

 日本数学会

2021年度秋季総合分科会

英 文 サ マ リ 集

2021年9月

於 千葉大学

2021 日本数学会

秋季総合分科会プログラム

期 日 2021年9月14日(火)～9月17日(金)

会 場 千葉大学西千葉キャンパス
およびオンライン配信

連絡先 E-mail chiba21sept@mathsoc.jp

一般社団法人 日本数学会

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	特別講演 14:25～15:25	特別講演 14:25～15:25	特別講演 15:40～16:40	特別講演 14:25～15:25	特別講演 15:45～16:45	特別講演 11:00～12:00	特別講演 14:25～15:25 15:45～16:45	特別講演 15:45～16:45	特別講演 14:25～15:25
15日 (水)	無限可積分系 10:00～11:00	代 数 学 9:30～12:00		函 数 論 10:00～10:30	函数方程式論 9:00～12:00	函数解析学 9:00～10:45	統計数学 10:00～11:40	応用数学 10:00～12:00	幾何学・ トポロジー
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	日本数学会賞授賞式(総合校舎 G2より配信) (14:30～15:00) 総 合 講 演 (") 日本数学会賞秋季賞受賞者 (15:15～16:15) 芥川和雄(中大理工) (16:40～17:40)								
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総 合 講 演

9月15日(水)

2021年度日本数学会賞秋季賞受賞講演

日本数学会賞秋季賞受賞者^Z (15:15~16:15)

Autumn Prize Winner

芥川和雄(中大理工)^Z 境界付き多様体上のリッチフロー (16:40~17:40)

Kazuo Akutagawa (Chuo Univ.) The Ricci flow on manifolds with boundary

概要 On the Ricci flow on *closed manifolds*, a large number of fundamental and important results have been obtained even though many unsolved problems have still been remained. On the other hand, there have been not many known results on that on compact manifolds *with boundary*. In this talk, we consider the Ricci-DeTurck flow and the Ricci flow with a geometrically natural boundary condition, including *zero mean curvature condition*, on a compact manifold with boundary. It is different from the known boundary conditions. We would like to explain some results on the short-time existence of these flows and the preserving property of positive scalar curvature of the Ricci flow.

企 画 特 別 講 演

9月14日(火)

第II会場

市野篤史(京大理)^Z 重さ半整数の保型形式 (13:00~14:00)
 Atsushi Ichino (Kyoto Univ.) Automorphic forms of half-integral weight

概要 We discuss recent progress in the theory of automorphic forms of half-integral weight, which was initiated by Shimura in 1973.

第V会場

隠居良行(東工大理)^Z 圧縮性 Navier–Stokes 方程式の分岐・安定性解析 (13:00~14:00)
 Yoshiyuki Kagei (Tokyo Tech) Stability and bifurcation analysis of the compressible Navier–Stokes equations

概要 The compressible Navier–Stokes equation, which is the basic equation for compressible viscous fluids, is classified as a quasi-linear hyperbolic-parabolic system. Due to the hyperbolic and parabolic aspects of the system, solutions exhibit interesting behavior. In this talk, I will review the stability and bifurcation analysis of the compressible Navier–Stokes equation, and present some recent results on a related bifurcation phenomenon and singular limit problem.

9月16日(木)

第II会場

山ノ井克俊(阪大理)^Z 正則写像の値分布論に関する話題から (13:00~14:00)
 Katsutoshi Yamanoi (Osaka Univ.) Topics on value distribution theory for holomorphic mappings

概要 I will discuss some topics on value distribution theory for holomorphic mappings.

第V会場

堤誉志雄(京大理)^Z 非線形分散型方程式と関数空間 (13:00~14:00)
 Yoshio Tsutsumi (Kyoto Univ.) Nonlinear dispersive equations and function spaces

概要 Nonlinear dispersive equations appear in many fields of mathematical physics to model nonlinear wave phenomena. Solutions of these equations rapidly oscillate and so it is difficult to estimate this oscillation precisely. There has been a great development in the field of nonlinear dispersive equations for the past quarter century. To be specific, the Fourier restriction norm spaces for nonlinear dispersive equations were introduced by Bourgain in 1993. After Bourgain's work, many mathematicians presented variants of Fourier restriction norm spaces, which have also made big contributions to the research in this field. I would like to give a brief survey on the recent progress in nonlinear dispersive equations and to explain how the Fourier restriction norm space and its variants work for nonlinear dispersive equations.

