators with the d -dimensional weighted Hausdorff content H_ω^d . In the special case, it is shown that the iterated Hardy–Littlewood maximal operators M^N is bounded from $L^p(M\omega)$ to $L^p(\omega)$ with an arbitrary weight ω and any $N \in \mathbb{N}$.

- 20 筒井容平 (信州大理) A sparse bound for local smoothing operators 15
 Youhei Tsutsui (Shinshu Univ.) A sparse bound for local smoothing operators

概要 A sparse bound for local smoothing operators related to maximal Riesz means is given.

16:45~17:45 特別講演

- 河邊 淳 (信州大工) A unified approach to convergence theorems of distribution-based non-linear integrals
 Jun Kawabe (Shinshu Univ.) A unified approach to convergence theorems of distribution-based non-linear integrals

概要 The Lebesgue integral is used to aggregate an infinite number of inputs into a single output value, and gives a continuous aggregation process as a result of the Lebesgue convergence theorem.

The Choquet, Šipoš, Sugeno, and Shilkret integrals may be considered as a nonlinear aggregation functional $I: \mathcal{M}(X) \times \mathcal{F}^+(X) \rightarrow [0, \infty]$, where $\mathcal{M}(X)$ is the set of all nonadditive measures $\mu: \mathcal{A} \rightarrow [0, \infty]$ on a measurable space (X, \mathcal{A}) , and $\mathcal{F}^+(X)$ is the set of all \mathcal{A} -measurable functions $f: X \rightarrow [0, \infty]$. For this functional, its continuity corresponds to a convergence theorem of integral, which means that the limit of the integrals of a sequence of functions is the integral of the limit function. Many attempts have thus been made to formulate the monotone, the bounded, the dominated, and the Vitali convergence theorems for the Choquet, Šipoš, Sugeno, and Shilkret integrals, all of which are nonlinear integrals determined by the μ -decreasing distribution function $G_\mu(t) := \mu(\{f \geq t\})$.

The purpose of this talk is to present a unified approach to those convergence theorems of such distribution-based nonlinear integrals, in other words, an approach that does not depend on the types of nonlinear integrals. A crucial ingredient is a perturbation of functional that manages the change in the functional value $I(\mu, f)$ when the integrand is slightly shifted from f to $f + \varepsilon$ and the μ -decreasing distribution function is slightly shifted from $G_\mu(f)$ to $G_\mu(f) + \delta$.

9月27日(木) 第II会場

9:15~12:00

- 21 水上雅昭 (東京理大理) Boundedness in a chemotaxis-haptotaxis system with signal-dependent
大塚裕彦 (東京理大理) sensitivity 15
横田智巳 (東京理大理)
Masaaki Mizukami Boundedness in a chemotaxis-haptotaxis system with signal-dependent
(Tokyo Univ. of Sci.) sensitivity
Hirohiko Otsuka (Tokyo Univ. of Sci.)
Tomomi Yokota (Tokyo Univ. of Sci.)

概要 In this talk we consider a chemotaxis-haptotaxis system with signal-dependent sensitivity. In the previous works by Cao (2016), Tao (preprint) and Tao–Winkler (2014) it was shown that the system without signal-dependent sensitivity possesses a global classical solution some conditions; however, the system with signal-dependent sensitivity has not been studied. The purpose of this talk is to establish global existence and boundedness in the system with signal-dependent sensitivity.

- 22 来間俊介 (東京理大理) 非有界領域における非局所項をもつ Cahn–Hilliard 方程式について 15
Shunsuke Kurima (Tokyo Univ. of Sci.) A nonlocal Cahn–Hilliard equation on an unbounded domain

概要 This talk deals with a nonlocal Cahn–Hilliard system on an unbounded domain with smooth bounded boundary. In the case of bounded domains, this system has been studied by using a Faedo–Galerkin approximation scheme considering a compactness. However, in the case of unbounded domains, the compactness breaks down. The present work establishes existence and energy estimates of weak solutions for the above system on an unbounded domain.

- 23 香川溪一郎 (早大理工) Initial boundary value problem of the viscous Cahn–Hilliard equation
大谷光春 (早大理工) 15
Keiichiro Kagawa (Waseda Univ.) Initial boundary value problem of the viscous Cahn–Hilliard equation
Mitsuharu Ôtani (Waseda Univ.)

概要 We consider the initial boundary value problem for the viscous Cahn–Hilliard equation. In 2014, Bui, et al. proved the existence of strong solutions under the condition that the nonlinear term $\varphi(u)$ satisfies $\varphi(u)u \geq 0$ for all $u \in \mathbb{R}$ and Sobolev subcritical growth condition. In this talk, we exclude these conditions by decomposing the nonlinear term $\varphi(u)$ into the sum of a monotone function and a locally Lipschitz perturbation and show the existence of global solutions. In physics, $\varphi(u) = u^3 - u$ is often used as a typical example. However, the previous result cannot cover this case. Our framework can cover not only this case but also more general cases $\varphi(u) = |u|^{p-2}u - |u|^{q-2}u$ with $p > q \geq 2$.

- 24 喜多航佑 (早大理工) Bounds for global solutions of a reaction diffusion system 15
大谷光春 (早大理工)
Kosuke Kita (Waseda Univ.) Bounds for global solutions of a reaction diffusion system
Mitsuharu Ôtani (Waseda Univ.)

概要 We consider the uniform boundedness for global solutions of a reaction diffusion system arising from a nuclear reactor model with the Robin boundary condition, which consists of two real-valued unknown functions. Since this system has no variational structure, we cannot apply the standard methods relying on the Lyapunov functional in order to obtain a priori estimates of global solutions. To cope with this difficulty, we make use of the weighted L^1 norm characterized by the first eigenfunction of Laplacian with the Robin boundary condition.

- 25 黒田隆徳 (早大理工) Periodic solutions for complex Ginzburg–Landau equations in bounded domains 15
 大谷光春 (早大理工) domains 15
 Takanori Kuroda (Waseda Univ.) Periodic solutions for complex Ginzburg–Landau equations in bounded domains
 Mitsuharu Ôtani (Waseda Univ.) domains

概要 We are concerned with the existence of time periodic solutions for 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; $T > 0$; $f : [0, T] \times \Omega \rightarrow \mathbb{C}$ is a given external force and Ω is bounded domains with smooth boundaries. Our approach to (CGL) is to regard it as a parabolic equation governed by $-\lambda\Delta u + \kappa|u|^{q-2}u$. Since (CGL) has a monotone perturbation $-i\alpha\Delta u$ and a non-monotone one $i\beta|u|^{q-2}u$, it is hard to directly apply general theories for periodic problems of parabolic equations.

- 26 高橋美羽 (日本女大理) ソレー効果に関連する実験を記述する初期値境界値問題の数値解法につ
 愛木豊彦 (日本女大理) いて 15
 M. Anthonissen
 (Eindhoven Univ. of Tech.)
 Miu Takahashi (Japan Women's Univ.) Numerical method for initial boundary value problem describing a real
 Toyohiko Aiki (Japan Women's Univ.) experiment related to Soret effect.
 Martijn Anthonissen
 (Eindhoven Univ. of Tech.)

概要 In this talk we discuss an initial boundary value problem describing a real experiment related to the Soret effect on a bounded domain in a plane. Our aim is to present a numerical method for the problem by using a dummy variable, since the shape of the domain is rather complex. Here, we shall show the idea and prove a existence and uniqueness of a solution to the approximation problem given by the dummy variable.

- 27 中屋敷亮太 (千葉大理) 力学的境界条件を含む結晶粒界モデルの漸近挙動 15
 Ryota Nakayashiki (Chiba Univ.) Large-time behavior of the solutions to the system of grain boundary
 motion including dynamic boundary condition

概要 In this talk, we consider a system of parabolic type PDEs. Each constituent system is based on the mathematical model of grain boundary motion, proposed by [Kobayashi-et. al, Physica D., 140 (2000), 141–150], and the principal part of the system consists of a quasilinear diffusion equation of singular type, subject to the dynamic boundary condition. The objective of this study is to obtain a uniform mathematical method for the models of grain boundary motions including dynamic boundary conditions. On this basis, we here address three issues. The first is to show the existence of solutions to the systems, including the rigorous expressions of solutions. The second is to show the continuous associations among the different systems. The final is to show the large time behavior of solutions. The three issues will be demonstrated in forms of the Main Theorems of this talk.

- 28 佐々木善雅 (新潟大 自然) 不連続な流束をもつ保存則方程式の一意可解性について 15
 應和宏樹 (新潟大 自然)
 Yoshimasa Sasaki (Niigata Univ.) On the existence and uniqueness of solutions to scalar conservation laws
 Hiroki Ohwa (Niigata Univ.) with discontinuous flux functions

概要 We consider the existence and uniqueness of solutions to the initial value problem for a scalar conservation law with a flux function which is discontinuous with respect to the unknown function. For the initial value problem, we generalize the shock admissibility condition introduced by Oleinik. Using the wave front tracking method constructed by shock waves which satisfy the generalized shock admissibility condition, we prove the existence of weak solutions to the initial value problem. Moreover, for the initial value problem, we generalize the well-posedness theory introduced by Liu and Yang. Using the generalized theory, we derive an L^1 contractive estimate concerned with weak solutions to the initial value problem.

- 29 渡邊 紘 (大分大 理工) 非等方的拡散項を持つ非局所的放物型・双曲型保存則系の適切性 15
 Hiroshi Watanabe (Oita Univ.) Well-posedness for nonlocal parabolic-hyperbolic conservation laws with anisotropic diffusion terms

概要 Systems for parabolic-hyperbolic conservation laws are interesting research object in the sense of mathematics and applications. In a mathematical point of view, the systems have both properties of hyperbolic equations and those of parabolic equations. Therefore, it has discontinuous solutions in general. From this, the unified well-posedness theory is not given. In application point of view, the systems can be applied to many mathematical models (fluid dynamics, traffic flow, aggregation phenomena, crowd dynamics and so on). In this talk, we formulate initial value problems for the systems with anisotropic diffusion terms and discuss the well-posedness for the problem.

- 30 岩 瀧 司 (東北大 理工) The semigroup generated by the Dirichlet Laplacian of fractional order 15
 Tsukasa Iwabuchi (Tohoku Univ.) The semigroup generated by the Dirichlet Laplacian of fractional order

概要 We study the definition of the semigroup generated by the Dirichlet Laplacian of fractional order on an arbitrary open set and its properties. It will be shown that we obtain the boundedness, the smoothing effects and the maximal regularity estimates in the homogeneous Besov spaces as well as whole space case.

14:15~16:00

- 31 都 築 寛 (広島修道大 経済) Initial-boundary value problems for Vlasov–Poisson equations with angle error in a half-space 15
 Yutaka Tsuzuki
 (Hiroshima Shudo Univ.) Initial-boundary value problems for Vlasov–Poisson equations with angle error in a half-space

概要 We deal with initial-boundary problems for Vlasov–Poisson equations in a half-space with magnetic. In 2013, Skubachevskii gives local-in-time solvability to the system. Moreover, in 2017, existence result with weaker condition were obtained by effectively using the magnetic force whose direction is horizontal to the wall. This talk provides an existence result for the equation where the magnetic force has angle error in the vertical direction.

- 32 加納 理成 (高知大教育) 非線形硬化現象を記述する1次元モデルの可解性について 15
 Risei Kano (Kochi Univ.) The existence of solutions for the non-linear hardening models

概要 In this talk, we discuss the parabolic problem from the hardening phenomena. The unknown functions u and σ describe the displacement and stress, respectively in the one-dimensional interval $(0, L)$. Our problem means the hardening problem that the materials are hardened by plasticity. That is derived from the hardening model by Visintin (2006), and the perfect plasticity model by Duvaut–Lions (1976).

In the perfect plasticity model, the function that is threshold value in the plastic deformation, is a constant. In this talk, we discuss the solvability for the above model with the threshold function depending upon time or unknown function, based on the idea of Duvaut–Lions (1976). The problem equipped with the constraint set depend on the unknown function, is called quasi-variational inequality. The solvabilities of quasi-variational inequality have been dealt with in some papers.

- 33 熊崎 耕太 (長崎大教育) 水分膨張を記述するある自由境界問題の時間大域解の存在について 15
 A. Muntean (Karlstad Univ.)
 Kota Kumazaki (Nagasaki Univ.) Existence of a global solution for a moving boundary problem describing
 Adrian Muntean (Karlstad Univ.) swelling

概要 In this talk, we propose a mathematical model describing water swelling in porous materials. Water swelling is an important issue to investigate frost damage which is a nonlinear phenomenon to give rise to cracks on the concrete surface. Our model consists of a diffusion equation for water content in a one microscopic hole inside of concrete and an ordinary differential equation describing the growth rate of the front of the water content region. In this talk, we discuss the existence and uniqueness of a time local and global solution for this problem.

- 34 白川 健 (千葉大教育) A class of optimal control problems for one-dimensional Kobayashi–
 山崎 教昭 (神奈川大工) Warren–Carter type systems 15
 H. Antil (George Mason Univ.)
 Ken Shirakawa (Chiba Univ.) A class of optimal control problems for one-dimensional Kobayashi–
 Noriaki Yamazaki (Kanagawa Univ.) Warren–Carter type systems
 Harbir Antil (George Mason Univ.)

概要 In this talk, we consider a class of optimal control problems for state problems of one-dimensional parabolic PDE systems. Each state problem is denoted by $(S)_\varepsilon$, with $\varepsilon > 0$, and is associated with the phase-field model of grain boundary motion, proposed by [Kobayashi et al.; Phys. D, 140 (2000), 141–150]. In this regard, each optimal control problem is denoted by $(OCP)_\varepsilon$, with $\varepsilon > 0$, and it is prescribed as a minimization problem of a cost. Additionally, the problems $(S)_\varepsilon$ and $(OCP)_\varepsilon$ are supposed to admit limiting profiles as $\varepsilon \downarrow 0$, and then, the limiting problems are supposed to contain no little singularities. In this talk, the main interest is in the case when $\varepsilon > 0$ (regular case), and the mathematical results concerned with the existence of the optimal control when $\varepsilon > 0$; (b) the necessary condition for the regular optimal control; (c) limiting observation as $\varepsilon \downarrow 0$; will be reported as the main theorems of this talk.

- 35 山崎 教昭 (神奈川大工) Double quasi-variational evolution equations governed by time-dependent
 剣持 信幸 (Univ. of Warsaw) subdifferentials 15
 白川 健 (千葉大教育)
- Noriaki Yamazaki (Kanagawa Univ.) Double quasi-variational evolution equations governed by time-dependent
 Nobuyuki Kenmochi (Univ. of Warsaw) subdifferentials
 Ken Shirakawa (Chiba Univ.)

概要 In this talk, we show the existence of solutions to the following double quasi-variational evolution equations governed by time-dependent subdifferentials in a uniformly convex Banach space V^* :

$$\partial_* \psi^t(u; u'(t)) + \partial_* \varphi^t(u; u(t)) + g(t, u(t)) \ni f(t) \text{ in } V^* \text{ for a.a. } t \in (0, T).$$

Here, the time-dependent function $\psi^t(v; z)$ is proper, lower semi-continuous (l.s.c.), and convex in $z \in V$. Also, $\varphi^t(v; z)$ is a time-dependent, non-negative, continuous convex function in $z \in V$. Note that $(t, v) \in [0, T] \times C([0, T]; H)$ is a parameter that determines the convex functions $\psi^t(v; \cdot)$ and $\varphi^t(v; \cdot)$ on V . In addition, the subdifferentials $\partial_* \psi^t(v; z)$ of $\psi^t(v; z)$ with respect to $z \in V$ is a multivalued operator in V^* , and $\partial_* \varphi^t(v; z)$ of $\varphi^t(v; z)$ with respect to $z \in V$ is a single-valued linear operator in V^* .

- 36 伊藤 昭夫 Evolution inclusion on a real Hilbert space with quasi-variational structure for inner product —Existence of global-in-time solutions— 15
 Akio Ito Evolution inclusion on a real Hilbert space with quasi-variational structure for inner product —Existence of global-in-time solutions—

概要 We consider a Cauchy problem of an abstract evolution inclusion on a real Hilbert space associated with subdifferentials of time-dependent proper l.s.c. convex functions. The abstract evolution inclusion, which is treated in this paper, contains not only convex functions but also inner products of the Hilbert space depending upon unknown functions. Especially, we call such structures for convex functions and inner products quasi-variational structures for convex functions and inner products. The main purposes of this paper are to show the existence of global-in-time solutions to the Cauchy problem, which has the quasi-variational structures.

16:15~17:15 特別講演

- 鈴木 敏行 (神奈川大工) Semilinear Schrödinger evolution equations with inverse-square potentials
 Toshiyuki Suzuki (Kanagawa Univ.) Semilinear Schrödinger evolution equations with inverse-square potentials

概要 We consider the nonlinear Schrödinger equations with inverse-square potentials (NLS)

$$i \frac{\partial u}{\partial t} = \left(-\Delta + \frac{a}{|x|^2} \right) u + g_0(u) \quad \text{in } \mathbb{R} \times \mathbb{R}^N,$$

where $i = \sqrt{-1}$, $N \geq 3$, and $a \geq a(N) = -(N-2)^2/4$. The condition of a is derived from the selfadjointness of $P_a := -\Delta + a|x|^{-2}$ (in the sense of form-sum). For instance, we suppose $g_0(u) := \pm|u|^{p-1}u$ or $g_0(u) := \pm u(|x|^{-\gamma} * |u|^2)$; so that (NLS) conserves the charge and energy. The perturbed operator P_a has a lot of interesting properties both in physical and mathematical sides. In this talk we solve the Cauchy problems for (NLS) in the energy class and analyze the global solutions to (NLS). If $a > a(N)$, the energy class is just equal to $H^1(\mathbb{R}^N)$ (L^2 -type Sobolev space). But if $a = a(N)$, the energy class is a little wider than $H^1(\mathbb{R}^N)$. Thus it is difficult to apply the usual contraction principle to solve (NLS). Hence we need to apply another approach: energy methods. If we have time, we generalize the perturbed potential $a|x|^{-2}$ as inverse-square singular potentials $V(x)$: $V(\mu x) = \mu^{-2}V(x)$ ($\mu > 0$); for example, $V(x) = (b \cdot x)|x|^{-3}$.

函数解析学

9月24日(月) 第Ⅲ会場

10:30~12:00

- 1 井上 寛 (第一薬大) 一般化リース系に基づく非自己共役ハミルトニアンの研究 (1) 10
Hiroshi Inoue (Daiichi Univ. of Pharm.) Non-self-adjoint Hamiltonian based on generalized Riesz systems (1)

概要 In this talk, I shall introduce my studies and ideas about non-self-adjoint Hamiltonian and some physical operators constructed from biorthogonal sequences in a Hilbert space. The notion of generalized Riesz system plays an important rule such studies. From this reason, I introduce under what assumptions a biorthogonal sequence is a generalized Riesz system and construct some well-defined physical operators.

- 2 井上 寛 (第一薬大) 一般化リース系に基づく非自己共役ハミルトニアンの研究 (2) 10
Hiroshi Inoue (Daiichi Univ. of Pharm.) Non-self-adjoint Hamiltonians based on generalized Riesz systems (2)

概要 In this talk, I shall introduce my studies about relationships between generalized Riesz systems and D -quasi bases. The notion of D -quasi bases is an important rule for constructing non-self-adjoint hamiltonian and physical operators in case that D_φ and D_ψ are not dense in H .

- 3 神澤 健雄 (東京理大理工) Criteria for the reducibilities of linear systems 10
Takeo Kamizawa (Tokyo Univ. of Sci.) Criteria for the reducibilities of linear systems

概要 In this presentation, we will study two approaches for the reducibility of linear ordinary differential equations: algebraic reducibility and the Lyapunov reducibility. For those aspects, several criteria of reducibility will be introduced and discussed. Especially, the generalised Shemesh criterion can be used to check the existence of a common eigenspace, so it can determine if a Fedorov type solution exists.

- 4 渡辺 秀司 (群馬大理工)* 超伝導のBCS-Bogoliubov モデルにおける2次相転移とその作用素論的証明 15
Shuji Watanabe (Gunma Univ.) The second-order phase transition in the BCS-Bogoliubov model of superconductivity and its operator-theoretical proof

概要 We give an operator-theoretical proof of the statement that the transition from a normal conducting state to a superconducting state is a second-order phase transition in the BCS-Bogoliubov model of superconductivity. Here we have no magnetic fields.

- 5 和田 和幸 (八戸工高専) 量子ウォークにおける波動作用素の非存在 15
Kazuyuki Wada Absence of wave operators for quantum walks
(Nat. Inst. of Tech., Hachinohe Coll.)

概要 We consider 1-dimensional quantum walks on the line. It is known that if a coin operator rapidly converges to a unitary matrix, then the wave operator exists. We consider the coin operator which slowly converges to a unitary matrix. It is shown that the wave operator does not exist.

- 6 森岡 悠 (同志社大理工) Detection of edge defects by embedded eigenvalues of quantum walks
 瀬川 悦生 (東北大情報) 15
Hisashi Morioka (Doshisha Univ.) Detection of edge defects by embedded eigenvalues of quantum walks
Etsuo Segawa (Tohoku Univ.)

概要 We derive a detection method of edge defects for position-dependent quantum walks using eigenvalues embedded in the continuous spectrum of time evolution operators. The localization occurs if the initial state has an overlap with an eigenfunction of the time evolution operator. However, we cannot detect the existence of edge defects by the existence of the localization. The existence of edge defects is distinguished by the location of eigenvalues of the time evolution operator.

14:15~16:15

- 7 中村 周 (東大数理) Essential self-adjointness of pseudodifferential operators on Euclidean
 平良 晃一 (東大数理) spaces 15
Shu Nakamura (Univ. of Tokyo) Essential self-adjointness of pseudodifferential operators on Euclidean
Kouichi Taira (Univ. of Tokyo) spaces

概要 In this talk, we prove the essential self-adjointness of real principal type pseudo-differential operators in Euclidean spaces under null non-trapping condition. For a proof, we employ microlocal propagation estimates in a interior region and a exterior region respectively. This is joint work with Shu Nakamura.

- 8 只野之英 (東大数理) Long-range scattering theory for discrete Schrödinger operators on hexag-
 onal lattice 15
Yukihide Tadano (Univ. of Tokyo) Long-range scattering theory for discrete Schrödinger operators on hexag-
 onal lattice

概要 We consider discrete Schrödinger operators on the 2-dimensional hexagonal lattice, which is a tight-binding model of Hamiltonian on a graphene sheet. In this talk, we construct Isozaki–Kitada modifiers for a pair of the discrete Schrödinger operator without potential and that with a long-range potential.

- 9 川本昌紀 (東京理大理) Klein–Gordon equations with homogeneous time-dependent electric fields
 15
Masaki Kawamoto (Tokyo Univ. of Sci.) Klein–Gordon equations with homogeneous time-dependent electric fields

概要 We consider the stableness for time-dependent propagator generated by the Klein–Gordon system with time dependent homogeneous electric fields, such a system can be described thorough the time-dependent non-selfadjoint operator.

- 10 渡部 拓也 (立命館大理工) エネルギー交差におけるレゾナンスの準古典分布 15
 藤家 雪朗 (立命館大理工)
A. Martinez (Univ. Bolongna)
Takuya Watanabe (Ritsumeikan Univ.) Semiclassical distribution of resonances near an energy-level crossing
Setsuro Fujiié (Ritsumeikan Univ.)
André Martinez (Univ. Bolongna)

概要 We study the resonances of a two-by-two semiclassical system of one dimensional Schrödinger operators, near an energy where the two potentials intersect transversally, one of them being bonding, and the other one anti-bonding. We obtain estimates on the location and on the widths of these resonances. Our method relies on the construction of fundamental solutions for the two scalar unperturbed operators, and on an iterative procedure in order to obtain solutions to the system.

- 11 山田修宣 (立命館大理工) A refined trace theorem and its application to uniform resolvent estimates of Dirac operators 15
大鍛治隆司 (京大理) H. Kalf
 (Math. Inst. der LMU München)
Osanobu Yamada (Ritsumeikan Univ.) A refined trace theorem and its application to uniform resolvent estimates of Dirac operators
Takashi Okaji (Kyoto Univ.) Hubert Kalf
 (Math. Inst. der LMU München)

概要 We propose a refined trace theorem which shows that the Fourier transform of weighted $L^2(\mathbf{R}^n)$ functions can be regarded as L^2 functions on each sphere $|x| = r$ ($n \geq 2$) for a wide class of weighted functions. We discuss also about the Hölder continuity with respect to r . As the application we consider uniform resolvent estimates of Dirac operators for the massive or massless case.

- 12 浅原啓輔 (北大理) 一般化された対相互作用モデルのスペクトル解析 15
船川大樹 (北海学園大工) Keisuke Asahara (Hokkaido Univ.) Spectral analysis of a generalized pair-interaction model
Daiju Funakawa (Hokkai-Gakuen Univ.)

概要 We consider a generalized pair-interaction model $H(\lambda)$ in quantum field theory with a coupling constant $\lambda \in \mathbb{R}$. We talk about the spectrum of $H(\lambda)$ for all $\lambda \in \mathbb{R}$. In this talk, we introduce the operator $H(\lambda)$ is diagonalized by a proper Bogoliubov transformation for some $\lambda \in \mathbb{R}$. In particular, $H(\lambda)$ has bound states for some λ .

- 13 日高建 準相対論的パウリ・フィールツ模型の基底状態の存在について 15
廣島文生 (九大数理) Takeru Hidaka
佐々木格 (信州大理) Fumio Hiroshima (Kyushu Univ.) On the existence of the ground state for the semi-relativistic Pauli–Fierz model
Itaru Sasaki (Shinshu Univ.)

概要 The existence of the ground state of the so-called semi-relativistic Pauli–Fierz model is proven. Let A be a quantized radiation field and $H_{f,m}$ the free field Hamiltonians which is the second quantization of $\sqrt{|k|^2 + m^2}$. The semi-relativistic Pauli–Fierz Hamiltonian is given by $H_{\text{SRPF}} = \sqrt{(-i\nabla \otimes 1 - A)^2 + M^2} + V \otimes 1 + 1 \otimes H_{f,m}$ for $(m, M) \in [0, \infty) \times [0, \infty)$. We emphasize that our results include a singular case $(m, M) = (0, 0)$.

16:30~17:30 特別講演

- 宮尾忠宏 (北大理) 磁石と作用素不等式
Tadahiro Miyao (Hokkaido Univ.) Magnetism and operator inequalities

概要 In this talk, I will review recent studies on the Hubbard model, which is expected to describe metallic ferromagnetism in strongly correlated electron systems. I will begin with a description of the physical background, then I will present a list of open problems in this field.

As an attempt to solve the problems, a new viewpoint of universality is introduced in strongly correlated electron systems. Our description relies on the operator theoretic correlation inequalities. I explain the Marshall–Lieb–Mattis theorem and Lieb’s theorem from a viewpoint of universality. In addition, from the new perspective, I prove that Lieb’s theorem still holds true even if the electron-phonon and electron-photon interactions are taken into account. I also study Nagaoka–Thouless’ theorem and its stabilities in terms of universality.

9月25日(火) 第III会場

9:15~12:00

- 14 藤井 淳一 (大阪教育大) Power difference mean の表現関数の PM 性について 15
Junichi Fujii (Osaka Kyoiku Univ.) On PM-property for the representing functions of power difference means

概要 The class of power difference means, which is closely related to that of Stolarsky ones, includes typical operator means in the sense of Kubo–Ando. On the other hand, Wada pointed that the property ‘PMI’ implies the Ando–Hiai inequality, which becomes recently the remarkable one in the theory of multivariate operator means. In this talk, we restrict ourselves to representing operator monotone functions and discuss when the power difference means satisfy PMI or PMD.

- 15 瀬尾 祐貴 (大阪教育大教育) 負パラメータをもつ量子 Tsallis 相対エントロピー 10
Yuki Seo (Osaka Kyoiku Univ.) Quantum Tsallis relative entropy of negative order

概要 In this talk, we show some fundamental properties of the quantum Tsallis relative entropy of negative order based on the properties of the quasi geometric mean of positive semidefinite matrices. Moreover, we show matrix trace inequalities on the quantum Tsallis relative entropy of negative order, which includes the quasi geometric mean of positive definite matrices.

- 16 伊藤 公智 (前橋工科大) Estimations of the weighted power mean by the Heron mean 10
Masatoshi Ito (Maebashi Inst. of Tech.) Estimations of the weighted power mean by the Heron mean

概要 For positive real numbers a and b , the weighted power mean $P_{t,q}(a,b)$ and the weighted Heron mean $K_{t,q}(a,b)$ are defined as follows: For $t \in [0,1]$ and $q \in \mathbb{R}$, $P_{t,q}(a,b) = \{(1-t)a^q + tb^q\}^{\frac{1}{q}}$ and $K_{t,q}(a,b) = (1-q)a^{1-t}b^t + q\{(1-t)a + tb\}$. These means generalize the arithmetic and the geometric ones. In this talk, we get estimations of the weighted power mean by the Heron mean. In other words, we obtain the greatest value $\alpha = \alpha(t,r)$ and the least value $\beta = \beta(t,r)$ such that the double inequality $K_{t,\alpha}(a,b) < P_{t,r}(a,b) < K_{t,\beta}(a,b)$ holds for $t,r \in (0,1)$. We can also obtain operator inequalities for bounded linear operators on a Hilbert space.

- 17 遠山 宏明 (前橋工科大) Some relations among the n -th relative operator entropies and the n -th
伊佐 浩史 (前橋工科大) operator divergences II 15
亀井 栄三郎

渡邊 雅之 (前橋工科大)
Hiroaki Tohyama Some relations among the n -th relative operator entropies and the n -th
(Maebashi Inst. of Tech.) operator divergences II
Hiroshi Isa (Maebashi Inst. of Tech.)
Eizaburo Kamei
Masayuki Watanabe
(Maebashi Inst. of Tech.)

概要 Let A and B be bounded positive invertible operators on a Hilbert space \mathcal{H} , $n \in \mathbb{N}$ and $x \in \mathbb{R}$. We define the n -th version of the Tsallis relative operator entropy $T_x(A|B)$ by $T_x^{[1]}(A|B) \equiv T_x(A|B)$, $T_x^{[n]}(A|B) \equiv \frac{T_x^{[n-1]}(A|B) - T_0^{[n-1]}(A|B)}{x}$ ($x \neq 0$) and $T_0^{[n]}(A|B) \equiv \lim_{x \rightarrow 0} T_x^{[n]}(A|B)$ ($n \geq 2$). In particular, $T_0^{[n]}(A|B)$ is called the n -th relative operator entropy, and is denoted by $S^{[n]}(A|B)$. In this talk, we show some properties of $T_x^{[n]}(A|B)$ and $S^{[n]}(A|B)$. Moreover, we try to introduce operator divergences defined by the differences between the n -th relative operator entropies, and show the properties and a relation between them.

- 18 内山 充 Strongly operator convex functions 15
 (島根大*・立命館大総合科学技術研究機構)
 L. G. Brown (Purdue Univ.)
 Mitsuru Uchiyama Strongly operator convex functions
 (Shimane Univ.* / Ritsumeikan Univ.)
 Lawrence G. Brown (Purdue Univ.)

概要 For C^1 -function $f(t)$ on an interval J and for $t_0 \in J$, $K_f(t, t_0) := \frac{f(t) - f(t_0)}{t - t_0}$. We will show that $K_f(t, t_0)$ is strongly operator convex if and only if f is operator monotone.

- 19 木本 一史 (琉球大理) 完全グラフの正規化ラプラシアン行列に対するアルファ行列式の極限挙動 15
 Kazufumi Kimoto (Univ. of Ryukyus) Limit behavior of alpha determinants for normalized Laplacian matrices of complete graphs

概要 We give a limit formula for alpha determinants of a certain parametric deformation of normalized Laplacian matrices of complete graphs K_n . We also calculate the normalized immanants of the same matrices, which allows us to obtain a limit formula for them. Further, we give a biclique-analog of the results above.

- 20 伊藤 稔 (鹿児島大理) 高階の Cayley–Hamilton 定理を用いたある不変式環の記述 15
 Minoru Itoh (Kagoshima Univ.) A description of an invariant theory using the Cayley–Hamilton theorem of higher order

概要 We describe an invariant theory using the Cayley–Hamilton theorem of higher order (given by Y. Agaoka). We need this Cayley–Hamilton type theorem to describe the relations of generators of invariants as an ideal, though these relations can be described simply as an ideal with trace (as reported in the last MSJ meeting held in the spring 2018).

- 21 織田 寛 (拓殖大工) 複素簡約 Lie 環上のベクトル値多項式に対する変数分離定理 15
 Hiroshi Oda (Takushoku Univ.) Separation of variables theorem for vector-valued polynomials on complex reductive Lie algebras

概要 Let G be a connected complex reductive Lie group with Lie algebra \mathfrak{g} and let (π_μ, V_μ) be a minuscule representation of G . The space $\mathcal{P}(\mathfrak{g}) \otimes V_\mu$ of V_μ -valued polynomials on \mathfrak{g} is naturally a module of a commutative algebra \mathcal{I}_μ containing $\mathcal{P}(\mathfrak{g})^G$ (A. A. Kirillov’s family algebra). In this talk, we define the space \mathcal{H}_μ of V_μ -valued harmonic polynomials and show the separation of variables formula “ $\mathcal{P}(\mathfrak{g}) \otimes V_\mu = \mathcal{I}_\mu \otimes \mathcal{H}_\mu$ ” as a generalization of Kostant’s well-known result. We also discuss a natural system of generators for \mathcal{H}_μ , “restrictions” of $\mathcal{H}(\mathfrak{g})$ to various G -orbits in $\mathfrak{g} \times V_\mu^*$, and a generalization of the Hesselink–Peterson formula on graded multiplicities.

- 22 田森 宥好 (東大数理) 実単純リ一群の極小表現の構成 15
 Hiroyoshi Tamori (Univ. of Tokyo) Realization of minimal representations of real simple Lie groups

概要 We consider the realization of a minimal representation as the kernel of an intertwining differential operator from the space of smooth sections of an associated bundle over a flag manifold. It is shown that for the connected split real simple Lie groups of type D_n, E_6, E_7 and E_8 , the space for an associated line bundle admits such realization if and only if the annihilator of an irreducible highest weight module for the corresponding Lie algebra is the Joseph ideal.

- 23 示野 信一 (関西学院大理工) Dunkl 解析における Hobson の公式とその応用 15
 Nobukazu Shimeno Hobson's formula in Dunkl analysis and its applications
 (Kwansei Gakuin Univ.)

概要 Classical Hobson's formula describes how a differential operator with constant coefficients acts on radial functions on an Euclidean space. We give an analogue of Hobson's formula for Dunkl operators and its applications.

13:15~14:15 特別講演

- 和地 輝仁 (北教大釧路) Capelli 恒等式と概均質ベクトル空間の b -関数
 Akihito Wachi (Hokkaido Univ. of Edu.) Capelli identities and b -functions of prehomogeneous vector spaces

概要 To compute the b -function of the determinant $\det(x_{ij})$ is one of the purposes that the Capelli identity was established. Since then a deep relation with the representation theory of Lie group has been understood, and finally the abstract Capelli problem was proposed and settled completely in the paper of Howe and Umeda in 1991. The abstract Capelli problem is a problem asking if every invariant differential operator on V comes from \mathfrak{g} or not, where \mathfrak{g} is a Lie algebra, and V is a representation space of a finite-dimensional representation of \mathfrak{g} .

If the abstract Capelli problem holds for a prehomogeneous vector space, then the b -function can be computed easily by using invariant differential operators. But the abstract Capelli problem fails for most of the prehomogeneous vector spaces. Even in such a case there may be a "Capelli identity", and the b -function is computed by using it. Thus it is still important to study Capelli identities for prehomogeneous vector spaces where the abstract Capelli problem does not hold.

In this talk I introduce such Capelli identities for some prehomogeneous vector spaces, that is, Capelli identities of "odd" type, which help compute the b -functions of prehomogeneous vector spaces associated with quivers, Capelli identities for the prehomogeneous vector spaces of parabolic type, which are generalization of those for quivers, and Capelli identities with zero entries, which are related to non-reductive prehomogeneous vector spaces.

9月26日(水) 第III会場

9:30~12:00

- 24 松本 健吾 (上越教育大)* Flow equivalence of topological Markov shifts and extended Ruelle algebras 15
 Kengo Matsumoto Flow equivalence of topological Markov shifts and extended Ruelle algebras
 (Joetsu Univ. of Edu.)

概要 We study discrete flow equivalence of two-sided topological Markov shifts by using extended Ruelle algebra, which is defined by a groupoid C^* -algebra of an étale groupoid constructed from the Markov shift. We characterize flow equivalence of two-sided topological Markov shifts in terms of conjugacy of certain actions weighted by ceiling functions of two-dimensional torus on the stabilized extended Ruelle algebras for the two-sided topological Markov shifts.

- 25 鈴木 悠平 (名大多元数理) Eigenvalue set for etale groupoids and constructions of distinguished minimal actions 15
 Yuhei Suzuki (Nagoya Univ.) Eigenvalue set for etale groupoids and constructions of distinguished minimal actions

概要 Minimal free topological dynamical systems are one of the major source to construct a natural simple C^* -algebras (via the crossed product construction). In this talk, we clarify that for every pair of a non-torsion exact group and a compact space in a certain large class (e.g., the product of the Cantor set and topological closed manifold) there are continuously many minimal free actions which associate pairwise non-isomorphic groupoids. Moreover one can choose these actions to have a nice crossed product. Based on Appendix B of my paper arXiv:1702.04875.