9月17日(金)

第II会場

小谷元子(東北大理)^Z 離散幾何解析とその応用 (13:00~14:00)
 Motoko Kotani (Tohoku Univ.) Discrete geometric analysis and its application

概要 There are several attempts to discretize geometric notions. In this presentation, we discuss discrete geometric analysis and discrete surface theory. Emphasis is put to connect those notions with corresponding geometric notions for continuum objects. Considering discrete objects as microscopic structure of continuous materials, relations between discrete and continuum is regarded as those between microscopic structure and macroscopic structure of materials. In that way, we apply discrete geometric analysis to study of materials.

第VII会場

小谷真一(阪大*・南京大)^Z KdV equation with ergodic initial data (13:00~14:00)
 Shinichi Kotani KdV equation with ergodic initial data
 (Osaka Univ.* / Nanjing Univ.)

概要 KdV equation is a mathematical model of shallow water waves and GGKM found that it is solvable by the inverse scattering method if initial data decay sufficiently fast. Since then many researchers have been investigating this equation from various points of view. Initial data considered there were decaying or periodic, however recently people get interested in solutions oscillating in space. There are two cases of almost periodic initial data so far which are shown to be solvable. The one is smooth quasi-periodic initial data. Unfortunately in this case the solvability is known to be local in time. The other is the case that the underlying Schroedinger operators with almost periodic potentials have only absolutely continuous spectrum. This is a rather strong restriction, which is preferable to remove it. In this talk the speaker presents a unified method of solving the KdV equation, which admits general initial data including decaying or oscillating. As a byproduct one can treat solutions starting from ergodic initial data, especially a wide class of almost periodic initial data is possible to consider. Our method heavily depends on Sato theory of completely integrable systems. The key idea is to describe Sato theory in terms of the spectral quantities of the underlying Schroedinger operators, namely the Weyl-Titchmarsh functions. To have the global existence of solutions we have to avoid the singularities of the solutions, which is equivalent to the non-vanishing of the tau-function. The non-degeneracy of the tau-function is established by using the Herglotz property of the Weyl-Titchmarsh functions.

数 学 基 礎 論 お よ び 歴 史

9月16日(木) 第I会場

10:15~12:00

- 1 只木孝太郎 (中部大工)^Z アルゴリズム的ランダムネスによる量子情報理論の精密化 V 15
 Kohtaro Tadaki (Chubu Univ.) A refinement of quantum information theory by algorithmic randomness
 V

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 operational refinement of the Born rule, called the principle of typicality, for specifying the property of the results of quantum measurements in an operational way. In this talk, we refine and reformulate the quantum noiseless channel coding theorem based on the principle of typicality, in order to demonstrate how properly our framework works in practical problems in quantum mechanics.

- 2 関 隆 宏 (新潟大経営戦略本部)^Z Exchange に関わる結合則の族の分類 15
 Takahiro Seki (Niigata Univ.) A classification of a family of associativity associated with exchange

概要 Implicational axioms B, B' and C are regarded as combinations of associativity and exchange. In substructural logics without exchange, since two kinds of implication are introduced, there are several variants of B, B' and C. In this talk, we consider a classification of a family of associativity associated with exchange by using Kripke-style semantics.

- 3 大 川 裕 矢 (千葉大融合理工)^Z 解釈可能性論理 \mathbf{IL} の部分論理に対する単一解釈可能性論理について .. 15
 Yuya Okawa (Chiba Univ.) Unary interpretability logics for sublogics of the interpretability logic \mathbf{IL}

概要 The interpretability logic \mathbf{IL} and the unary interpretability logic \mathbf{il} are extensions of the provability logic \mathbf{GL} with the binary modal operator \triangleright and the unary modal operator \mathbf{I} , respectively. The modal formula $A \triangleright B$ is intended as “ $T + B$ is interpretable in $T + A$ ” and the modal formula $\mathbf{I}A$ is intended as “ $T + A$ is interpretable in T ”. De Rijke proved that \mathbf{il} corresponds to \mathbf{IL} , that is, for any modal formula A of unary interpretability logic, $\mathbf{il} \vdash A$ if and only if \mathbf{IL} proves the modal formula which is obtained by replacing all occurrences of the formula $\mathbf{I}B$ in A with $\top \triangleright B$.