- 26 縄田 紀夫 (大阪教育大教育) 中心列 C^* -環の無限性について 15
 Norio Nawata (Osaka Kyoiku Univ.) Infiniteness of central sequence C^* -algebras

概要 Let \mathcal{W} be the Razak–Jacelon algebra, which is a certain simple separable nuclear stably projectionless C^* -algebra having trivial K -groups and a unique tracial state and no unbounded traces. In this talk, we show that the central sequence C^* -algebra $F(\mathcal{W})$ of \mathcal{W} is infinite.

- 27 榎本 雅俊 * 2つの部分空間の有界同型の不変量 15
 綿谷 安男 (九大数理)
 Masatoshi Enomoto A bounded isomorphic invariant of two subspace systems
 Yasuo Watatani (Kyushu Univ.)

概要 We study two subspace systems up to bounded isomorphism. For this purpose, it is crucially important to investigate operator ranges. It is related to a Hilbert representation of a Dynkin quiver. We introduce a bounded isomorphic invariant of two subspace systems constructed from graphs of Schatten class operators. We also point out that algebraic isomorphism and bounded isomorphism are different in these two subspace systems.

- 28 澤田 友佑 (名大多元数理) CP_0 -半群の伸張の構成について 15
 Yusuke Sawada (Nagoya Univ.) On the constructions of minimal dilations of CP_0 -semigroups

概要 We clarify the relation between the constructions by Bhat–Skeide and Muhly–Soled of minimal dilations of CP_0 -semigroups.

- 29 森 迪也 (東大数理) Isometries between projection lattices of von Neumann algebras 15
 Michiya Mori (Univ. of Tokyo) Isometries between projection lattices of von Neumann algebras

概要 Since Wigner’s unitary-antiunitary theorem, there have been many researches on isometries between collections of projections in $B(H)$. Recently, G. P. Gehér and P. Šemrl gave a complete description of surjective isometries (with respect to the operator norm) from the collection of all projections in $B(H)$ onto itself. In this talk, we consider a further generalization of this result. Namely, we give a characterization of surjective isometries between projection lattices of two von Neumann algebras.

- 30 安藤浩志 (千葉大理) Structure of bicentralizer algebras and inclusions of type III factors ··· 15
 U. Haagerup
 C. Houdayer (Univ. Paris-Sud)
 A. Marrakchi (Univ. Paris-Sud)

Hiroshi Ando (Chiba Univ.) Structure of bicentralizer algebras and inclusions of type III factors
 Uffe Haagerup
 Cyril Houdayer (Univ. Paris-Sud)
 Amine Marrakchi (Univ. Paris-Sud)

概要 We investigate the structure of the relative bicentralizer algebra $B(N \subset M, \varphi)$ for inclusions of von Neumann algebras with normal expectation where N is a type III₁ subfactor and $\varphi \in N_*$ is a faithful state. We first construct a canonical flow β on the relative bicentralizer algebra and we show that the W^* -dynamical system $(B(N \subset M, \varphi), \beta^\varphi)$ is independent of the choice of φ up to a canonical isomorphism. In the case when $N = M$, we deduce new results on the structure of the automorphism group of $B(M, \varphi)$ and we relate the period of the flow β^φ to the tensorial absorption of Powers factors. For general irreducible inclusions $N \subset M$, we relate the ergodicity of the flow β^φ to the existence of irreducible hyperfinite subfactors in M that sit with normal expectation in N . When the inclusion $N \subset M$ is discrete, we prove a relative bicentralizer theorem and we use it to solve Kadison's problem when N is amenable.

- 31 戸松玲治 (北大理) On minimal actions of compact groups on full factors ········· 15
 Reiji Tomatsu (Hokkaido Univ.) On minimal actions of compact groups on full factors

概要 We discuss the fullness of the crossed product von Neumann factor associated with a minimal action of a compact group on a factor.

14:15~15:00

- 32 宮島静雄 (東京理大理) Characterization of closed balls via metric projections, II ········· 10
齊藤功 (東京理大理)
 Shizuo Miyajima (Tokyo Univ. of Sci.) Characterization of closed balls via metric projections, II
Isao Saito (Tokyo Univ. of Sci.)

概要 A closed ball with its center at the origin in a real Banach space X has the following property (P): For every $x \in X$, a positive-scalar multiple of x gives a nearest point in C to x . In MSJ Spring Meeting 2018 at The University of Tokyo, we reported that a converse of this fact holds in the sense that a bounded closed convex set $C \subset X$ with $0 \in \text{Int } C$ possessing property (P) is a closed ball with center 0, provided X is *smooth* and $\dim X > 1$.

In this talk we prove that the above result holds without the assumption of smoothness.

- 33 羽鳥理 (新潟大自然) A geometric inequality and isometries on the positive cone ········· 15
阿部敏一 (茨城大工)
Osamu Hatori (Niigata Univ.) A geometric inequality and isometries on the positive cone
Toshikazu Abe (Ibaraki Univ.)

概要 We prove a geometric inequality for positive operators in the Banach algebra of all bounded linear operators on a Hilbert space. As an application we exhibit a several examples of a generalized gyrovectors spaces (GGV) which consists of positive operators. We describe a surjective isometry for Thompson-like metric on these GGVs.

- 34 渡辺恵一 (新潟大理) ムビウスの演算に関連する Cauchy–Bunyakovsky–Schwarz 型の不等式 · 15
 Keiichi Watanabe (Niigata Univ.) Cauchy–Bunyakovsky–Schwarz type inequalities related to the Möbius addition

概要 We present Cauchy–Bunyakovsky–Schwarz type inequalities related to the Möbius addition.

15:15~16:15 特別講演

三浦 毅 (新潟大理) 関数空間上の全射等距離写像

Takeshi Miura (Niigata Univ.) Surjective isometries on function spaces

概要 Let $(M, \|\cdot\|_M)$ and $(N, \|\cdot\|_N)$ be normed linear spaces. A mapping $S: M \rightarrow N$ is an isometry if and only if

$$\|S(f) - S(g)\|_N = \|f - g\|_M$$

holds for all $f, g \in M$. Here, we note that isometries need not be linear maps. If an isometry is surjective, then we see that it is essentially real linear by the Mazur–Ulam theorem. Even if surjective isometries are real linear, they need not be complex linear nor conjugate linear. For example, let \mathbb{T} be the unit circle in the complex number field. Then the complex linear space of all linear functions $az + b$ on \mathbb{T} with the supremum norm on \mathbb{T} has a surjective real linear isometry that maps $az + b$ to $az + \bar{b}$, where \bar{b} denotes the complex conjugate of b . It is neither complex linear nor conjugate linear isometry. To the best of my knowledge, the structure of surjective isometries on function spaces remains obscure.

To investigate surjective isometries on function spaces, we first examine C^1 space of all continuously differentiable functions defined on the closed unit interval $[0, 1]$ with respect to several norms. We also show the structure of surjective isometries on a Banach space of analytic functions on the open unit disc.

統計数学

9月24日(月) 第IX会場

9:30~12:00

- 1 小山民雄(立教大理) \mathcal{A} -超幾何分布のパラメータ空間について 15
 Tamio Koyama (Rikkyo Univ.) Parameter space of \mathcal{A} -hypergeometric distributions

概要 We formulate parameters of interest, nuisance parameter, and sufficient statistics as σ -algebra. We determine them in the case of \mathcal{A} -hypergeometric distribution.

- 2 高橋博樹(慶大理工) Large Deviation Principle for arithmetic mean of digits in continued fraction expansion 15
 Hiroki Takahashi (Keio Univ.) Large Deviation Principle for arithmetic mean of digits in continued fraction expansion

概要 Khinchin proved that the arithmetic mean of continued fraction digits of Lebesgue almost every irrational number in $(0,1)$ diverges to infinity. Hence, none of the classical limit theorems such as the weak and strong laws of large numbers or central limit theorems hold. Nevertheless, we prove the existence of a large deviations rate function which estimates exponential probabilities with which the arithmetic mean of digits stays away from infinity. This leads us to a contradiction to the widely-shared view that the Large Deviation Principle is a refinement of laws of large numbers.

- 3 高橋勇人(早大教育) Inclusion-exclusion principles on partially ordered sets and the distributions of the number of pattern occurrences in finite samples 15
 Hayato Takahashi (Waseda Univ.) Inclusion-exclusion principles on partially ordered sets and the distributions of the number of pattern occurrences in finite samples

概要 We study the word counting problem. In Regnier and Szpankowski (1998), generating functions of the number of pattern occurrences are shown. In Bassino et.al (2010), simplified form of generating functions of the number of pattern occurrences are shown in combination with inclusion-exclusion principles. In this paper, we show a new inclusion-exclusion formula in multivariate generating function form on partially ordered sets, and show a simpler expression of generating functions of the number of pattern occurrences in finite samples, which is also easy to implement in computer program. The advantage of our method is that it is easy to compute other statistics based on the statistics of the number of pattern occurrence, e.g., statistics of the number of occurrence of subset patterns.

- 4 那須笑梨奈(横浜国大工) 2次元パーコレーションにおける lowest horizontal crossing の幅について
 竹居正登(横浜国大工) 10
 Erina Nasu (Yokohama Nat. Univ.) On the width of the lowest horizontal crossing in two-dimensional per-
 Masato Takei (Yokohama Nat. Univ.) colation

概要 We consider the bond percolation problem on the square lattice. Our main object is the lowest open crossing r_n of a box $[0, n]^2$. On the event an open crossing of $[0, n]^2$ exists, we define the width ξ_n of the lowest open crossing by the maximum height of points on r_n . We show that as $n \rightarrow \infty$, $\xi_n/(\log n)$ converges to a constant in probability when the system is in the supercritical regime. This improves the previous result obtained by Y. C. Zhang (1999).

- 5 佐久間紀佳 (愛知教育大教育) A modified logarithmic Sobolev inequality for canonical Lévy processes
鈴木良一 (慶大理工) and its applications 10
Noriyoshi Sakuma (Aichi Univ. of Edu.) A modified logarithmic Sobolev inequality for canonical Lévy processes
Ryoichi Suzuki (Keio Univ.) and its applications

概要 In this talk, we show a modified logarithmic Sobolev inequality for canonical Lévy processes. We provide a direct, intrinsic proof of a modified logarithmic Sobolev inequality. Moreover, we derive several previously known inequalities as corollaries of main theorem. As an application of main theorem, we also get a concentration inequality for canonical Lévy processes.

- 6 四丸直人 (岡山理大理) Partial sum of irrational rotations: mean 15
高嶋恵三 (岡山理大理)
Naoto Shimaru (Okayama Univ. of Sci.) Partial sum of irrational rotations: mean
Keizo Takashima
(Okayama Univ. of Sci.)

概要 We consider the distributions of the sum $\sum_{i=1}^n (\{i\alpha\} - \frac{1}{2})$ of irrational rotations, which were studied by Hardy–Littlewood, Ostrowski, Hecke, Khintchine, and Beck. We give an exact formula for the first-order sums, by using Ostrowski expansion, rational rotation approximation and cancellation techniques to derive our results. We also give some mathematical explanations for the effects on the distributions of the sum, caused by large partial quotient in the continued fraction expansion of irrational number α .

- 7 四丸直人 (岡山理大理) Partial sum of irrational rotations: variance 10
高嶋恵三 (岡山理大理)
Naoto Shimaru (Okayama Univ. of Sci.) Partial sum of irrational rotations: variance
Keizo Takashima
(Okayama Univ. of Sci.)

概要 We consider the distributions of the second-order partial sum $\sum_{i=1}^n \left\{ (\{i\alpha\} - \frac{1}{2})^2 - \frac{1}{12} \right\}$, which was originally studied in Behnke. We give estimates for the second-order sums by using rational rotation approximation, which explain their cubic-function-like behaviors. We also give some mathematical explanations for the effects on the distributions of the sum, caused by large partial quotient in the continued fraction expansion of irrational number α .

- 8 星野浄生 (阪府大理) 正則基底に関して Ogawa 可積分な乱関数の SFC による同定 15
Kiyoki Hoshino (Osaka Pref. Univ.) Identification from the SFCs of random functions Ogawa-integrable with
respect to regular basis

概要 We consider the question whether and how a random function is identified from the stochastic Fourier coefficients (SFCs). We give an affirmative answer when random functions are Ogawa-integrable with respect to regular CONS and the SFCs are given by Ogawa integral.

- 9 村山拓也 (京大理) Chordal Komatu–Loewner equation for a family of continuously growing
hulls 15
Takuya Murayama (Kyoto Univ.) Chordal Komatu–Loewner equation for a family of continuously growing
hulls

概要 In this talk, I discuss the chordal Komatu–Loewner equation on standard slit domains in a manner applicable not just to a simple curve but also a family of continuously growing hulls. Especially a conformally invariant characterization of the Komatu–Loewner evolution is obtained. As an application, we can extend the locality of the stochastic Komatu–Loewner evolution with coefficients $(\sqrt{6}, -b_{\text{BMD}})$ in a full generality.

14:15~15:00

- 10 嶽村 智子 (奈良女大理) Dirichlet forms corresponding to diffusion processes in a tube and the time changed process 15
 Tomoko Takemura Dirichlet forms corresponding to diffusion processes in a tube and the time changed process
 (Nara Women's Univ.)

概要 We discussed Convergence of diffusion processes in a tube which is direct product diffusion processes \mathbb{Y} of one dimensional diffusion processes $X^{(1)}$ and skew product diffusions Ξ , or the time changed process \mathbb{X} which is based on a positive continuous additive functional $\Phi(t)$. The skew product Ξ are given by one dimensional diffusion processes R and a spherical Brownian motion Θ by means of positive continuous additive functional $\mathbf{f}(t)$. We show Concrete expressions of the Dirichlet forms corresponding to time changed processes, which may be of non-local type caused by degeneracy of the underlying measures.

- 11 竹内 敦司 (阪市大理) Convergence rates of extreme value distributions via the Stein equations 15
 Atsushi Takeuchi (Osaka City Univ.) Convergence rates of extreme value distributions via the Stein equations

概要 Consider the maximum of independent and identically distributed random variables. The classical result says that the renormalized sample maxima converges to the extreme value distributions, under certain conditions on the distribution function. In this talk, we shall study the uniform rate of the convergence on the Kolmogorov distance in the framework of the Stein equations.

- 12 濱名 裕治 (熊本大理) Radial Ornstein–Uhlenbeck 過程の到達時刻について 10
 Yuji Hamana (Kumamoto Univ.) On the first hitting time of the radial Ornstein–Uhlenbeck process

概要 We investigate the first hitting times of the radial Ornstein–Uhlenbeck processes. In this talk we will give an explicit form of the distribution function of the hitting time by means of the confluent hypergeometric function and its zeros with respect to the first parameter.

15:15~16:15 特別講演

- 土田 兼治 (防衛大) 対称マルコフ過程における加法的汎関数の大偏差原理
 Kaneharu Tsuchida Large deviation principles of additive functionals for symmetric Markov processes
 (Nat. Defense Acad. of Japan)

概要 We consider large deviation principles of continuous or discontinuous additive functionals generated by symmetric Markov processes. As a useful approach in proving the large deviation, the Gärtner–Ellis theorem is well-known. The Gärtner–Ellis theorem implies that the large deviation holds if there exists the logarithmic moment generating function of additive functional and it is differentiable. In the first half of this presentation, we introduce some examples which large deviations are obtained by proving the differentiability of the logarithmic moment generating function directly. But in many cases, it is known that logarithmic moment generating functions are not differentiable. In the second half, we consider the large deviation in a quite general setting. We can not expect to directly apply the Gärtner–Ellis theorem to the large deviation in such a situation. Especially, we show that the large deviation holds for joint additive functionals with continuous and discontinuous parts generated by Borel right processes on Lusin spaces.

16:30~17:30 特別講演

- 星野 壮 登 (九大数理) A relation between regularity structures and paracontrolled calculus
 Masato Hoshino (Kyushu Univ.) A relation between regularity structures and paracontrolled calculus

概要 In the field of singular SPDEs, two prominent theories are recently established: the theory of regularity structures by Hairer and the paracontrolled calculus by Gubinelli, Imkeller, and Perkowski. They are written by different mathematical tools, so that we can use either of them according to the situation. However, the GIP theory applies to less number of equations, because the GIP theory is less algebraic. In this talk, we discuss how to fill this gap. Our goal is to show the equivalence of the Hairer's theory and the "higher order" version of the GIP theory introduced by Bailleul and Bernicot, on the d -dimensional torus.

9月25日(火) 第IX会場

9:30~11:30

- 13 千野 由 喜 (Leiden Univ.) Random walk in cooling random environment 15
 Yuki Chino (Leiden Univ.) Random walk in cooling random environment

概要 In this talk, I will show some asymptotic behaviour of the random walk in cooling random environment (RWCRE). First we will give an introduction of the RWCRE, which is an environment resampled along some increasing time sequence according to some prescribed probability measure. Next, we show some ergodic theorem for the cooling environment which yields the strong law of large numbers and the quenched large deviation principle. The point is to understand the connection between the RWRE and the RWCRE. In the end of the talk, I will present the remaining open problems. This talk is based on a joint work with L. Avena, C. da Costa and F. den Hollander.

- 14 森 隆 大 (京大数理研) マルコフ過程の交差測度に対する大偏差原理 15
 Takahiro Mori (Kyoto Univ.) Large deviations for intersection measures of some Markov processes

概要 Consider an intersection measure of p independent (possibly different) m -symmetric Hunt processes up to time t in a metric measure space E with a Radon measure m . We derive a Donsker–Varadhan type large deviation principle for the normalized intersection measure on the set of finite measures on E as $t \rightarrow \infty$. This extends earlier work by W. König and C. Mukherjee. We also obtain the asymptotic behaviour of logarithmic moment generating function, which is related to the results of X. Chen and J. Rosen. Our results rely on assumptions about the heat kernels of the processes, hence include rich examples.

- 15 植田 優 基 (北大理) Free infinite divisibility for the class of Generalized Power distributions
 森下 順 貴 (北大理) with Free Poisson term 15
 Yuki Ueda (Hokkaido Univ.) Free infinite divisibility for the class of Generalized Power distributions
 Junki Morishita (Hokkaido Univ.) with Free Poisson term

概要 We talk about free infinite divisibility for the class of Generalized Power distributions with Free Poisson term (GFPF) by methods of complex analysis. More specifically, we show that the class of GFPF satisfies the univalent inverse Cauchy transform property and the free regular property under some conditions. The class of GFPF contains important distributions in classical and free probability which are Marchenko–Pastur distributions, free Generalized Inverse Gaussian distributions, beta distributions, shifted semicircle laws and free positive stable laws with index $1/2$. Thus, we lead some results of free infinite divisibility for these important distributions.

- 16 勝田 敏之 (関西学院大理工) 客の離脱を伴う複数クラス単一サーバー待ち行列の安定性条件 15
 Toshiyuki Katsuda (Kwansei Gakuin Univ.) Stability condition for a multiclass single-server queue with abandonment

概要 In this study we consider a multiclass single-server queue with customer abandonment and establish a sufficient condition for the stability of the queue under the first-come, first-served service discipline. Our condition is a generalization of the corresponding condition of such a queue in the single-class case. To obtain the condition, we extend the methodology of fluid-limit stability for the stability of multiclass queueing networks to our multiclass queue with abandonment.

- 17 濱口 雄史 (京大理) 無限次元後退確率微分方程式の解の有限次元近似 12
 Yushi Hamaguchi (Kyoto Univ.) Finite-dimensional approximation of solutions of infinite-dimensional BSDEs

概要 We consider Lipschitz-type backward stochastic differential equations (BSDEs) driven by cylindrical martingales on the space of continuous functions. We show the existence and uniqueness of the solution of such infinite-dimensional BSDEs and prove that the sequence of solutions of corresponding finite-dimensional BSDEs approximates the original solution.

- 18 影山 正幸 (名古屋大芸術工) MDPs with some risk utility functions 15
 Masayuki Kageyama (Nagoya City Univ.) MDPs with some risk utility functions

概要 We investigate some risk functions to evaluate risk over a finite or infinite horizon by Markov decision processes (MDPs).

11:30~12:00 統計数学分科会総会

9月26日(水) 第IX会場

9:40~12:00

- 19 澤 正憲 (神戸大システム情報) 強さ3の巡回的準直交配列の構成法と機能的MRI実験への応用 15
 吉田 和輝 (神戸大システム情報)
 佐竹 翔平 (神戸大システム情報)
 Masanori Sawa (Kobe Univ.) A construction of circulant almost orthogonal arrays of strength 3 and
 Kazuki Yoshida (Kobe Univ.) its applications in functional MRI experiments
 Shohei Satake (Kobe Univ.)

概要 Event-related functional Magnetic Resonance Imaging (efMRI) is an imaging technique that enables one to estimate the shape of the hemodynamic response function (HRF), describing changes in the blood oxygen level dependent (BOLD) to neural activity in response to mental stimuli. Although efficient designs are useful for statistical inference on HRF, there are only a few publications on systematic constructions of such designs. Lin et al. (2017) thus introduced a new class of integer sequences to generate highly efficient designs, which produces a certain statistical concept called circulant almost orthogonal array (CAOA), and laid the foundation on a theory of systematic constructions of CAOAs with strength 2 and bandwidth 1. In this talk, we establish a method for constructing CAOAs with strength 3 and bandwidth 1, and thereby provide a number of infinite families of such CAOAs.

- 20 佐竹 翔平 (神戸大システム情報) 強さ 3 の巡回的準直交配列の構成法と存在性について 15
 吉田 和輝 (神戸大システム情報)
 澤 正憲 (神戸大システム情報)
 Shohei Satake (Kobe Univ.) On constructions and existence of circulant almost orthogonal arrays
 Kazuki Yoshida (Kobe Univ.) with strength 3
 Masanori Sawa (Kobe Univ.)

概要 fMRI designs have been researched to be applied to investigate brain activity. In 2017, Lin, Phoa and Kao defined circulant almost orthogonal arrays (CAOAs) as a kind of fMRI designs. Recently, Satake, Yoshida and Sawa gave a systematic construction of CAOAs with strength 3 by using the idea of Hadamard 3-design in combinatorial design theory. Here we can only get families of CAOAs with constant constraints. In this talk, by combining our construction and a combinatorial observation, we show the existence of families of CAOAs with non-constant constraints.

- 21 松原 和樹 (中央学院大商) Cyclically near-resolvable splitting-balanced block designs with block
 景山 三平 size 2×2 15
 (東京理大理数センター)
 Kazuki Matsubara (ChuoGakuin Univ.) Cyclically near-resolvable splitting-balanced block designs with block
 Sanpei Kageyama (Tokyo Univ. of Sci.) size 2×2

概要 The concept of a splitting-balanced block design, denoted by $(v, u \times k, \lambda)$ -SBD, has been defined with some applications for authentication codes in Ogata et al. (2004). On the other hand, the result on graph decompositions given in Fu and Mishima (2002) implies that there exists a 1-rotationally resolvable $(v, 2 \times 2, 2)$ -SBD if and only if $v \equiv 0 \pmod{4}$. In this talk, a new direct construction of a cyclically near-resolvable $(v, 2 \times 2, 2)$ -SBD is provided. Finally, it is shown that there exists a cyclically near-resolvable $(v, 2 \times 2, 2)$ -SBD if and only if $v \equiv 1 \pmod{4}$.

- 22 地 嵩 頌子 (東京理大理工) Combinatorial designs for dropout in deep learning 15
 宮本 暢子 (東京理大理工)
 藤原 良叔 (筑波大*)
 Shoko Chisaki (Tokyo Univ. of Sci.) Combinatorial designs for dropout in deep learning
 Nobuko Miyamoto (Tokyo Univ. of Sci.)
 Ryoh Fuji-Hara (Univ. of Tsukuba*)

概要 Dropout is used in deep learning. It is a method of learning by invalidating nodes with randomly for each layer in the multi-layer neural network. This is useful for over-learning which excessively adapts to training data. It becomes difficult for the model to generalize to new data which were not in the training set. A random sample of nodes cause more irregular frequency of dropout edges. We propose a combinatorial design of dropout nodes from each partite which balances frequency of edges. In this talk, we introduce the design called dropout design and give some its constructions.

- 23 藤森 洸 (早大理工) The variable selection by the Dantzig selector for Cox's proportional
 hazards model 10
 Kou Fujimori (Waseda Univ.) The variable selection by the Dantzig selector for Cox's proportional
 hazards model

概要 The proportional hazards model proposed by D. R. Cox in a high-dimensional and sparse setting is discussed. The regression parameter is estimated by the Dantzig selector, which will be proved to have the variable selection consistency under some appropriate regularity conditions. This fact enables us to reduce the dimension of the parameter and to construct asymptotically normal estimators for the regression parameter and the cumulative baseline hazard function. In this talk, the simple model which satisfies the regularity conditions and some numerical results of the variable selection consistency of the Dantzig selector for the proportional hazards model are provided.

- 24 中川 智之 (東京理大理工) ロバストなベイズ推定に対する客観事前分布 15
Tomoyuki Nakagawa Objective priors for the robust Bayesian inference
(Tokyo Univ. of Sci.)

概要 In the Bayesian analysis, it is well-known that ordinary Bayes estimator is not robust against outliers. Ghosh and Basu (2016) and Nakagawa and Hashimoto (2017) proposed robust Bayesian inferences against outliers using the density power divergence and γ -divergence, respectively. On the other hand, the selection of priors is also an important problem in the robust Bayesian inference. In this talk, we propose the two type objective priors for the robust Bayesian inference.

- 25 八木 文香 (東京理大理) 単調型欠測をもつ成長曲線モデルにおける推定 15
瀬尾 隆 (東京理大理)
藤越 康祝 (広島大*)
Ayaka Yagi (Tokyo Univ. of Sci.) Estimation of parameters in the growth curve model with monotone
Takashi Seo (Tokyo Univ. of Sci.) missing data pattern
Yasunori Fujikoshi (Hiroshima Univ.*)

概要 We consider the maximum likelihood estimators (MLEs) of the mean parameter vector and the covariance matrix in the growth curve model when the data set has a monotone missing pattern. Throughout this talk, we assume that the data are missing completely at random (MCAR). As a result, we present the MLE of the mean parameter vector when the covariance matrix is known, and the MLE of the covariance matrix when the mean parameter vector is known. That is, we give the determining equation to obtain the MLEs of the mean parameter vector and the covariance matrix.

- 26 佃 康司 (東大総合文化) Poisson-Dirichlet 分布に従う母集団からの標本が保持する情報量について 15
間野 修平 (統計数理研)
Koji Tsukuda (Univ. of Tokyo) Fisher information of multiple samples from the Poisson-Dirichlet pop-
Shuhei Mano (Inst. of Stat. Math.) ulations

概要 The Poisson-Dirichlet distribution $PD(\theta)$ is a statistical model of random distributions with the scalar parameter θ , where the parameter corresponds to the diversity of realized distributions. The following two sampling schemes are considered: (i) drawing s samples of n elements from corresponding s populations which follow $PD(\theta)$ independently, and (ii) drawing a single sample of ns elements from a population which follows $PD(\theta)$. In this presentation, we demonstrate that the magnitude relation of the two Fisher information, which sample partitions converted from samples in (i) and (ii) possess, can change depending on the parameters n , s , and θ .

12:15~12:30 2018年度日本数学会解析学賞授賞式

14:15~15:05

- 27 若木 宏文 (広島大理) Laplace approximation of the distribution function of the Bartlett-
Nanda-Pillai test 15
Hiroyumi Wakaki (Hiroshima Univ.) Laplace approximation of the distribution function of the Bartlett-
Nanda-Pillai test

概要 We show the null distribution function of the Bartlett-Nanda-Pillai test (BNP test) can be shown as a ratio of expectations of some functions of several independent beta random distributions. Using the Laplace's approximation method we obtain the limiting distribution of BNP test and its computable error bound when the sample size and the dimension tend to infinity.

- 28 柿沢佳秀 (北大経済) 非対称カーネル密度推定量のバイアス修正の再考察 15
 五十嵐岳 (筑波大システム情報)
 Yoshihide Kakizawa (Hokkaido Univ.) Bias correction of asymmetric kernel density estimators revisited
 Gaku Igarashi (Univ. of Tsukuba)

概要 Asymmetric kernel density estimation is recently well-studied in the literature. Actually, applying several bias reduction methods for the classical (location-scale type) standard kernel density estimator, some asymmetric kernel density estimators can be bias-corrected in an additive or multiplicative way. In this talk, we revisit additive bias reduction method to reduce the bias up to the higher-order.

- 29 前園宜彦 (九大数理) Mean residual life function estimators for nonnegative data by logarithmic transformation 10
 R. R. Fauzi (九大数理)
 Yoshihiko Maesono (Kyushu Univ.) Mean residual life function estimators for nonnegative data by logarithmic transformation
 Rizky Reza Fauzi (Kyushu Univ.)

概要 In this talk we discuss the kernel-type estimators of mean residual life function $m_X(t) = E(X - t | X > t)$. New estimators that can eliminate the boundary bias effect are proposed. Let X_1, X_2, \dots, X_n be independently and identically distributed nonnegative random variables with an absolutely continuous survival function S_X and a density f_X . We study asymptotic properties of a kernel estimator of $m_X(t)$.

15:20~16:20 特別講演

- 間野修平 (統計数理研) 分割, 超幾何系, Dirichlet 過程と統計的推測
 Shuhei Mano (Inst. of Stat. Math.) Partitions, hypergeometric systems, Dirichlet processes, and their statistical inferences

概要 This talk is on statistical inferences on some combinatorial stochastic processes. Especially, it discusses the intersection of three subjects: partitions, hypergeometric systems, and Ferguson's Dirichlet processes. It is shown that these three subjects related to a common structure called exchangeability. Then, based on the algebraic nature, direct samplers with use of homogeneity of polynomials and dualities in Markov processes, and estimation with information geometry of polytopes will be presented.

16:40~17:40 特別講演

劉 言 (京大情報) 時系列の予測・補間問題と推定問題
 Yan Liu (Kyoto Univ.) From prediction and interpolation problem to parameter estimation problem of time series

概要 We consider prediction and interpolation problem of stationary processes and their application to parameter estimation problem. In a naive approach to defining linear prediction, the independence between the predictor and the prediction error is assumed, which turns out to be useful only for the Gaussian stationary process. Instead of independence, the concept is extended to the least prediction error, which is evaluated in an adequate normed space. This refinement of the definition makes the prediction problem available for a much richer class of stationary processes, such as harmonizable stable process. The interpolation problem for the class is defined along the same line. On the other hand, the estimation problem is to determine the parameters in the model, a parametric spectral density, from observations. The Whittle likelihood is introduced to estimate parameters of the Gaussian stationary process as an approximate Gaussian likelihood. In addition, the Whittle likelihood could also be interpreted as a method which minimizes the prediction error explained above. In this connection, we regard the prediction error and the interpolation error as a contrast between the Fourier transform of observations and the parametric spectral density. The parameters of the stationary process are estimated by the minimum contrast estimation. To precisely understand the estimation procedure, we first investigate the fundamental properties of the contrast functions. The new functions are not contained in the class of either location or scale disparities. Afterward, we discuss the asymptotic behaviors of the minimum contrast estimator applied to the different types of stationary processes. The estimator is shown to be asymptotic consistent. The asymptotic distribution of the estimator depends on the assumptions on the stochastic process. In particular, the estimator is robust against the fourth order cumulant when the process is Gaussian. Although it is shown that the Whittle estimator is asymptotically efficient in the sense that the family of parametric spectral densities is truly specified, the new class contains robust members to the randomly missing observations from the stationary process. We discuss this phenomenon in much more details.

9月27日(木) 第IX会場

9:40~11:30

30 後藤 佑一 (早大理工) Zero crossings 推定量の漸近理論と頑健性 10
 谷口 正信 (早大理工)
 Yuichi Goto (Waseda Univ.) Asymptotic theory and robustness of zero crossings estimator
 Masanobu Taniguchi (Waseda Univ.)

概要 Zero Crossing (ZC) statistic is the number of zero crossings observed in a time series. In this talk, a strictly stationary ellipsoidal ϕ -mixing processes with mean zero, finite variance is discussed. We consider the estimation problems of the autocorrelation of a time series by using zero crossing. First, we will elucidate the joint asymptotic distribution of the ZC estimator. Next, we show that the ZC estimator has a good robustness when the spectral density of the process is contaminated by a sharp peak.

- 31 後藤 佑一 (早大理工) バイナリ時系列に基づく判別解析 10
 谷口 正信 (早大理工)
Yuichi Goto (Waseda Univ.) Discriminant analysis based on binary time series
 Masanobu Taniguchi (Waseda Univ.)

概要 Binary time series is after having been converted a some time series into 0 and 1. In this presentation, we propose a classification method based on binary time series. We will show that the misclassification probability tends to zero when the number observation tends to infinity. Next, we evaluate the asymptotic misclassification probability when the two categories are contiguous. Finally, we show that our classification method based on binary time series has a good robustness when the spectral density of the process is contaminated by a sharp peak.

- 32 谷田 義行 (早大理工) 時系列における経験ベイズ推定量 10
 谷口 正信 (早大理工)
Yoshiyuki Tanida (Waseda Univ.) Empirical Bayesian estimators for time series
 Masanobu Taniguchi (Waseda Univ.)

概要 The empirical Bayesian shrinkage (EBS) estimator is expressed in terms of a shrinkage function $\phi(\cdot)$, and includes the sample mean and the James–Stein estimator as special cases. We evaluate the mean squared error (MSE) of EBS estimator for the mean of a Gaussian vector stationary process. Then a sufficient condition for the proposed EBS estimator to improve the sample mean is given in terms of $\phi(\cdot)$ and the spectral density matrix of the process. We also seek $\phi(\cdot)$ which gives the largest improvement for the difference of MSE's between EBS and the sample mean. The results have a potential to improve the a lot of estimators in various time series data.

- 33 中山 優吾 (筑波大数理物質) Robust support vector machines for high-dimensional data 15
 Yugo Nakayama (Univ. of Tsukuba) Robust support vector machines for high-dimensional data

概要 In this talk, we consider asymptotic properties of support vector machine (SVM) for high-dimensional imbalanced data.

We show that 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 performance of SVM is affected by the imbalance and the tuning parameter. In order to overcome such difficulties, we propose a robust SVM (RSVM). We show that RSVM gives preferable performances for high-dimensional data. Finally, we check the performance of RSVM by numerical simulations.

- 34 石井 晶 (東京理大理工) Strongly spiked eigenvalue モデルにおける高次元相関ベクトルの検定に
 矢田 和善 (筑波大数理物質) ついて 15
 青嶋 誠 (筑波大数理物質)
Aki Ishii (Tokyo Univ. of Sci.) Correlation test for high-dimensional data under the strongly spiked
Kazuyoshi Yata (Univ. of Tsukuba) eigenvalue model
Makoto Aoshima (Univ. of Tsukuba)

概要 In this talk, we consider a correlation test for high-dimensional data. Aoshima and Yata (2018) proposed two eigenvalue models for high-dimensional data and constructed two-sample test procedures. One is called strongly spiked eigenvalue (SSE) model and the other one is called non-SSE (NSSE) model. Yata and Aoshima (2013) proposed a correlation test for high-dimensional data under the NSSE model. We focus on the SSE model that is often seen when we analyze the microarray data set. We give a new test procedure by using the extended cross-data-matrix method given by Yata and Aoshima (2013). We also check the performances of our test procedure by simulation study.

- 35 矢田 和善 (筑波大数理物質) 高次元平均ベクトルの一致推定について 15
 青嶋 誠 (筑波大数理物質)
 Kazuyoshi Yata (Univ. of Tsukuba) Consistency of high-dimensional mean vectors
 Makoto Aoshima (Univ. of Tsukuba)

概要 In this talk, we consider estimation of mean vectors in high-dimensional settings. First, we show that the sample mean vector is not a consistent estimator of the true mean vector in high-dimension, low-sample-size (HDLSS) settings. With the help of a threshold method, we propose a new estimation method for the mean vector. We show that it holds the consistency property even in HDLSS settings. We apply the new method to multi-sample problems. Finally, we demonstrate the new method by using actual microarray data sets.

- 36 柳原 宏和 (広島大理) High-dimensionality adjusted asymptotically loss efficient GC_p in normal multivariate linear models 15
 Hirokazu Yanagihara (Hiroshima Univ.) High-dimensionality adjusted asymptotically loss efficient GC_p in normal multivariate linear models

概要 This paper deals with a variable selection procedure in a multivariate linear regression model with normality assumption, which is called a normal multivariate linear regression model, by minimizing a generalized C_p (GC_p) criterion. The GC_p criterion used in this paper is defined by adding a penalty term to the multivariate standardized residual of sum of squares. A purpose of this paper is to clarify a sufficient condition of the penalty term in the GC_p criterion to satisfy an asymptotically loss efficiency property from the large sample and high-dimensional asymptotic framework, such that $n \rightarrow \infty$ under the condition $p/n \rightarrow c_0 \in [0, 1)$. Then, we can propose an asymptotically loss efficient GC_p criterion under any noncentrality parameter matrix.