We investigate unary interpretability logics for twenty sublogics of \mathbf{IL} . For each sublogic of \mathbf{IL} , we provide the sublogic of \mathbf{il} corresponding to that logic.

- 4 倉 橋 太 志 (神戸大システム情報)^Z 述語証明可能性論理の包含関係について 15
 Taishi Kurahashi (Kobe Univ.) On inclusions between quantified provability logics

概要 Quantified provability logic $\text{QPL}_\sigma(T)$ is known to be heavily dependent on the theory T and the Σ_1 definition $\sigma(v)$ of T . We investigate several consequences of inclusion relations between quantified provability logics and show that inclusion relations rarely hold. Moreover, we give a necessary and sufficient condition for the inclusion relation between quantified provability logics with respect to Σ_1 arithmetical interpretations.

- 5 岩田 莊平 (神戸大システム情報)^Z 保存性の論理 CL およびその拡大の位相的意味論について 15
 倉橋 太志 (神戸大システム情報)
 Sohei Iwata (Kobe Univ.) Topological semantics of extensions of the conservativity logic CL
 Taishi Kurahashi (Kobe Univ.)

概要 It is well known that the logic of provability **GL** is complete with respect to the class of all finite transitive and conversely well-founded Kripke frames. On the other hand, **GL** is not strongly complete with respect to Kripke semantics. This obstacle can be avoided by dealing with topological semantics which is developed by Simmons and Esakia, etc. That is, **GL** is determined by the class of all scattered topological spaces. Moreover, as opposed to Kripke semantics, Shehtman proved that **GL** is strongly complete with respect to scattered spaces. Ignatiev introduced the logic **CL** which is a sublogic of the basic interpretability logic **IL**. The logic **CL** is a basis for study of capturing properties of the notion of conservativity. We propose a topological semantics of **CL** and its extensions (such as **IL**, etc). Using our new semantics, strong completeness of these logics can be proved.

- 6 倉橋 太志 (神戸大システム情報)^Z 様相算術における選言特性と存在特性 15
 Taishi Kurahashi (Kobe Univ.) Disjunction and existence properties in modal arithmetic

概要 We investigated several versions of disjunction and existence properties in modal arithmetic. Among other things, we proved that for any consistent RE extension T of PA(K4), T has the modal disjunction property if and only if T has the modal existence property. This is a refinement of Friedman and Sheard's result. Moreover, we newly introduced the notion of Σ_1^\square formulas, and proved that for any such a theory T , T has the modal disjunction property if and only if T is Σ_1^\square -sound. This is a joint work with Motoki Okuda.

14:40~15:30

- 7 D. Găină (九 大 I M I)^Z Omitting Types Theorem in hybrid-dynamic first-order logic with rigid symbols 15
 G. Badia
 (Univ. of Queensland•Johannes Kepler Univ. Linz)
 T. Kowalski (La Trobe Univ.)
 Daniel Găină (Kyushu Univ.) Omitting Types Theorem in hybrid-dynamic first-order logic with rigid symbols
 Guillermo Badia
 (Univ. of Queensland/Johannes Kepler Univ. Linz)
 Tomasz Kowalski (La Trobe Univ.)

概要 In the the present contribution, we prove an Omitting Types Theorem (OTT) for an arbitrary fragment of hybrid-dynamic first-order logic with rigid symbols (i.e. symbols with fixed interpretations across worlds) closed under *negation* and *retrieve*. The logical framework can be regarded as a parameter and it is instantiated by some well-known hybrid and/or dynamic logics from the literature. We develop a *forcing* technique and then we study a *forcing property* based on local satisfiability, which lead to a refined proof of the OTT. For uncountable signatures, the result requires compactness, while for countable signatures, compactness is not necessary. We apply the OTT to obtain upwards and downwards Löwenheim-Skolem theorems for our logic, as well as a completeness theorem for its *constructor-based* variant.