14:15~15:05

- 37 明石 郁哉 (早大理工) 一般化経験尤度法による球面上分布の回転対称性の検定 15
 Fumiya Akashi (Waseda Univ.) GEL method for tests of rotational symmetry on spheres

概要 This talk considers a nonparametric test for directional data. Most of classical density functions on the unit spheres share the common important feature called rotational symmetry. However, recently we found real data which do not satisfy this condition, and Ley and Verdebout (J. Multivariate Anal. 2017, 159:67–81) proposed a family of skew-rotationally-symmetric distributions on spheres. On the other hand, it is often severe to assume certain parametric family for real data. To overcome such hurdle, this talk employees the measure of skewness proposed by Mardia (Biometrika 1970, 57(3):519–530), and constructs the generalized empirical likelihood statistic for the null hypothesis of rotational symmetry. The proposed statistic is shown to converge to standard chi-squared distribution, and some simulation experiments illustrate finite sample performance of the proposed method.

- 38 加藤昇吾 (統計数理研) A class of circulas obtained through a Fourier series based approach
 A. Pewsey 15
 (Univ. of Extremadura)
 M. C. Jones (The Open Univ.)
 Shogo Kato (Inst. of Stat. Math.) A class of circulas obtained through a Fourier series based approach
 Arthur Pewsey (Univ. of Extremadura)
 M. C. Jones (The Open Univ.)

概要 Circular data are a set of observations which can be expressed as angles $[-\pi, \pi)$. Bivariate circular data, comprised of pairs of circular observations $[-\pi, \pi)^2$, arise in numerous contexts. In this talk we propose a general Fourier series based approach to obtaining the bivariate circular analogues of copulas recently coined ‘circulas’. As examples of the general construction we consider some classes of circulas arising from different patterns of non-zero Fourier coefficients. The shape and sparsity of such arrangements are found to play a key role in determining the properties of the resultant models. All the special cases of the circulas we consider have simple closed-form expressions for their densities and display different dependence structures from the existing circulas.

- 39 布能英一郎 (関東学院大経済) Pooling incomplete samples における Kullback 情報量の分解 10
 Eiichiro Funo (Kanto Gakuin Univ.) Decomposition of the Kullback–Leibler information on pooling incomplete samples

概要 Discrete multivariate probability models are examined in this presentation. Consider the hypothesis H_2 where some parameters from the first sample and those from the second sample are proportional, and the hypothesis H_1 where H_2 is not satisfied. In two sample problems under the hypothesis H_2 , the null hypothesis where the samples are from the same population is tested against the hypothesis where the samples are from the different population. It is found that the total information is equal to the sum of the within information and the between information in some case, but not equal in several cases. To investigate this phenomenon, we calculate the Kullback information based on H_2 against H_1 . Some interesting results are presented.

応用数学

9月24日(月) 第IV会場

9:00~12:00

- 1 藤村 丞 (福岡大情報基盤センター) On the number of perfect matchings of line graphs II 10
 白石修二 (福岡大理) Sho Fujimura (Fukuoka Univ.) On the number of perfect matchings of line graphs II
 Shuji SHIRAIISHI (Fukuoka Univ.)

概要 For any general graphs, we provide a formula for the number of perfect matchings in line graphs.

- 2 田中康平 (信州大経法) Topological and combinatorial methods in motion planning problem .. 15
 Kohei Tanaka (Shinshu Univ.) Topological and combinatorial methods in motion planning problem

概要 The topological complexity is a numerical invariant closely related to the robotic motion planning problem. I will present topological and combinatorial methods for calculating the topological complexity of a finite space and the associated simplicial complex.

- 3 佐竹翔平 (神戸大システム情報) On quadratic residues and circulant almost orthogonal arrays 15
 Shohei Satake (Kobe Univ.) On quadratic residues and circulant almost orthogonal arrays

概要 fMRI designs have been researched to be applied to investigate brain activity. In 2017, Lin, Phoa and Kao defined circulant almost orthogonal arrays (CAOAs) as a kind of fMRI designs. Recently, Satake, Yoshida and Sawa gave a systematic construction of CAOAs by using the idea of Hadamard 3-design. In their construction from Paley matrices, one must know the distribution of quadratic residues (QRs) modulo primes. The distribution of QRs has been attracted many mathematicians, however, many unknown parts are remained. In this talk, we give an observation of the distribution of QRs. From this result, a necessary condition for existence of CAOAs, constructed from Paley matrices, can be obtained.

- 4 生田卓也 (神戸学院大法) Butson-type complex Hadamard matrices and association schemes on
 宗政昭弘 (東北大情報) Galois rings of characteristic 4 10
 Takuya Ikuta (Kobe Gakuin Univ.) Butson-type complex Hadamard matrices and association schemes on
 Akihiro Munemasa (Tohoku Univ.) Galois rings of characteristic 4

概要 We consider nonsymmetric hermitian complex Hadamard matrices belonging to the Bose–Mesner algebra of commutative nonsymmetric association schemes. We give nonsymmetric association schemes of class 6 on Galois rings of characteristic 4, and classify hermitian complex Hadamard matrices belonging to the Bose–Mesner algebra of its association schemes. It is shown that such a matrix is again necessarily a Butson-type complex Hadamard matrix whose entries are 4-th roots of unity.

- 5 須田 庄 (愛知教育大) The maximum number of diamonds in tournaments 10
 G. Greaves (Nanyang Tech. Univ.) Sho Suda (Aichi Univ. of Edu.) The maximum number of diamonds in tournaments
 Gary Greaves (Nanyang Tech. Univ.)

概要 In 1984, Frankl and Füredi asked what is the maximum number of hyperedges in an r -uniform hypergraph with n -vertices such that every set of $r + 1$ vertices contains 0 or exactly 2 hyperedges. We consider this problem for the case that $r = 4$ and hypergraphs are obtained from tournaments.

- 6 三枝崎剛 (琉球大教育) 完全巡回指数の導入 10
 大浦学 (金沢大理工)
 Tsuyoshi Miezaki (Univ. of Ryukyus) On the complete cycle index
 Manabu Oura (Kanazawa Univ.)

概要 In this talk, we introduce the concept of the complete cycle index and discuss a relation with the complete weight enumerator in coding theory.

- 7 三枝崎剛 (琉球大教育) タット多項式の高種数化 10
 大浦学 (金沢大理工)
 佐久間雅 (山形大理)
 篠原英裕 (山形大非常勤)
 Tsuyoshi Miezaki (Univ. of Ryukyus) On the Tutte polynomials in genus g
 Manabu Oura (Kanazawa Univ.)
 Tadashi Sakuma (Yamagata Univ.)
 Hidehiro Shinohara (Yamagata Univ.)

概要 We introduce the concept of the Tutte polynomials in genus g and discuss some properties. We note that the Tutte polynomials in genus one are well-known the Tutte polynomials. It is known that the Tutte polynomials are matroid invariants and we claim that the Tutte polynomials in genus g are also matroid invariants. The main result of this talk is to give inequivalent matroids which have same Tutte polynomial, and have different Tutte polynomials in genus 2.

- 8 善本潔 (日大理工) Structures of edge-colored complete bipartite graphs 15
 Kiyoshi Yoshimoto (Nihon Univ.) Structures of edge-colored complete bipartite graphs

概要 Let G be a graph. A mapping $c : E(G) \rightarrow \mathbb{N}$ is called an *edge-coloring* of G and $c(e)$ is called the *color* of an edge e . A subgraph H of G is called *properly colored*, or shortly *PC*, if every pair of adjacent edges in H have distinct colors. Gallai gave a structure of edge-colored complete graphs which has no PC cycle of length three. For edge-colored complete bipartite graphs, Axenovich, Jiang and Tuza showed that if every vertex is incident with at least three edges whose colors are mutually distinct, then the complete bipartite graph contains a PC cycle C_4 of length four. In this talk, we will discuss structures of edge-colored complete bipartite graphs which has no PC C_4 .

- 9 安藤清 A local condition for k -contractible edges 15
 (国立情報学研・JST ERATO)
 Kiyoshi Ando A local condition for k -contractible edges
 (Nat. Inst. of Information/JST ERATO)

概要 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. For a graph G and a vertex x of G , let $G[N(x)]$ be the subgraph induced by the neighborhood of x . We prove that if $G[N(x)]$ has less than $\lceil \frac{k}{2} \rceil$ edges for any vertex x of a k -connected graph G , then G has a k -contractible edge. We also show that the bound $\lceil \frac{k}{2} \rceil$ is sharp.

- 10 大野由美子 (横浜国大環境情報) 球面上の偶三角形分割の facial achromatic number 15
松本直己 (成蹊大理工)
Yumiko Ohno (Yokohama Nat. Univ.) Facial achromatic number of even triangulations on the sphere
Naoki Matsumoto (Seikei Univ.)

概要 An n -coloring $c : V(G) \rightarrow \{1, \dots, n\}$ of a graph G on a surface is a *facial t -complete n -coloring* if every t -tuples of colors appears on the boundary of some face of G . The maximum number n such that G has a facial t -complete n -coloring is called the *facial t -achromatic number*. They are expansion of a complete coloring and the achromatic number, respectively. In this talk, we will show some results of a facial 3-complete coloring and the facial 3-achromatic number of even triangulations on the sphere.

- 11 小関健太 (横浜国大環境情報) 4-連結グラフの交差数とハミルトン性 15
C. Zamfirescu (Ghent Univ.)
Kenta Ozeki (Yokohama Nat. Univ.) Hamiltonicity of 4-connected graphs with few crossing number
Carol Zamfirescu (Ghent Univ.)

概要 A seminal theorem of Tutte states that planar 4-connected graphs are Hamiltonian. Applying a result of Thomas and Yu, one can show that every 4-connected graph with crossing number 1 is Hamiltonian. In this talk, we continue along this path and prove the titular statement. We also discuss the traceability 4-connected graphs with small crossing number.

- 12 盧 曉南 (東京理大理工) On separably existentially closed graphs 15
Xiao-Nan Lu (Tokyo Univ. of Sci.) On separably existentially closed graphs

概要 Let G be a (finite, simple, undirected) graph with vertex set V . Let $N(A; B)$ denote the set of all the vertices which are adjacent to every vertex in A but no vertex in B for disjoint $A, B \subseteq V$. Let n be a positive integer. If $N(A; B) \neq \emptyset$ for any pair of disjoint $A, B \subseteq V$ (possibly empty) with $|A \cup B| = n$, the graph G is said to be n -existentially closed (n -ec). Moreover, if $N(A; B)$'s never coincide for different choices of such (A, B) , then G is said to be n -separably existentially closed (n -sec). In this talk, I will introduce the relation between n -ec graphs, n -sec graphs, and some explicit constructions.

14:20~16:30

- 13 吉江佑介 (東北大情報) 距離正則グラフ上量子ウォークの定常状態 15
樋口雄介 (昭和大教養)
瀬川悦生 (東北大情報)
Mohamed Fuard Mohamed Sabri
(東北大情報)
Yusuke Yoshie (Tohoku Univ.) Stationary state of quantum walks on distance-regular graphs
Yusuke Higuchi (Showa Univ.)
Etsuo Segawa (Tohoku Univ.)
Mohamed Fuard Mohamed Sabri
(Tohoku Univ.)

概要 In this talk, we treat a quantum walk model on a finite connected graph with infinite tails with supplying infinite energy. In this model, we can construct the stationary state of quantum walk corresponding to the stationary distribution of random walks and observe convergence to the state like random walks. We consider the stationary state for this model on some graphs with useful properties. In particular, we give the explicit expression of the stationary state of this model on hyper cubes and Hamming graphs, classes of distance-regular graphs, by using a property of the stationary state.

- 14 齋藤 正 顕 (名古屋文理大基礎教育センター) Ihara zeta 関数の収束半径に関する不等式 10

Seiken Saito (Nagoya Bunri Univ.) The inequalities of the radii of convergence of Ihara zeta-functions

概要 We prove the inequalities among the spectral radius $\rho(A)$ of a finite graph X , the radius of convergence R of its Ihara zeta-function $Z_X(u)$, and the average degree \bar{d}_X of X . These inequalities are posed by A. Terras in her book (2011) as research problems. Relating to Terras' inequalities, we propose a new conjecture between R and some Rayleigh quotients.

- 15 樋口 雄 介 (昭和大教養) 量子ウォークから誘導される力学系 15
 M. F. Sabri (東北大情報)
 瀬川 悦 生 (東北大情報)
 吉江 佑 介 (東北大情報)

Yusuke Higuchi (Showa Univ.) A dynamical system induced by discrete-time quantum walk
 Mohamed Fuard Sabri (Tohoku Univ.)
 Etsuo Segawa (Tohoku Univ.)
 Yusuke Yoshie (Tohoku Univ.)

概要 We set a dynamical system on a finite and connected graph induced by the Grover walk. To this end, we add additional infinite length tails to the original graph and keep providing an external energy at each time step from them. Then we obtain i) a uniquely existence of a fixed point; ii) the scattering way from the temporal and spatial global view point in the long time limit. The total mass in the long time limit of the internal graph is evaluated by the number of edges.

- 16 井手 勇 介 (北陸先端大) Cycle・Path 上の離散時間量子ウォークの固有解析 15
 Choon-Lin Ho (淡江大)
 今野 紀 雄 (横浜国大工)

Yusuke Ide (JAIST) Spectral analysis of discrete-time quantum walks on cycle and path graphs
 Choon-Lin Ho (Tamkang Univ.)
 Norio Konno (Yokohama Nat. Univ.)

概要 We consider discrete-time quantum walks on cycle graph and path graph with isospectral (but not need the same) coin operators. By using spectral analysis of the time evolution operators for the quantum walks, we have fundamental results for the two cases. For the cycle graph cases, we find a classification criterion of quantum walks from the point of the periodicity. On the other hands, for the path cases, we find a formula for the time-averaged distribution which consists of the information of the corresponding random walk and eigenvalues of the coin operators.

- 17 船川 大 樹 (北海学園大工) 2次元スプリットステップ量子ウォークの レゾナンスについて 15
 布田 徹 (国土館大理工)
 笹山 智 司 (北大理工)
 鈴木 章 斗 (信州大工)

Daiju Funakawa (Hokkai-Gakuen Univ.) About the resonance of a 2-dimensional split-step quantum walk
 Toru Fuda (Kokushikan Univ.)
 Satoshi Sasayama (Hokkaido Univ.)
 Akito Suzuki (Shinshu Univ.)

概要 We consider the 2-dimensional 4-states quantum walk. This quantum walk is an extension of the 1-dimensional split-step quantum walk. The time evolution operator U is defined by the multiplication of the shift operator S and the coin operator C . In this talk, we introduce the condition of C for resonance of U . Moreover, we show that the resonance vector belongs to L^∞ space.

- 18 寺西功哲 (北大理) ユニタリ作用素に対する時間作用素 15
佐々木格 (信州大理)
鈴木章斗 (信州大工)
船川大樹 (北海学園大工)
松澤泰道 (信州大教育)
Noriaki Teranishi (Hokkaido Univ.) A note on time operators with respect to a unitary operator
Itaru Sasaki (Shinshu Univ.)
Akito Suzuki (Shinshu Univ.)
Daiju Funakawa (Hokkai-Gakuen Univ.)
Yasumichi Matsuzawa (Shinshu Univ.)

概要 We define a time operator with respect to a unitary operator. This definition is similar to that of strong time operator. We establish a general existence theorem on such a time operator. We construct a time operator with respect to the unitary operator of the Hadamrd walk.

- 19 久保田匠 (東北大情報) Periodicity of Grover walks on some trees 10
吉江佑介 (東北大情報)
Sho Kubota (Tohoku Univ.) Periodicity of Grover walks on some trees
Yusuke Yoshie (Tohoku Univ.)

概要 The Grover walk is kind of quantum walks and it is defined by a graph. This is studied in many fields and has many applications. Also, there are recently studies on periodicity of Grover walk on many graphs. For example, Higuchi–Konno–Segawa–Sato determine the periodic strongly regular graphs in 2017 and Kubota–Segawa–Taniguchi–Yoshie determine periodic graphs in the generalized Bethe trees in 2018. Periodic graphs are extremely rare and it is hard to find them. On the other hand, by through search by MAGMA, we found some new periodic graphs and consider families including them and determine periodic graphs of those. In this talk, we especially talk examples of periodic trees and introduce an infinite family including them. This talk is based on joint work with Yusuke Yoshie (Tohoku university).

- 20 小松堯 (横浜国大理工) 量子ウォークの固有値問題から誘導される定常測度 10
今野紀雄 (横浜国大工)
Takashi Komatsu Stationary measure induced by eigenvalue problem of quantum walk
(Yokohama Nat. Univ.)
Norio Konno (Yokohama Nat. Univ.)

概要 Recently, quantum walks are intensively studied in quantum physics and quantum computing. The behavior of the quantum walk is quite different from that of classical random walk, e.g., ballistic spreading and localization. In this talk, we give the stationary measures by using transfer matrices induced by eigenvalue problem for quantum walks on the one-dimensional. For example, there are three classes of the stationary measures. First one is the set of the measures with exponential type. Second one is the set of the measures with quadratic polynomial type. Last one is the set of the measures with periodicity. Especially, we discuss the condition to have periodicity.

16:40~17:40 特別講演

今野紀雄 (横浜国大工) 量子ウォーク 2.0
 Norio Konno (Yokohama Nat. Univ.) Quantum walk 2.0

概要 Quantum walk (QW) is a quantum version of random walk and has been extensively studied since around 2000. A striking property of QW is the spreading property. The standard deviation of the walker's position grows linearly in time, quadratically faster than random walk, i.e., ballistic spreading. On the other hand, a walker stays at the starting position: localization occurs. Moreover, due to the rapid development of quantum computer by huge IT companies recently, it has become a reality that programs based on QWs run on quantum computers. Therefore, my title is "Quantum Walk 2.0". In this talk, after an overview of the history of QW, I explain the recent trends.

9月25日(火) 第IV会場

9:00~12:00

21 奈良知恵 (明大MIMS) N次元超立方体の正方形面からなる2-スケルトンの連続平坦化 15
 伊藤仁一 (椋山女学園大教育)
 Chie Nara (Meiji Univ.) Continuous flattening of the 2-skeleton of the square faces in a hyper-
 Jin-ichi Itoh (Sugiyama Jogakuen Univ.) cube

概要 It is known that we can continuously flatten the surface of a 3-dimensional cube onto any of its faces by moving creases to change the shapes of some faces successively, following Sabitov's volume preserving theorem. Let C_n be an n -dimensional cube with $n > 3$, and S be the set of its 2-dimensional faces, in other words, the 2-dimensional skeleton of the square faces in C_n . We show that S can be continuously flattened onto any face F of S such that the faces of S that are parallel to F do not have any crease, that is, they are rigid during the motion.

22 中本敦浩 (横浜国大環境情報) 多角形の幾何学的四角形分割について 15
 松本直己 (成蹊大理工)
 川谷元 (東京理大理)
 J. Urrutia (UNAM)
 Atsuhiko Nakamoto (Yokohama Nat. Univ.) Geometric quadrangulations of a polygon
 Naoki Matsumoto (Seikei Univ.)
 Gen Kawatani (Tokyo Univ. of Sci.)
 Jorge Urrutia (UNAM)

概要 Let P be a polygon on the plane and we consider a geometric quadrangulation of P , that is, a geometric plane graph with each finite face quadrilateral which is obtained from P by adding straight segments in the interior of P . Introducing a new notion for P , called the spirality, we give a sufficient condition for P to admit a geometric quadrangulation. Moreover, we give a condition for P such that any two geometric quadrangulations of P can be transformed into each other by flipping edges.

23 野口健太 (東京理大理工) 1-平面的グラフの連結度とハミルトン性 15
 Kenta Noguchi (Tokyo Univ. of Sci.) Connectivity and Hamiltonicity of 1-planar graphs

概要 A graph is called 1-planar if it can be drawn in the plane such that each edge has at most one crossing point against the other edges. We consider connectivity and Hamiltonicity of 1-planar graphs. On the relationship between planar graphs and Hamiltonicity, very famous Tutte's theorem states that every 4-connected planar graph G is Hamiltonian (i.e., G has a spanning cycle). In this talk, we shall state an analogous result for 4-connected maximal 1-planar graphs.

- 24 松本直己 (成蹊大理工) オイラーグラフ上の帰還ゲームについて 15
長尾篤樹 (お茶の水女大基幹)
Naoki Matsumoto (Seikei Univ.) Feedback game on Eulerian graphs
Atsuki Nagao (Ochanomizu Univ.)

概要 We consider a new impartial game, called a feedback game, on Eulerian graphs. In this talk, we introduce some known results and our results about the time-complexity of the game and the game on toroidal grid graphs.

- 25 平沼駿 (横浜国大環境情報) グラフの直積からなる domatically full なグラフについて 15
川谷元 (東京理大理)
松本直己 (成蹊大理工)
Syun Hiranuma (Yokohama Nat. Univ.) Domatically full graphs obtained from Cartesian products of graphs
Gen Kawatani (Tokyo Univ. of Sci.)
Naoki Matsumoto (Seikei Univ.)

概要 A dominating set of a graph $G = (V, E)$ is a subset D of V such that every vertex not in D adjacent to some vertex in D . The maximum number of disjoint dominating sets in a dominating set partition of a graph G is called domatic number $d(G)$ of G . G is said to be domatically full graph if $d(G) = \delta(G) + 1$ where $\delta(G)$ is the minimum degree of a vertex of G . We give a construction of domatically full graphs by using Cartesian products of graphs.

- 26 藤田慎也 On the weighted safe set problem on paths and cycles 10
(横浜市大データサイエンス)
T. Jensen (Aarhus Univ.)
B. Park (亜洲大)
佐久間雅 (山形大理)
Shinya Fujita (Yokohama City Univ.) On the weighted safe set problem on paths and cycles
Tommy Jensen (Aarhus Univ.)
Boram Park (Ajou Univ.)
Tadashi Sakuma (Yamagata Univ.)

概要 Some recent results on safe set problems in vertex-weighted graphs will be reviewed.

- 27 三橋秀生 (法政大理工) 有限グラフ上の四元数量子ウォークの左固有値について 15
今野紀雄 (横浜国大理工)
佐藤巖 (小山工高専)
Hideo Mitsuhashi (Hosei Univ.) Left eigenvalues of quaternionic quantum walks on graphs
Norio Konno (Yokohama Nat. Univ.)
Iwao Sato (Oyama Nat. Coll. of Tech.)

概要 We investigate left eigenvalues of quaternionic quantum walks on finite graphs. We apply the second weighted zeta function of a graph to obtain some left eigenvalues of quaternionic Grover walks. A quaternionic version of Sato's determinant formula for the second weighted zeta function plays a important role in our results.

- 28 齋藤 溪 (横浜国大理工) 正則グラフ上の Fourier 量子ウォークの周期性 15
Kei Saito (Yokohama Nat. Univ.) Periodicity for the Fourier quantum walk on regular graphs

概要 Quantum walks on the graph have extensively studied from various perspectives. Several results are known for cases where the Grover matrix is adopted as the coin operator. However, when adopting the Fourier matrix as the coin operator, there are almost no corresponding results. In this talk, we focus on the periodicity and present a necessary condition for quantum walks to have a finite period. As an application of this result, we showed that the quantum walks do not have any finite period for some specific graphs: complete graph, cycle graph with selfloops.

- 29 齋藤 溪 (横浜国大理工) 空間発展過程による量子ウォークの定常測度の解析 15
Kei Saito (Yokohama Nat. Univ.) Analysis of the stationary measure of quantum walk by position-evolution process

概要 The stationary measure of the 2-state quantum walk in one dimension has intensively investigated and given some examples by Konno and Takei (2015), Kawai, Komatsu and Konno (2017). In the quantum walk in one dimension, we discovered that the states of quantum walker at positions $x - 1$ and $x + 1$ can be completely described by the state at position x . In other words, by taking the state at the origin for all times as the initial state, all the quantum states are obtained. In this talk, we introduce such a position-evolution process and present some results given by this process.

- 30 佐藤 巖 (小山工高専) The spectral analysis of the unitary matrix of a 2-tessellable staggered
今野 紀雄 (横浜国大工) quantum walk on a graph 15
井手 勇介 (北陸先端大)
Iwao Sato (Oyama Nat. Coll. of Tech.) The spectral analysis of the unitary matrix of a 2-tessellable staggered
Norio Konno (Yokohama Nat. Univ.) quantum walk on a graph
Yusuke Ide (JAIST)

概要 Recently, the staggered quantum walk (SQW) on a graph is discussed as a generalization of coined quantum walks on graphs and Szegedy walks. We present a formula for the time evolution matrix of a 2-tessellable SQW on a graph, and so directly give its spectra. Furthermore, we discuss about the property of the eigenvalues of the discriminant for the time evolution matrix of a 2-tessellable SQW on a graph, and present eigenvectors for some of its eigenvalues.

9月26日(水) 第IV会場

10:00~12:00 特別セッション「機械学習の数学的課題: 深層学習の理論を中心に」

- 園田 翔 (理化学研 AIP) 深層ニューラルネットワーク理論の近況 45
Sho Sonoda (RIKEN) Recent developments on deep neural network theory

概要 Despite the success of deep learning in practice, a lot of open problems remain in theory. For example, why deep learning succeeded to estimate a good neural network in spite of the large number of parameters, or what a neural network does in its “black-box” network. In this talk, I review recent developments on deep neural network theory; and explain how neural networks approximate functions from the viewpoint of the integral representation theory and ridgelet analysis; and what functions neural networks approximate from the viewpoint of the optimal transport theory and Wasserstein geometry.

- 鈴木大慈 (東大工) 深層学習の汎化誤差理論とそのモデル解析への応用 45
 Taiji Suzuki (Univ. of Tokyo) Generalization error theory of deep learning and its application to model analysis

概要 In this talk, we overview the recent developments of deep learning theory especially from the point of view of generalization and representation ability, and give some generalization error analysis from kernel methods and its applications to the model determination analysis. Along with rapid development of deep learning applications, its theoretical analysis has been developed extensively these days. In the first part, we overview the recent progress of deep learning theories. Second, we show what kind of quantity determines the generalization error. To do so, we define an intrinsic dimensionality from a kernel method perspective. Based on the quantity, we derive a generalization error bound. As an application of the theory, we show an approach for model structure determination, especially, model compression method. Finally, we analyze representation ability of deep learning using wavelet analyses.

14:15~16:20

- 31 今井 淳 (千葉大理) 自己インダクタンスの正則化 15
 Jun O'Hara (Chiba Univ.) Regularization of the self-inductance

概要 We introduce several methods to define the self-inductance of a single loop as the regularization of divergent integrals which we obtain by applying Neumann (or Weber) formula for the mutual inductance of a pair of loops to the case when two loops are identical.

- 32 川原田 茜 (京大教育大) ある非線型セル・オートマトンの生成パターンと特異関数との関係について 10
 行木 孝夫 (北大理) Akane Kawaharada Relation between spatio-temporal patterns generated by a nonlinear cellular automaton and a singular function
 (Kyoto Univ. of Edu.) Takao Namiki (Hokkaido Univ.)

概要 In this talk, we give results about the spatio-temporal patterns generated by a nonlinear two-dimensional symmetrical elementary cellular automaton. By using pre-fractal sets we show the relation between the spatio-temporal pattern and a singular function. We also calculate the fractal dimension of the boundary of its limit set.

- 33 森 竜樹 (阪大基礎工) Numerical approach to existence and stability of stationary solutions to
 鈴木 貴 (阪大MMDS) a SKT cross-diffusion equation 15
 四ツ谷 晶二 (龍谷大理工) Tatsuki Mori (Osaka Univ.) Numerical approach to existence and stability of stationary solutions to
 Takashi Suzuki (Osaka Univ.) a SKT cross-diffusion equation
 Shoji Yotsutani (Ryukoku Univ.)

概要 The SKT cross-diffusion equation is proposed by N. Shigesada, K. Kawasaki and E. Teramoto in 1979 to investigate segregation phenomena of two competing species with each other in the same habitat area. Y. Lou and W.-M. Ni derived limiting equations to see whether this effect may give rise to a spatial segregation or not, and to clarify its mechanism. It has been thought that the number of solutions of a stationary limiting equation seems to be at most two. However, we have found several parameter values numerically for which there exist three solutions. In this talk, we show numerical overviews of existence, non-existence, multiplicity and stability of solutions to the stationary limiting equation.

- 34 松井一徳 (金沢大理工) 混合境界条件を課した圧力ポアソン問題について 15
 Kazunori Matsui (Kanazawa Univ.) A pressure-Poisson problem with mixed boundary conditions

概要 A pressure-Poisson problem is used in numerical schemes such as MAC (marker and cell), projection and particle methods for solving the Navier–Stokes equations. We introduce the Stokes problem and a corresponding pressure-Poisson problem, and compare between the two solutions using boundary data.

- 35 千葉悠喜 (東大数理) 滑らかな領域上の Robin 境界条件を持つ Poisson 方程式に対する Nitsche
 齊藤宣一 (東大数理) 法 15
 Yuki Chiba (Univ. of Tokyo) Nitsche’s method for Poisson equations with a Robin boundary condi-
 Norikazu Saito (Univ. of Tokyo) tion in a smooth domain

概要 In the case of finite element approximation for PDEs in a smooth domain, we calculate numerical solution in a polygonal domain approximating the original domain. Then, it may occur that we calculate approximate solution of another problem. In particular, we need to be more careful with boundary condition including derivatives like reduced-FSI model. For standard FEM, there are many study for numerical calculation with several boundary conditions in a smooth domain, but few studies exist for another method like Nitsche’s method and DG method. In this study, we show the analysis and some numerical results of Nitsche’s method for Poisson equations with a Robin boundary condition in a smooth domain.

- 36 中西 徹 (東大数理) 有限要素法による高次元半線形熱方程式の球対称解の数値解析 15
 齊藤宣一 (東大数理)
 Toru Nakanishi (Univ. of Tokyo) Numerical analysis for the radially symmetric solutions of multidimen-
 Norikazu Saito (Univ. of Tokyo) sional semilinear heat equations by finite element method

概要 This paper presents error analysis of the finite element method for computing spherically symmetric solutions of semilinear heat equations. In particular, we establish optimal order error estimates in a weighted L^2 norm for the symmetric formulation and in the L^∞ norm for the non-symmetric formulation.

- 37 高安亮紀 (筑波大システム情報) 微分方程式の爆発解の精度保証付き数値計算 — 指数関数非線形項を持つ
 松江 要 場合 — 15
 (九大IMI・九大I2CNER)
 Akitoshi Takayasu (Univ. of Tsukuba) Numerical validation of blow-up solutions for differential equations with
 Kaname Matsue exponential nonlinearity
 (Kyushu Univ./Kyushu Univ.)

概要 We provide a numerical validation methodology for the finite difference discretization of $u_t = u_{xx} + e^u$ with 0-Dirichlet boundary condition. The main ideas are compactification of phase spaces and time-scale desingularization. In the current case, treatment of numerical validations with exponential growth is the main issue. Fortunately, under a kind of exponential homogeneity of vector field, we can treat the problem in the same way as polynomial vector fields. In particular, we can validate blow-up solutions of differential equations with such exponential nonlinearity as in previous works.

- 38 渡部 善隆 (九大情報基盤研究開発センター) 2階線形楕円型作用素に対する可逆性検証と精度保証付きノルム評価の改善 15
木下 武彦
中尾 充宏 (早大理工)
Yoshitaka Watanabe (Kyushu Univ.) An improvement for verifying the existence and bounds of the inverse
Takehiko Kinoshita of second-order elliptic operators
Mitsuhiro T. Nakao (Waseda Univ.)

概要 We consider second-order elliptic operators with Dirichlet boundary condition. This talk presents some improvements for our previous approaches for determining the existence and bounds of the inverse of the operators. Our proposed approaches are based on constructive L^2 -norm estimates of Laplacian and applications of the authors' previous result related to a posteriori estimates of inverse operators which use projection and a priori error estimations.

16:40~17:40 特別講演

- 深尾 武史 (京都教育大) 総体積保存則に拘束される偏微分方程式と発展方程式による抽象論的接近
Takeshi Fukao (Kyoto Univ. of Edu.) Abstract approach of evolution equation to partial differential equations
with total mass conservation

概要 In this talk, we discuss the well-posedness of Cahn–Hilliard system with dynamic boundary condition. In this model, a characteristic property of conservation holds which is related to the sum of the volume in the bulk and on the boundary. By virtue of the effective usage of this property we can prove the existence and uniqueness of the solution and its continuous dependence. Moreover, we also treat a degenerate parabolic equations as asymptotic limits of Cahn–Hilliard systems.

9月27日(木) 第IV会場

10:00~11:40

- 39 後藤田 剛 (北大電子研) Convergence of the filtered solutions to the 2D Euler equations with
vortex sheet initial data 15
Takeshi Gotoda (Hokkaido Univ.) Convergence of the filtered solutions to the 2D Euler equations with
vortex sheet initial data

概要 We study the 2D filtered Euler equations, which are the regularized 2D Euler equations derived by a spatial filtering method, and focus on the vortex sheet solution that is a weak solution with locally finite kinetic energy and vorticity in the space of Radon measure. We show that vortex sheet solutions of the 2D filtered Euler equations converge to those of the 2D Euler equations in the limit of the regularization parameter.

- 40 清水 雄貴 (京大理) 極小曲面上の点渦力学系: 1. 理論解析 15
榑原 航也 (京大理)
Yuuki Shimizu (Kyoto Univ.) Point vortex dynamics on minimal surfaces: 1. Theoretical analysis
Koya Sakakibara (Kyoto Univ.)

概要 We introduce a theoretical analysis for point vortex dynamics on minimal surfaces. First, we give both a minimal surface spanned by a given boundary configuration and its uniformizing map to obtain a global isothermal coordinate. Second, we compute the evolution of point vortices on the coordinate. Finally, we discuss how the boundary configuration and shapes of the minimal surface affects the dynamics of point vortices.

- 41 榊原航也(京大理) 極小曲面上の点渦力学系:数値解析 15
 清水雄貴(京大理)
 Koya Sakakibara (Kyoto Univ.) Point vortex dynamics on minimal surfaces: Numerical analysis
 Yuuki Shimizu (Kyoto Univ.)

概要 The method of fundamental solutions (MFS for short) is a meshfree numerical solver for linear homogeneous partial differential equations with constant coefficients, and it has been applied to various problems in the plane. In this talk, we extend MFS to a surface being conformally equivalent to a flat surface in the plane. Moreover, we apply it to point vortex dynamics on minimal surfaces and construct efficient numerical scheme based on MFS.

- 42 三宅常時(宇部工高専) 4個の発振器を環状に結合した回路の対称性を用いた解析 10
 勝田祐司(宇部工高専)
 George Miyake An analysis of four coupled oscillators circuits in a ring by using the
 (Ube Nat. Coll. of Tech.) symmetry of the circuits
 Yuji Katsuta (Ube Nat. Coll. of Tech.)

概要 The symmetry of coupled oscillator circuits consisting of four identical oscillators expressed by an odd function is studied. The equations derived by converting coordinate system are analyzed, because the symmetry of the circuit is a dihedral group representation provided that the coupling characteristics are expressed by an odd function. From the symmetry of the equations derived by converting coordinate system, it is shown that there exist the origin whose eight values of the coordinate are zero, and there exist two types of equilibrium points: one is the equilibrium point whose six values of the coordinate are zero, and the other is the equilibrium point whose four values of the coordinate are zero. An analysis is performed for these equilibrium points.

- 43 坂口文則(福井大工) 固有関数消去法による微分作用素の整数型固有値計算法の改良 15
 Fuminori Sakaguchi (Univ. of Fukui) An improvement of integer-type algorithm for eigenvalues of differential
 operators by means of the elimination of eigenfunctions

概要 Several years ago, we proposed an integer-type high-accuracy method for calculating the eigenvalues of M -th order differential operators. This methods utilizes the discontinuity of the $M - 1$ -th order derivatives of the solutions of characteristic functions, which is allowed under the multiplication by a factor from the left. In this study, an improvement of this method is proposed, where we eliminate the true eigenfunction components from the solutions of characteristic equations and we calculate the eigenvalues by analyzing only the error components caused by the singularities. Moreover, we give some numerical examples which show that we are successful in reducing to a large extent the computational quantity.

- 44 中田行彦(島根大総理工) ある遅延微分方程式の陽的な周期解について 15
 Yukihiro Nakata (Shimane Univ.) An explicit periodic solution of a delay differential equation

概要 We show that a nonlinear delay differential equation, which is a Hutchinson–Wright equation with distributed delay, has a periodic solution of period two when the steady state is unstable. To find the periodic solution, we study an integrable system of ordinary differential equations, following the idea by Kaplan and Yorke (1974). The periodic solution is expressed in terms of the Jacobi elliptic functions. An implication for a related disease transmission dynamics model is discussed.

14:15~15:50

- 45 矢ヶ崎一幸 (京大情報) Chaos in randomly perturbed dynamical systems 15
 Kazuyuki Yagasaki (Kyoto Univ.) Chaos in randomly perturbed dynamical systems

概要 We consider a wide class of randomly perturbed systems subjected to stationary Gaussian processes and show that chaotic orbits exist almost surely under some nondegenerate condition, no matter how small the random forcing terms are. This result is very contrasting to the deterministic forcing case, in which chaotic orbits exist only if the influence of the forcing terms overcomes that of the other terms in the perturbations. We illustrate our theory for the Duffing oscillator subjected to the Ornstein–Uhlenbeck process parametrically.