- 8 坪井 明人 (筑波 大*)^Z Torsion-free groups and model completeness 10
 Akito Tsuboi (Univ. of Tsukuba*) Torsion-free groups and model completeness

概要 A model complete theory allows quantifier elimination in a mild sense. In fact, every formula is equivalent to an existential formula under a model complete theory. In this talk, I show that T_{tf} , the theory of torsion-free groups, has no model companion.

- 9 池田宏一郎 (法政大経営)^Z ジェネリック構造の中の群 15
 Koichiro Ikeda (Hosei Univ.) Groups in generic structures

概要 We show that there is no infinite group definable in a normal saturated generic structure.

9月17日(金) 第I会場

9:20~10:15

- 10 真木亮輔 (阪府大理)^Z Sierpiński–Zygmund number and Suslin forcing 15
 嘉田勝 (阪府大理)
 Ryosuke Maki (Osaka Pref. Univ.) Sierpiński–Zygmund number and Suslin forcing
 Masaru Kada (Osaka Pref. Univ.)

概要 Sierpinski–Zygmund number \mathfrak{s}_3 is the smallest cardinal κ such that, there exists a function g from the real line to itself whose restriction to any set X of reals of size κ is discontinuous. We show that, by a finite support iteration of Suslin forcing notions of length ω_2 over a model for CH, the value of \mathfrak{s}_3 is still \aleph_1 .

- 11 薄葉季路 (早大理工)^Z Generically extendible cardinals 15
 Toshimichi Usuba (Waseda Univ.) Generically extendible cardinals

概要 An uncountable cardinal κ is said to be generically extendible if for every $\alpha > \kappa$, there is a $\beta > \alpha$ and a poset P such that P forces that “there is an elementary embedding j from V_α to V_β^P with critical point κ and $\alpha < j(\kappa)$ ”. In this talk we consider the consistency strength of generically extendible cardinals.

- 12 渕野昌 (神戸大システム情報)^Z First-order definability of generic and Laver-generic large cardinals ... 15
 Sakaé Fuchino (Kobe Univ.) First-order definability of generic and Laver-generic large cardinals

概要 Similarly to the (genuine) large cardinal properties like supercompactness, almost hugeness and hugeness, it is not apparent at first sight if the corresponding generic large cardinal properties are first-order definable. In case of Laver-genericity introduced by the speaker together with André Ottenbreit Maschio Rodrigues and Hiroshi Sakai, it is even more difficult to see the the definability, since the definition includes the condition that the generic set should be included in the target model of the generic elementary embedding.

Nevertheless, we will show that these notions are first-order definable (in the language of ZFC). We shall also mention some applications of the methods involved.

The results presented in this talk are obtained in a joint research of the speaker with Hiroshi Sakai.

10:30~10:45 数学基礎論および歴史分科会総会

11:00~12:00 特別講演

木原 貴行 (名大情報)² 計算可能性と定義可能性の階層構造/この10年で何が起ったか

Takayuki Kihara (Nagoya Univ.) Hierarchies of computability and definability

概要 From their birth to the present, the study of hierarchies of computability and definability have always stood at the center of computability theory and descriptive set theory. Researchers have been gradually exploring these hierarchies and have solved many mysteries. In this talk, I will survey recent developments in this research. Surprisingly, in less than a decade, there have been a series of breakthroughs in the study of these hierarchies, resulting in a dramatic development of the theory. I will give an overview of some of these breakthroughs to which I have made major contributions.

In detail, I will talk about the following topics: 1. The decomposability conjecture of Borel functions; 2. Degree spectra, Borel isomorphism problem, and infinite dimensional topology; 3. Enumeration degrees and nonmetrizable topology; 4. Zigzag structures in descriptive set theory (Wadge theory); 5. Zigzag structures in computability theory (Martin's conjecture); 6. Realizability toposes and Lawvere–Tierney topologies.