- 46 本永翔也 (京大情報) Nonintegrability of parametrically forced nonlinear oscillators 15
 矢ヶ崎一幸 (京大情報)
 Shoya Motonaga (Kyoto Univ.) Nonintegrability of parametrically forced nonlinear oscillators
 Kazuyuki Yagasaki (Kyoto Univ.)

概要 We discuss nonintegrability of parametrically forced nonlinear oscillators which are represented by second-order homogeneous differential equations with trigonometric coefficients and contain the Duffing and van der Pol oscillators as special cases. Specifically, we give sufficient conditions for their rational nonintegrability in the meaning of Bogoyavlenskij, using Kovacic’s algorithm as well as an extension of the Morales–Ramis theory due to Ayoul and Zung. In application of the extended Morales–Ramis theory, for the associated variational equations, the identity components of their differential Galois groups are shown to be not commutative even if the differential Galois groups are triangularizable. The obtained results are very general and reveal their rational nonintegrability for the wide class of parametrically forced nonlinear oscillators.

- 47 石塚裕大 (京大理) Understanding of dynamical reconstruction based on delay embedding
 中野直人 (京大国際高等教育院) through Gröbner basis 15
 Yasuhiro Ishitsuka (Kyoto Univ.) Understanding of dynamical reconstruction based on delay embedding
 Naoto Nakano (Kyoto Univ.) through Gröbner basis

概要 Dynamical reconstruction by using delay embedding is studied. This embedding method can be used for direct inference of a dynamical system by using time-series only. This reconstruction procedure can be interpreted as derivation of a single equation with respect to the particular embedded variable. Focusing on polynomial dynamical systems, Gröbner basis plays an important role to characterise this methodology. Corresponding members of the resultant Gröbner basis hold information of the target dynamical system. This framework using Gröbner basis can also represent availability of dynamical reconstruction by using delay embedding.

- 48 李聖林 (広島大理) 動的変形ドメインによるパターン形成 15
 Sungrim Seirin Lee (Hiroshima Univ.) Pattern formation induced by domain deformation

概要 The motion and spatial organization of subnuclear domains has been extensively studied by microscopy, but an understanding of the underlying mechanisms remains elusive. In this study, we used mathematical modeling and an in vitro cell system to investigate the mechanism underlying genomic architecture reorganization, a process commonly observed during cellular differentiation. We found that dynamic nuclear deformation provides a driving force for this reorganization by using a new approach of mathematical model based on multi-phasefield method. This study makes a significant contribution toward a better understanding of the mechanisms underlying the reorganization of nuclear architecture, a fundamental question of long-standing interest in genome and developmental biology.

- 49 後藤田剛 (北大電子研) 角層剥離の数理モデリング 15
 上坂正晃 (北大電子研)
 安ヶ平裕介 (北大理)
 小林康明 (お茶の水女大理)
 北畑裕之 (千葉大理)
 傳田光洋 (資生堂)
 長山雅晴 (北大電子研)
 Takeshi Gotoda (Hokkaido Univ.) Mathematical modeling for epidermal desquamation
 Masaaki Uesaka (Hokkaido Univ.)
 Yusuke Yasugahira (Hokkaido Univ.)
 Yasuaki Kobayashi (Ochanomizu Univ.)
 Hiroyuki Kitahata (Chiba Univ.)
 Mitsuhiro Denda (Shiseido Co., Ltd.)
 Masaharu Nagayama (Hokkaido Univ.)

概要 The proteases celled Kallikrein-related peptidase (KLKs) play critical role in epidermal desquamation. KLKs are expressed by keratinocytes in the stratum granulosum and secreted to the intercellular space within lamellar granules. Proteolytic activity induced by KLKs are essential for the desquamation process to occur since desquamation involves the degradation of corneodesmosomes which are the main adhesive structure in the stratum corneum. KLKs act on the protein components that comprise corneodesmosomes and the progress of corneodesmosome degradation loosens adhesion among corneocytes so that they shed off the surface of the stratum corneum. On the basis of experimental studies, we propose a mathematical model for the desquamation process.

- 50 鈴木 貴 (阪大 MMDS) 血管新生モデリング —走化性パラドクスの解消 5
 Takashi Suzuki (Osaka Univ.) Modeling angiogenesis —resolution of chemotactic paradox

概要 A model adaptive to three factors of angiogenesis, chemotactic gradient, chemotactic velocity, and chemotactic gradient variance, is realized by local activation and global inhibition.

- 51 鈴木 貴 (阪大 MMDS) 細胞変形モデリング —自由境界とリュービルの定理 5
 Takashi Suzuki (Osaka Univ.) Modeling cell deformation —free boudaries and Liouville's theorem

概要 Cell deformation driven by the ECM degradation on plasma membrane is formulated as a Stefan-like free boundary problem which is reduced to a degenerate parabolic equation by Liouville's transport theory.

16:10~17:10 特別講演

- 大林 一平 パーシステントホモロジー —数学と計算機科学の融合による「かたち」
 (理化学研 AIP・東北大 AIMR) のデータ解析
 Ippei Obayashi (RIKEN/Tohoku Univ.) Persistent homology —Analysis of the shape of data by the combination
 of mathematics and computer science

概要 Persistent homology is a mathematical tool to characterize the shape of data quantitatively and efficiently. Persistence diagrams are used to visualize the information about persistence diagram and they are good descriptors of the shape of data. In the last decade, persistent homology is rapidly developed from theories and algorithms, to the applications to life scieces, sensor network, and materials science. From the viewpoint of mathematics, persistent homology is the homology theory on filtrations, and its generalization. However, to solve the practical problems, we require the power of computers and we need the ideas from computer science. In this presentation, I will talk about inverse analysis on a persistence diagram. The main topic is volume optimal cycles. The topic relates many mathematical and computational concepts, such as algebraic topology, linear programming, sparseness, etc. We also show the ability of inverse analysis combined with machine learning.

トポロジー

9月24日(月) 第VI会場

9:20~12:00

- 1 宮澤 治子 (津田塾大数学・計算機研) 絡み目のバーンサイド群と n 変形について 10
 和田 康載 (早大教育)
 安原 晃 (早大商)
 Haruko Miyazawa (Tsuda Coll.) Burnside groups and n -moves for links
 Kodai Wada (Waseda Univ.)
 Akira Yasuhara (Waseda Univ.)

概要 Let n be a positive integer. Dabkowski and Przytycki introduced the n th Burnside group of links which is preserved by n -moves, and proved that for any odd prime p there exist links which are not equivalent to trivial links up to p -moves by using their p th Burnside groups. This gives counterexamples for the Montesinos–Nakanishi 3-move conjecture. In general, it is hard to distinguish p th Burnside groups of a given link and a trivial link. In this talk, we give a necessary condition for which p th Burnside groups are isomorphic to those of trivial links. The necessary condition gives us an efficient way to distinguish p th Burnside groups of a given link and a trivial link. As an application, we show that there exist links, each of which is not equivalent to a trivial link up to p -moves for any odd prime p .

- 2 宮澤 治子 (津田塾大数学・計算機研) ウェルデッド絡み目における仮想化変形の一般化について 10
 和田 康載 (早大教育)
 安原 晃 (早大商)
 Haruko Miyazawa (Tsuda Coll.) Generalized virtualization on welded links
 Kodai Wada (Waseda Univ.)
 Akira Yasuhara (Waseda Univ.)

概要 For each positive integer n we introduce two local moves $V(n)$ and V^n , which are generalizations of the virtualization move. We give a classification of welded links up to $V(n)$ -move. In particular, a $V(n)$ -move is an unknotting operation on welded knots for any n . On the other hand, we give a necessary condition for which two welded links are equivalent up to V^n -move. This leads to show that a V^n -move is not an unknotting operation on welded knots except $n = 1$. We also discuss relations among V^n -moves, associated core groups and the multiplexing of crossings.

- 3 寺垣内政一 (広島大教育) 長さ3のプレッツェル結び目の結び目群の正規生成元 10
 Masakazu Teragaito (Hiroshima Univ.) Weight elements of the knot groups of some 3-strand pretzel knots

概要 It is well known that any knot group has weight one, that is, it is normally generated by a single element. Such an element is called a weight element of the knot group. A meridian is a typical weight element, but it is known that the knot group of any non-trivial torus knot, hyperbolic 2-bridge knot, cable knot, or hyperbolic knot with unknotting number one admits other weight elements. We show that for a few infinite classes of 3-strand pretzel knots and all prime knots up to 8 crossings, the knot groups admit weight elements that are not automorphic images of meridians.

- 4 鈴木 正明 (明大総合数理) Genera of two-bridge knots and epimorphisms of their knot groups \cdots 10
 A. T. Tran
 (Univ. of Texas at Dallas)

Masaaki Suzuki (Meiji Univ.) Genera of two-bridge knots and epimorphisms of their knot groups
 Anh T. Tran (Univ. of Texas at Dallas)

概要 Let K, K' be two-bridge knots of genus k, k' respectively. We show the necessary and sufficient condition of k in terms of k' that there exists an epimorphism from the knot group of K onto that of K' .

- 5 斎藤 敏夫 (上越教育大) Tunnel number of knots and generalized tangles \cdots 10
 Toshio Saito (Joetsu Univ. of Edu.) Tunnel number of knots and generalized tangles

概要 It is known that there is a fundamental inequality related to tunnel number of a knot and tangles obtained by its tangle decomposition. The inequality gives an upper bound for tunnel number of the knot, and there exists a knot in the 3-sphere so that the inequality is non-strict. This talk will discuss a slight generalization of those.

- 6 滝岡 英雄 (阪市大数学研) 結び目の $2n$ 移動と Γ 多項式 \cdots 10
 Hideo Takioka (Osaka City Univ.) $2n$ -moves and the Γ -polynomial for knots

概要 We study $2n$ -moves and the Γ -polynomial for knots. In this talk, we show that $4k$ -move is not an unknotting operation for any integer $k \geq 2$ by using the Γ -polynomial and if $\Gamma(K; -1) = 9 \pmod{16}$ then the knot K does not become the unknot by a single 4-move.

- 7 中西 康剛 (神戸大理) Differences of Alexander polynomials for knots caused by a single crossing change, II \cdots 10
 Yasutaka Nakanishi (Kobe Univ.) Differences of Alexander polynomials for knots caused by a single crossing change, II

概要 Okada and the author showed that the sets of Alexander polynomials of knots obtained from 5_1 and 10_{132} by a single crossing change does not coincide. In this talk, we give those of the granny knot and the square knot coincide.

- 8 嘉藤 桂樹 (東工大理) A mirroring formula for the interior polynomial of a bipartite graph \cdots 10
 Keiju Kato (Tokyo Tech) A mirroring formula for the interior polynomial of a bipartite graph

概要 The interior polynomial is an invariant of (signed) bipartite graphs, and the interior polynomial of a plane bipartite graph is equal to a part of the HOMFLY polynomial of a naturally associated link. The HOMFLY polynomial $P_L(v, z)$ is a famous link invariant with many known properties. For example, the HOMFLY polynomial of the mirror image of L is given by $P_L(-v^{-1}, z)$. This implies a property of the interior polynomial in the planar case. We prove that the same property holds for any bipartite graph. The proof relies on Ehrhart reciprocity applied to the so called root polytope. We also establish formulas for the interior polynomial inspired by the knot theoretical notions of flyping and mutation.

- 9 M. Khovanov (Columbia Univ.) Braid group actions from categorical symmetric Howe duality on de-
 A. D. Lauda (Univ. of Southern California) formed Webster algebras 15
 J. Sussan (City Univ. of New York)
 米澤康好 (名大多元数理)
 Mikhail Khovanov (Columbia Univ.) Braid group actions from categorical symmetric Howe duality on de-
 Aaron D. Lauda (Univ. of Southern California) formed Webster algebras
 Joshua Sussan (City Univ. of New York)
 Yasuyoshi Yonezawa (Nagoya Univ.)

概要 We construct a 2-representation of the quiver Hecke (KLR) algebra of $U_q(\mathfrak{gl}_m)$ on a bimodule category over a deformation of Webster algebra of type A_1 categorifying the symmetric Howe representation of $U_q(\mathfrak{gl}_m)$. As a consequence, we obtain a braid group action on the homotopy category of the bimodule category.

- 10 笠原 泰 (高知工科大) 種数 g の写像類群の $2g + 1$ 次元線型表現について 10
 Yasushi Kasahara (Kochi Univ. of Tech.) On $2g + 1$ -dimensional linear representations of mapping class groups of genus g

概要 We give the classification of the $2g + 1$ -dimensional complex linear representations of the pure mapping class groups of compact orientable surfaces of genus g with or without boundary/punctures, for sufficiently large g . The classification is up to conjugation and is described in terms of certain twisted 1-cohomology group of the pure mapping class group in question.

- 11 中村伊南沙 (金沢大理工) ブランチ点をもつ分岐被覆曲面結び目の単純化数 10
 Inasa Nakamura (Kanazawa Univ.) Simplifying branched covering surface-knots with a non-zero number of branch points

概要 A branched covering surface-knot is a surface-knot in the form of a branched covering over an oriented surface-knot, where we include the case when the number of branch points is zero. We can simplify a branched covering surface-knot by an addition of 1-handles with chart loops to a form such that its chart is the union of edges whose end points are vertices of degree 1, and 1-handles with chart loops. The simplifying number is the minimum number of 1-handles necessary to obtain such a simplified form. We give upper estimates of simplifying numbers for the case when branched covering surface-knots have a non-zero number of branch points.

- 12 福田 瑞季 (東北大理) Gluck twist along branched twist spins 10
 Mizuki Fukuda (Tohoku Univ.) Gluck twist along branched twist spins

概要 A branched twist spin is a 2-knot in the four sphere and it is a generalization of twist spun knot. In the study of four dimensional topology, the Gluck twist that is a surgery along a 2-knot is well-studied. It is known that the Gluck twist along a twist spun knot does not changed the four sphere. In this talk, we show the Gluck twist along a branched twist spin also does not changed the four sphere and construct a branched twist spin from another branched twist spin by Gluck twist along it.

- 13 丹下 基生 (筑波大数理物質)^b E_8 交差形式をもつ 4 次元多様体と correction term 15
 Motoo Tange (Univ. of Tsukuba) 4-manifolds with E_8 intersection form and their correction terms

概要 We give examples of Brieskorn homology spheres with E_8 -genus $g_8 = 1$, including $\Sigma(2, 5, 9)$. This construction is a twisting method of well-known plumbing 4-manifolds. Our result contributes to Scaduto's classification of intersection form of definite 4-manifolds which bound $\Sigma(2, 5, 9)$.

14:15~14:55

- 14 阿部 翠空星 (阪市大数学研) 種数 2 のハンドル体結び目の量子 $U_q(\mathfrak{g})$ 不変量 15
Sukuse Abe (Osaka City Univ.) Quantum $U_q(\mathfrak{g})$ invariants of genus 2 handlebody-knots

概要 Let \mathfrak{g} be a semi-simple lie ring. We define quantum $U_q(\mathfrak{g})$ invariant and perturbative \mathfrak{g} invariant of genus 2 handlebody-knots by an arithmetic expansion of quantum $U_q(\mathfrak{sl}_2)$ type invariant. It is effectively easy to calculate the perturbative invariant $\mathfrak{g} = \mathfrak{sl}_2$, which is a significantly stronger invariant than the previous conventional invariant. A handlebody-knot is an embedding of a handlebody in the 3-sphere S^3 . Even for two types of handlebody knots, this can only be classified in up to six crossings. This information can be applied primarily to the 7-crossing-classification problem. Further, we aim to define universal perturbative invariants and introduce extensions upto such invariants.

- 15 湯 浅 亘 (京 大 理) A_2 colored polynomials of rigid vertex graphs 10
Wataru Yuasa (Kyoto Univ.) A_2 colored polynomials of rigid vertex graphs

概要 The Kauffman–Vogel polynomials are three variable polynomial invariants of 4-valent rigid vertex graphs. A one-variable specialization of the Kauffman–Vogel polynomials for unoriented 4-valent rigid vertex graphs was given by using the Kauffman bracket and the Jones–Wenzl idempotent with the color 2. Bataineh, Elhamedi and Hajij generalized it to any color with even positive integers. We give another generalization of the one-variable Kauffman–Vogel polynomial for oriented and unoriented 4-valent rigid vertex graphs by using the A_2 bracket and the A_2 clasps. These polynomial invariants are considered as the \mathfrak{sl}_3 colored Jones polynomials for singular knots and links.

- 16 湯 浅 亘 (京 大 理) A_2 skein representations of pure braid groups 10
Wataru Yuasa (Kyoto Univ.) A_2 skein representations of pure braid groups

概要 We define a family of representations $\{\rho_n\}_{n \geq 0}$ of a pure braid group P_{2k} . These representations are obtained from an action of P_{2k} on a certain type of A_2 web space with color n . The A_2 web space is a generalization of the Kauffman bracket skein module of a disk with marked points on its boundary. We also introduce a triangle-free basis of such an A_2 web space and calculate matrix representations of ρ_n about the standard generators of P_{2k} .

15:10~16:10 特別講演

渡 邊 忠 之 (島根大総合理工) $\text{Diff}(S^4)$ の特性類と族のクラスパー手術

Tadayuki Watanabe (Shimane Univ.) Characteristic classes for $\text{Diff}(S^4)$ and clasper surgery for families

概要 This talk is concerned with the rational homotopy groups of the group $\text{Diff}(S^4)$ of self-diffeomorphisms of S^4 . We present a method to prove that there are many ‘exotic’ non-trivial elements in $\pi_*\text{Diff}(S^4) \otimes \mathbb{Q}$ parametrized by trivalent graphs. The proof utilizes Kontsevich’s characteristic classes for smooth sphere bundles and a version of clasper surgery for families, and is quite elementary. In fact, these are analogues of Chern–Simons perturbation theory in 3-dimension and clasper theory due to Goussarov and Habiro. We explain how the results in 3-dimension can be modified for 4-dimension and review some related problems, including the 4-dimensional Smale conjecture.

9月25日(火) 第VII会場

10:10~10:25 2018年度日本数学会幾何学賞授賞式

10:30~11:30 2018年度日本数学会幾何学賞受賞特別講演 (幾何学分科会と合同)

本多正平 (東北大理) Ricci 曲率が下に有界な特異空間上の幾何解析

Shouhei Honda (Tohoku Univ.) Geometric analysis on metric measure spaces with Ricci bounds from below

概要 In this talk we will discuss the recent developments on the study of metric measure spaces with Ricci bounds from below and applications to Riemannian geometry. In particular it is explained how to construct nontrivial geometric/analytic quantities which are continuous with respect to measured Gromov–Hausdorff convergence.

9月25日(火) 第VI会場

13:15~14:15

17 山岸義和 (龍谷大理工) アルキメデス螺旋格子上のボロノイタイリング 10

須志田隆道 (北大電子研)

Yoshikazu Yamagishi (Ryukoku Univ.) Voronoi tilings on Archimedean spiral lattices

Takamichi Sushida (Hokkaido Univ.)