午後

13 増田 茂 (流体数理古典理論研) Theory of the Eulerian integrals by Legendre *

Shigeru Masuda Theory of the Eulerian integrals by Legendre

(Res. Workshop of Classical Fluid Dynamics)

概要 Legendre issues the book in 1825. In this first volume, he discusses Eulerian Integral with two sorts of integrals, in relation to Euler's integrals, including his elliptic functions. Legendre complains Euler's integral, saying "they have never been occupied to make the calculation easy, nor to fix the degree of precision of which it is susceptible," (169) *and propose that some functions are explained with the arc of circle and of the logarithms.* (60, etc.)

14 増田 茂 (流体数理古典理論研) Legendre's theory of elliptic functions and Abel's theories *

Shigeru Masuda Legendre's theory of elliptic functions and Abel's theories

(Res. Workshop of Classical Fluid Dynamics)

概要 As soon as Abel contributes the paper in 1828, in which the nature of transcendent is developed. Legendre enhances his theory in 1832. We discuss Legendre's adoption of the Abel's theory.

15 増田 茂 (流体数理古典理論研) Jacobi's papers to Abel and Legendre on the theory of the elliptic functions *

Shigeru Masuda Jacobi's papers to Abel and Legendre on the theory of the elliptic functions

(Res. Workshop of Classical Fluid Dynamics) tions

概要 We discuss Jacobi's Latin paper : General Consideration of Abel's Transcendents, which extends Abel's paper : Remarks on some general properties of a certain sort of transcendental functions. The other papers relating to these are also discussed. (Translation is mine.)

16 齋藤 三郎 (群馬大*・再生核研) Division by zero and division by zero calculus *

Saburou Saitoh Division by zero and division by zero calculus

(Gunma Univ.* / Inst. of Reproducing Kernels)

概要 We think that modern mathematics is still flawed. It is clear that there are basic defects in function theory, differential equations, geometry, and algebra, and it has been seven years since the discovery. This will be a stain on world history and so, we publish the book: S. Saitoh, Introduction to the Division by Zero Calculus, 2021, Scientific Research Publ., Inc.. and we are founding the basic new international journal on the division by zero calculus: <https://romanpub.com/dbzc.php>

- 17 横溝恭平 (関東学院大理工) Avron の hypersequent calculus **GLCW** の一般化の部分体系に関する保存性 *
- 志村立矢 (日大理工) *
- Kyohei Yokomizo (Kanto Gakuin Univ.) The conservativity problem on between fragments of a generalization of
- Tatsuya Shimura (Nihon Univ.) Avron's hypersequent calculus **GLCW**

概要 Avron's **GLCW** is the propositional intermediate hypersequent calculus which is characterized by all Heyting algebras whose width is 1. Avron has considered properties of $\mathbf{GLCW}_{\mathcal{S}}$ which is the **GLCW** with restricted logical symbols to \mathcal{S} ($\rightarrow \in \mathcal{S} \subseteq \{\rightarrow, \wedge, \vee, \neg\}$). In the previous talk (2017) we generalized **GLCW** to m -**GLCW**, which is characterized by all Heyting algebras whose width is m . In this talk we will consider that whether m -**GLCW** $_{\mathcal{S}'}$ is conservative extension over m -**GLCW** $_{\mathcal{S}}$ ($\rightarrow \in \mathcal{S} \subsetneq \mathcal{S}' \subseteq \{\rightarrow, \wedge, \vee, \neg\}$) by a similar method to Avron's algebraic one.

- 18 藤田憲悦 (群馬大理工) On formalization of logic puzzles à la George Boolos *
- 倉田俊彦 (法政大経営) *
- Kenetsu Fujita (Gunma Univ.) On formalization of logic puzzles à la George Boolos
- Toshihiko Kurata (Hosei Univ.)

概要 George Boolos posed the puzzle "The hardest logic puzzle ever". We have introduced a simple formalization of the puzzle consisting of questions, answerers, and answers in terms of propositional logic, and showed its adequacy by the truth values semantics. We now pose a general form of the puzzle. Let G_n be the set of gods A_1, A_2, \dots, A_n (n is greater than 0) where A_i is Random, True, or False. Let $\text{NumR}(G_n)$ be the number of Random in G_n , and suppose that $\text{NumR}(G_n)$ is less than n . Then is it possible to identify the non-Random god in G_n ?

- 19 矢島幸信 Inequality and equality for the extent of products with a special factor *
- (神奈川大工・数学アートラボ) *
- 平田康史 (神奈川大工) *
- Yukinobu Yajima Inequality and equality for the extent of products with a special factor
- (Kanagawa Univ./Math Art Laboratory)
- Yasushi Hirata (Kanagawa Univ.)

概要 For a space X , let $e(X)$ denote a cardinal function for X called the extent of X . We discuss whether $e(X \times Y) > e(X) \cdot e(Y)$ or $e(X \times Y) = e(X) \cdot e(Y)$ holds when X is a monotonically normal space and Y is an almost discrete space.

- 20 矢島幸信 Equalities for the extent of infinite products and Σ -products *
- (神奈川大工・数学アートラボ) *
- 平田康史 (神奈川大工) *
- 薄葉季路 (早大基幹理工) *
- Yukinobu Yajima Equalities for the extent of infinite products and Σ -products
- (Kanagawa Univ./Math Art Laboratory)
- Yasushi Hirata (Kanagawa Univ.)
- Toshimichi Usuba (Waseda Univ.)

概要 For a space X , let $e(X)$ denote the extent for X . For an infinite product X , we discuss when $e(X)$ is the supremum of the extent of each factor of X and the cardinality of members of the factors. For a Σ -product Σ of spaces, we also discuss when $e(\Sigma)$ is supremum of the extent of each factor of Σ .

代 数 学

9月14日(火) 第II会場

10:00~11:45

- 1 小林 稔周 (明大理工)^Z Nearly Gorenstein 環の特徴づけ 10
Toshinori Kobayashi (Meiji Univ.) Characterizations of nearly Gorenstein rings

概要 The notion of nearly Gorenstein rings introduced by Herzog, Hibi and Stamate has been studied widely in the area of Cohen–Macaulay rings with applications to combinatorics. In this talk, I will introduce a characterization of nearly Gorenstein rings in terms of certain Ext groups. Such a characterization provides a useful criterion of nearly Gorenstein rings via reductions of regular sequence. I will also explain some applications to numerical semigroups.

- 2 小野 舞子 ^Z On naïvely liftable DG modules 15
(岡山理大教育推進機構)

S. Nasseh

(Georgia Southern Univ.)

吉野 雄二 (岡山大自然)

Maiko Ono (Okayama Univ. of Sci.) On naïvely liftable DG modules

Saeed Nasseh (Georgia Southern Univ.)

Yuji Yoshino (Okayama Univ.)

概要 Let $A \rightarrow B$ be a homomorphism of DG R -algebras such that the underlying graded A -module B is projective. Let N be a semifree right DG B -module, and denote by $N|_A$ the DG B -module N regarded as a right DG A -module via $A \rightarrow B$. We say that N is naïvely liftable to A if the DG B -module epimorphism $\pi_N: N|_A \otimes_A B \rightarrow N$ defined by $\pi_N(x \otimes b) = xb$ splits. The purpose of my talk is to show the following result:

Let n be a positive integer, A be a divided power DG R -algebra and $B = A\langle X_1, \dots, X_n \rangle$ be a free extension of A obtained by adjunction of variables X_1, \dots, X_n of positive degrees. If N is a bounded below semifree DG B -module with $\text{Ext}_B^i(N, N) = 0$ for all $i > 0$, then N is naïvely liftable to A .

- 3 中村 力 (東大数理)^Z Adelic complexes over commutative noetherian rings 15
Tsutomu Nakamura (Univ. of Tokyo) Adelic complexes over commutative noetherian rings

概要 The notion of adèles is an important tool in arithmetic. One can interpret the classical adèles to be defined for certain one-dimensional schemes, and Parshin (1976) introduced the two-dimensional version of adèles. This was further extended to arbitrary noetherian schemes by Beilinson (1980). He used (co)simplicial construction, and it yields a complex of abelian groups, called the adelic complex. In this talk, we give a simpler construction of the adelic complex for an affine noetherian scheme of finite dimension, and explain some advantage of our approach in terms of homological algebra.