概要 We study the transition of the number of spirals in a Voronoi tiling for an Archimedean spiral lattice. The cut-and-project structure of the ‘grain boundaries’ is proved, by considering the continuous space of the parameters.

18 一木俊助 (横浜国大環境情報) Characterization of generic transversality 15

Shunsuke Ichiki (Yokohama Nat. Univ.) Characterization of generic transversality

概要 In this talk, the notion of generic transversality and its characterization are given. The characterization is also a further improvement of the basic transversality result and its strengthening which was given by John Mather.

19 山本卓宏 (東京学大教育) 境界付き曲面の安定写像による平面像 15

Takahiro Yamamoto Apparent contours of stable maps of compact surfaces with boundary into the plane
(Tokyo Gakugei Univ.)

概要 In this talk, for a smooth map $f_0: M \rightarrow \mathbb{R}^2$ of a compact surfaces with boundary into the plane, we determine the minimal number of the total of the number of cusps and the number of nodes among stable maps $f: M \rightarrow \mathbb{R}^2$ which are homotopic to f_0 by using some formula.

20 寺本圭佑 (神戸大理) ある性質を持つカスプ辺のガウス写像に現れるカスプの符号について .. 15

Keisuke Teramoto (Kobe Univ.) On signs of cusps of Gauss maps of cuspidal edges with certain properties

概要 We treat cuspidal edges with certain properties. We show relationships between signs of cusps appearing on Gauss maps of such cuspidal edges and geometric invariants of cuspidal edges.

9月26日(水) 第VI会場

10:20~12:00

- 21 下村尚司 (名経大経済) 零次元同相写像の Bratteli–Vershik モデルの応用 10
 Takashi Shimomura Applications of the Bratteli–Vershik model for zero-dimensional homeomorphisms
 (Nagoya Univ. of Economics)

概要 There exist basic sets for all zero-dimensional homeomorphisms: here the basic sets satisfy the following conditions: (1) they are closed sets, (2) an arbitrary orbit passes the basic sets at most once, (3) an arbitrary orbit passes every neighborhood of the basic set, (4) every periodic orbit passes them exactly once. For some cases of zero-dimensional homeomorphic systems, it seems possible to show the existence of non-atomic invariant measures. We propose another application. We used graph covering method when we constructed Bratteli–Vershik models. When we consider graphs whose edges have lengths, we can study classification of some portion of substitution subshifts.

- 22 下村尚司 (名経大経済)* 極小代入力学系に於ける代入写像の特徴 10
 Takashi Shimomura Characterization of substitution map for minimal substitution subshifts
 (Nagoya Univ. of Economics)

概要 The question what is the condition of the substitution maps that generate minimal substitution subshifts is very basic. However, we could not find the answer to this question. We would like to report that we have found an answer to this question.

- 23 児玉大樹 (東大数理) 平坦関数の高階導関数について 15
 増田一男
 三松佳彦 (中大理工)
 Hiroki Kodama (Univ. of Tokyo) Derivatives of flat functions
 Kazuo Masuda
 Yoshihiko Mitsumatsu (Chuo Univ.)

概要 We remark that there is no smooth function $f(x)$ on $[0, 1]$ which is flat at 0 such that the derivative $f^{(n)}$ of any order $n \geq 0$ is positive on $(0, 1]$. Moreover, the number of zeros of the n -th derivative $f^{(n)}$ grows to the infinity and the zeros accumulate to 0 when $n \rightarrow \infty$.

- 24 小原まり子 (信州大理) On graded E-infinity rings and projective schemes 15
 Mariko Ohara (Shinshu Univ.) On graded E-infinity rings and projective schemes

概要 In this talk, I pick up some main points and talk my results for grading on spectra and notion of projective schemes. I will tell about definition of N-graded (resp. Z-graded) E-infinity-rings, by using an infinity-operad constructed from N (resp. Z) and spectral projective schemes.

- 25 井上浩一 (東京都市大共通教育) 対称式と $Q_m(w_n)$ 15
 Koichi Inoue (Tokyo City Univ.) Symmetric polynomial and $Q_m(w_n)$

概要 Milnor operation Q_m of Stiefel–Whitney class w_n is written explicitly as a certain determinant of 2^m -dim matrix of w_n 's.

- 26 原 口 忠 之 (奈良学園大人間教育) 滑らかな CW 複体のホモトピー構造 15

Tadayuki Haraguchi Homotopy structures of smooth CW complexes
(Naragakuen Univ.)

概要 In this talk we present the notion of smooth CW complexes and study their homotopy structures on the category of diffeological spaces. It is clear that the horn $J^{n-1} = \partial I^{n-1} \times I \cup I^{n-1} \times \{1\}$ is a continuous retract of the n -cube I^n . The fact contribute to the development of topological homotopy theory. But J^{n-1} is not a smooth retract of I^n . Thus we introduce the notion of tame property such that J^{n-1} is an approximate retract of I^n . We study smooth homotopy theory by using their properties.

14:15~14:50

- 27 松 雪 敬 寛 (東 工 大 理) ファイブレーションの特性類とグラフ複体 15

Takahiro Matsuyuki (Tokyo Tech) Characteristic classes of fibrations and graph complexes

概要 We construct a double chain complex generated by certain graphs and a chain map from that to the Chevalley–Eilenberg double complex of the dgl of symplectic derivations on a free dgl. It is known that the target of the map is related to characteristic classes of fibrations. We can describe some characteristic classes of fibrations whose fiber is a 1-punctured even-dimensional manifold by linear combinations of graphs though the cohomology of the dgl of derivations.

- 28 野 坂 武 史 (東 工 大 理) de Rham theory and cocycles of cubical sets from smooth quandles ... 15

Takefumi Nosaka (Tokyo Tech) de Rham theory and cocycles of cubical sets from smooth quandles

概要 We show a de Rham theory for cubical manifolds, and study rational homotopy type of the classifying spaces of smooth quandles. We also show that secondary characteristic classes produce cocycles of quandles.

15:10~16:10 特別講演

鍛 冶 静 雄 (九 大 I M I) 同変ループ積について

Shizuo Kaji (Kyushu Univ.) On equivariant loop product

概要 Algebraic structures on the homology of free loop spaces have been studied under the name of string topology, the term first coined by Chas and Sullivan in their paper in 1999. Among various algebraic operations, the most fundamental is the *loop product* in homology. There are different requirements for a space X to admit a loop product on the homology of the free loop space LX over it. For example, Chas–Sullivan’s loop product is defined when $X = M$ is a closed oriented manifold, while Chataur–Menichi’s loop product is for $X = BG$ the classifying space of a group. We define a loop product when $X = M_G$ is the Borel construction of a closed oriented manifold M acted by a Lie group G . This provides a uniform treatment to the above two cases. We adopt a homotopy theoretic approach, which allows us to define a secondary version of the loop product and reveals an interesting connection to group homology. This is joint work with H. Tene.

無限可積分系

9月24日(月) 第V会場

9:15~10:50

- 1 加藤 正輝 (神戸大理) 楕円ディガンマ関数の加法型公式 15
Masaki Kato (Kobe Univ.) An addition type formula for the elliptic digamma function

概要 Eisenstein derived the addition formula for the Weierstrass zeta function from the addition formula for the cotangent function and the fact that the Weierstrass zeta function can be represented as an infinite series of the cotangent function.

In this talk, we apply this Eisenstein's idea to the addition type formula for the double cotangent function, established by the speaker. We show that the elliptic digamma function, defined by the logarithmic derivative of the elliptic gamma function, satisfies an addition type formula. This formula includes the addition formula for the Weierstrass zeta function, evaluation formulas for the double Eisenstein series introduced by Tsumura and the double shuffle relations for the double Eisenstein series, proved by Gangl–Kaneko–Zagier.

- 2 綾野 孝則 (阪市大数学研) 種数3の超楕円曲線のシグマ因子上の有理型関数を退化させて得られる
V. M. Buchstaber (Steklov Math. Inst.) KdV 方程式の解について 15
Takanori Ayano (Osaka City Univ.) Solutions of KdV-equation obtained by the degeneration of meromorphic functions on the sigma divisor of hyperelliptic curves of genus 3
Victor Matveevich Buchstaber (Steklov Math. Inst.)

概要 Buchstaber and Mikhailov constructed the polynomial dynamical systems on the basis of commuting vector fields on the symmetric square of hyperelliptic curves. The zero set of the sigma function in the Jacobian of a curve is called sigma divisor. We constructed solutions of the systems for genus 3 in terms of the meromorphic functions on the sigma divisor of the hyperelliptic curves of genus 3. In this talk, we derive a partial differential equation from the dynamical systems, which is integrable by the meromorphic functions on the sigma divisor of the hyperelliptic curves of genus 3. When the curves degenerate to certain singular curves, the solution of the partial differential equation tends to that of the KdV-equation.

- 3 鈴木 貴雄 (近畿大理工) 自然数の分割 $(n+1, n+1, n+1)$ に対応する A 型ドリinfeld–ソ
Takao Suzuki (Kindai Univ.) A similarity reduction of the Drinfeld–Sokolov hierarchy of type A corresponding to the partition of natural number $(n+1, n+1, n+1)$

概要 The Drinfeld–Sokolov hierarchy is an extension of the KP hierarchy for the affine Lie algebra. In the case of type A, it can be characterized by partitions of natural numbers. In the previous work, we investigated the hierarchy corresponding to the partition $(n+1, n+1)$ and expressed its similarity reduction as the polynomial Hamiltonian system. In this talk, we will consider the Drinfeld–Sokolov hierarchy of type $A_{3n+2}^{(1)}$ corresponding to the partition $(n+1, n+1, n+1)$.

- 4 竹村 剛一 (中大理工) On q -deformations of the Heun equation 15
Kouichi Takemura (Chuo Univ.) On q -deformations of the Heun equation

概要 The q -Heun equation and its variants arise as degenerations of Ruijsenaars–van Diejen operators with one particle. We investigate local properties of these equations. In particular we characterize the variants of the q -Heun equation by using analysis of regular singularities. We also consider the quasi-exact solvability of the q -Heun equation and its variants. Namely we investigate finite-dimensional subspaces which are invariant under the action of the q -Heun operator or variants of the q -Heun operator.

- 5 大山陽介 (徳島大理工) q -超幾何函数 ${}_3\phi_2(a_1, a_2, a_3; 0, 0; q, x)$ の満たす差分方程式の q -Stokes 係数
 15

Yousuke Ohyama (Tokushima Univ.) q -Stokes phenomenon on a difference equation satisfied by q -hypergeometric series ${}_3\phi_2(a_1, a_2, a_3; 0, 0; q, x)$

概要 We give a connection formula of a difference equation satisfied by q -hypergeometric series ${}_3\phi_2(a_1, a_2, a_3; 0, 0; q, x)$. This equation has an irregular singular point at the origin, we need a resummation of a divergent power series. We also study other connection formulae of q -hypergeometric equations.

- 6 伊藤雅彦 (琉球大理) G_2 型 Gustafson q -ベータ積分の楕円化とその無限積表示について 15
 野海正俊 (神戸大理)

Masahiko Ito (Univ. of Ryukyus) Elliptic extension of Gustafson's q -beta integral of type G_2 and its infinite product expression
 Masatoshi Noumi (Kobe Univ.)

概要 We would like to talk about a way to extend Gustafson's q -beta integral of type G_2 to its elliptic form. We will also present the explicit expression for its infinite product in terms of Ruijsenaars' elliptic gamma functions.

11:00~12:00 特別講演

岩木耕平 (名大多元数理) 完全 WKB 解析と位相的漸化式

Kohei Iwaki (Nagoya Univ.) Exact WKB analysis and topological recursion

概要 Exact WKB analysis, initiated by Voros, is an effective method to study the global properties of Schrödinger-type linear ODEs with a small parameter \hbar . A fundamental result in exact WKB analysis established by Aoki–Kawai–Takei–Sato claims that monodromy matrices of (Borel resummed) WKB solutions are described combinatorially by period integrals over a Riemann surface defined as the classical limit of the Schrödinger-type ODE. Such period integrals are called Voros coefficients, and they play important role in the theory of exact WKB analysis. On the other hand, topological recursion, introduced by Eynard–Orantin, is a remarkable algorithm which computes certain correlation functions and free energy (of matrix models) from a given spectral curve. Correlation functions and free energy are expected to encode information of various geometric or enumerative invariants, and τ -functions of integrable hierarchies.

A surprising connection between WKB analysis and topological recursion was discovered recently by many people including Gukov–Sulkowski, Dumitrescu–Mulase and Bouchard–Eynard. They claim that a generating functions of the correlation functions gives the WKB solution of a Schrödinger-type equation whose classical limit coincides with the spectral curve for the topological recursion, and hence the resulting Schrödinger-type equation is called “quantum (spectral) curve”. In my talk, I'll give brief introductions to exact WKB analysis, topological recursion and quantum curves. After that, I'll explain our recent result on the realization of Voros coefficients in terms of the free energy of topological recursion, obtained in a joint work with T. Koike (Kobe) and Y. Takei (Kobe). If time allows, I'll also show results on Painlevé equations.

14:15~16:25

- 7 水野勇磨 (東工大情報理工) Jacobian matrices of Y-seed mutations and mutation networks 15

Yuma Mizuno (Tokyo Tech) Jacobian matrices of Y-seed mutations and mutation networks

概要 We study the Jacobian matrices associated with sequences of Y-seed mutations in universal semifields. For the case where these mutations occur at least once for all indices, we present a formula for a special value of their characteristic polynomials using mutation networks, which are combinatorial objects that describe the data of mutation sequences.

- 8 安東 雅訓 (奈良学園人間教育) 劣正則分割とグレイシャー対応 15
 Masanori Ando (Naragakuen Univ.) Inferior regular partitions and Glaisher correspondence

概要 We define r -inferior regular partition which is a restriction of partition. Its generating function equals to that of the number of operations in Glaisher correspondence. Using this result, we prove Mizukawa–Yamada’s identity. And extend this identity to m -tuple version.

- 9 星野 歩 (広島工大工) Matrix inversion for Koornwinder polynomials with one-column diagram 15
 白石 潤一 (東大数理)
 Ayumu Hoshino (Hiroshima Inst. of Tech.) Matrix inversion for Koornwinder polynomials with one-column diagram
 Jun’ichi Shiraishi (Univ. of Tokyo)

概要 We introduce a matrix inversion for Koornwinder polynomials with one-column diagram.

- 10 末武 一馬 (名大多元数理) 量子トロイダル代数に付随する (q, t) -KZ 方程式 15
 粟田 英資 (名大多元数理)
 菅野 浩明 (名大多元数理)
 Kazuma Suetake (Nagoya Univ.) The (q, t) -KZ equation associated with the quantum toroidal algebra
 Hidetoshi Awata (Nagoya Univ.)
 Hiroaki Kanno (Nagoya Univ.)

概要 It is a well-known fact that the KZ equation which relates the differential to the algebraic action can be obtained from the representation theory of the Kac–Moody algebra. We show that the same idea can be applied to the quantum toroidal algebra and propose the difference analogue, namely the (q, t) -KZ equation. Furthermore, we can prove that the solution to the (q, t) -KZ equation is the Nekrasov function for the instanton counting of the super symmetric gauge theory. This story realizes the celebrated AGT correspondence.

- 11 小寺 諒介 (神戸大理) On Guay’s evaluation map for affine Yangians 15
 Ryosuke Kodera (Kobe Univ.) On Guay’s evaluation map for affine Yangians

概要 We give a detailed proof of the existence of evaluation map for affine Yangians of type A to clarify that it needs an assumption on parameters. This map was first found by Guay but a proof of its well-definedness and the assumption have not been written down in the literature.

- 12 中津 了勇 (摂南大理工) Hodge 積分と位相的頂点 15
 高崎 金久 (近畿大理工)
 Toshio Nakatsu (Setsunan Univ.) Hodge integrals and topological vertex
 Kanehisa Takasaki (Kindai Univ.)

概要 A conjectural formula expressing the generating series of three-partition Hodge integrals in terms of topological vertex of topological string theory is proved. The proof is given by utilizing the recent result on quantum torus symmetry of random skew plane partition, which is a generalization of the previous study on random plane partition or melting crystal.

- 13 国場 敦夫 (東大総合文化) Matrix product solutions to the reflection equation from three dimensional integrability 15
V. Pasquier (Univ. Paris-Saclay)
Atsuo Kuniba (Univ. of Tokyo) Matrix product solutions to the reflection equation from three dimensional integrability
Vincent Pasquier (Univ. Paris-Saclay)

概要 We formulate a quantized reflection equation in which q -boson valued L and K matrices satisfy the reflection equation up to conjugation by a solution to the Isaev–Kulish 3D reflection equation. By forming its n -concatenation along the q -boson Fock space followed by suitable reductions, we construct families of solutions to the reflection equation in a matrix product form connected to the 3D integrability. They involve the quantum R matrices of the antisymmetric tensor representations of $U_p(A_{n-1}^{(1)})$ and the spin representations of $U_p(B_n^{(1)})$, $U_p(D_n^{(1)})$ and $U_p(D_{n+1}^{(2)})$. Similar results on the G_2 reflection equation will also be presented.

- 14 尾角 正人 (阪市大理) A型一般化量子群のKRクリスタル 15
Jae-Hoon Kwon (ソウル大)
Masato Okado (Osaka City Univ.) KR crystals of the generalized quantum group of type A
Jae-Hoon Kwon (Seoul Nat. Univ.)

概要 The generalized quantum group of type A is an affine analogue of quantum group associated to a general linear Lie superalgebra, which appears in the study of solutions to the tetrahedron equation. We construct Kirillov–Reshetikhin (KR) modules of this algebra, that is, a family of irreducible modules which have crystal bases. We also give a combinatorial description of the crystal structure, the combinatorial R matrix, and energy function on their tensor products.

16:40~17:40 特別講演

- 池田 岳 (岡山理大理) K 理論的 Peterson 同型
Takeshi Ikeda (Okayama Univ. of Sci.) K -theoretic Peterson isomorphism

概要 The K -homology ring of the affine Grassmannian of $SL_n(\mathbb{C})$ was studied by Lam, Schilling, and Shimozono. It is realized as a certain concrete Hopf subring of the ring of symmetric functions. On the other hand, a presentation for the quantum K -theory of the flag variety Fl_n is given by Anderson–Chen–Tseng and Koroteev–Pusukar–Smirnov–Zeitlin. We construct an explicit birational morphism between the spectrums of these two rings. Our method relies on Ruijsenaars’s relativistic Toda lattice with unipotent initial condition. From this result, we obtain a K -theory analogue of the so-called Peterson isomorphism for (co)homology. We provide a conjecture on the detailed relationship between the Schubert bases, and, in particular, we determine the image of Lenart–Maeno’s quantum Grothendieck polynomial associated with a Grassmannian permutation.