- 4 松井 紘樹 (東大数理)^Z 三角圏の素 thick 部分圏とその種々の三角圏への応用 15
 Hiroki Matsui (Univ. of Tokyo) Prime thick subcategories of triangulated categories and its applications

概要 Tensor triangular geometry is an epoch-making theory initiated by Balmer. For a tensor triangulated category, Balmer defined a topological space, called the Balmer spectrum of T , as the set of prime thick tensor ideals together with the Zariski topology. The importance of the theory is that the structure of T is controlled by the Balmer spectrum. However, this theory cannot be applied to triangulated categories without tensor structures. In this talk, we introduce the notion of prime thick subcategories of a triangulated category T and use it to define the spectrum of T . As an application, for a noetherian scheme X , we consider prime thick subcategories of the bounded derived category of coherent sheaves on X and the singularity category of X . We note that these triangulated categories do not have tensor structures naturally.

- 5 伊城 慎之介 (日大総合基礎)^Z Local log-regular rings and its small tilt 15
 下元 数馬 (日大文理)
 仲里 溪 (名大多元数理)
 Shinnosuke Ishiro (Nihon Univ.) Local log-regular rings and its small tilt
 Kazuma Shimomoto (Nihon Univ.)
 Kei Nakazato (Nagoya Univ.)

概要 A local log-regular ring is a certain commutative Noetherian ring which was introduced by Kazuya Kato. We proved that the prime-to- p -torsion part of the divisor class group of a local log-regular ring of mixed characteristic with perfect residue field is finite under a mild condition. In order to prove our theorem, we define the small tilt of a tower of commutative rings. This is an analogue of the tilt which is a fundamental tool in perfectoid theory. In this talk, we explain the definition of small tilt of a tower of commutative rings and an outline of the proof of the above theorem.

- 6 吉澤 毅 (豊田工高専) 有限次元 Cohen–Macaulay 環における局所コホモロジー加群の annihilator に関して *
 Takeshi Yoshizawa Annihilators of local cohomology modules over a finite-dimensional Cohen–
 (Toyota Nat. Coll. of Tech.) Macaulay ring

概要 We investigate the existence of annihilators of local cohomology modules without dependence on the choice of an ideal over a commutative Noetherian ring. Dao and Takahashi’s classification theorem of the dominant resolving subcategories helps observe the existence of annihilators over a finite-dimensional Cohen–Macaulay ring.

14:25~15:25 特別講演

- 下元 数馬 (日大文理)^Z 数論と可換環論の融合 —ホモロジカル予想を超えて—
 Kazuma Shimomoto (Nihon Univ.) Arithmetical commutative ring theory —Beyond the homological conjectures—

概要 In 1970’s, M.Hochster proposed a series of conjectures on the homological behavior of Noetherian commutative local rings, which were later called the “homological conjectures”. Among them, the direct summand conjecture had been attracting many researchers, because of its simple-looking statement. The conjecture was soon solved by Hochster himself in 1973 in his Nagoya paper. The remaining mixed characteristic case was quite difficult and finally resolved by Y. André in 2016, using perfectoid methods. This event brought a revolution to the direction of the research in commutative rings. In this talk, I begin with a review on the history of the homological conjectures and recent related results. Then I talk about the picture of the fusion of number theory and commutative rings and some interesting problems. I want to emphasize that certain non-Noetherian rings, Banach rings, simplicial rings, and cohomology are to come into sight.

15:40~16:50

- 7 柴田 義大 (山口大創成)^Z On relative almost projectivity and relative generalized projectivity ··· 10
 菊政 勲 (山口大理)
 倉富 要輔 (山口大理)
 Yoshiharu Shibata (Yamaguchi Univ.) On relative almost projectivity and relative generalized projectivity
 Isao Kikumasa (Yamaguchi Univ.)
 Yosuke Kuratomi (Yamaguchi Univ.)

概要 Relative almost projectivity and relative generalized projectivity are important for the study of direct sums of lifting modules. Although a generalized N -projective module is almost N -projective for a module N , the converse is not true. In this talk, we characterize these projectivities by using projective covers, and consider a condition for an almost N -projective module to be generalized N -projective.

- 8 Haigang Hu (静岡大創造科学技術)^Z Noncommutative conics in Sklyanin Quantum Projective Planes ····· 15
 松野 仁樹 (静岡大創造科学技術)
 毛利 出 (静岡大理)
 Haigang Hu (Shizuoka Univ.) Noncommutative conics in Sklyanin Quantum Projective Planes
 Masaki Matsumo (Shizuoka Univ.)
 Izuru Mori (Shizuoka Univ.)

概要 Let S be a 3-dimensional Sklyanin algebra, and $f \in S_2$ a regular central element. We say that $A = S/(f)$ is a noncommutative conic (in a Sklyanin Quantum Projective Plane). For a noncommutative conic A , there is an associated finite algebra $C(A)$ which plays an important role to study A . It is difficult to calculate $C(A)$ directly since S does not have a PBW basis. In this talk, we calculate $C(A)$ using geometric methods.

- 9 浅井 聡太 (阪大情報)^Z Grothendieck 群の元の標準分解と数値的ねじれ対 ··········· 15
 伊山 修 (東大数理)
 Sota Asai (Osaka Univ.) Canonical decompositions and numerical torsion pairs for elements in
 Osamu Iyama (Univ. of Tokyo) the Grothendieck group

概要 Let A be a finite-dimensional algebra over an algebraically closed field K , and $\text{proj } A$ be the category of finitely generated projective A -modules. Then, the Grothendieck group $K_0(\text{proj } A)$ is a free abelian group whose canonical basis is given by the indecomposable projective A -modules. For each element $\theta \in K_0(\text{proj } A)$, we can consider the canonical decomposition $\theta = \bigoplus_{i=1}^m \theta_i$ into a direct sum of indecomposable elements in $K_0(\text{proj } A)$ introduced by Derksen–Fei and the numerical torsion pairs introduced by Baumann–Kamnitzer–Tingley. We will report some relationship of these two notions which we found in our study.

- 10 大関 一秀 (山口大創成)^Z The reduction number of stretched ideals ··········· 15
 Kazuho Ozeki (Yamaguchi Univ.) The reduction number of stretched ideals

概要 The homological property of the associated graded ring of an ideal is an important problem in commutative algebra and algebraic geometry. In this talk we explore the structure of the associated graded ring of stretched \mathfrak{m} -primary ideals in the case where the reduction number attains almost minimal value in a Cohen–Macaulay local ring (A, \mathfrak{m}) . As an application, we present complete descriptions of the associated graded ring of stretched \mathfrak{m} -primary ideals with small reduction number.

- 11 辻 栄 周 平 (北 教 大 旭 川) 代数体の整数環上の超平面配置の特性準多項式 *
- 黒 田 匡 迪 (日 本 文 理 大 工)
- Shuhei Tsujie (Hokkaido Univ. of Edu.) Characteristic quasi-polynomials of hyperplane arrangements over the
Masamichi Kuroda rings of integers of algebraic number fields
(Nippon Bunri Univ.)

概要 A list \mathcal{A} consisting of finitely many integer vectors defines a “hyperplane arrangement” over $\mathbb{Z}/q\mathbb{Z}$ for every positive integer q . Kamiya, Takemura, and Terao showed that the function counting the elements of the complement is a quasi-polynomial in q , which is called the characteristic quasi-polynomial of \mathcal{A} . We introduce analogues of the characteristic quasi-polynomials for the rings of integers of algebraic number fields.

- 12 倉 富 要 輔 (山 口 大 理 工) On direct sums of hollow modules *
- Yousuke Kuratomi (Yamaguchi Univ.) On direct sums of hollow modules

概要 In this talk, we consider the problem “When is a direct sum of hollow modules lifting?” This problem was firstly studied by Baba and Harada in 1990 and they gave a necessary and sufficient condition for a direct sum of cyclic hollow modules with local endomorphism rings to be lifting. In 2007, Vanaja studied the problem under certain conditions on whole direct sum which the decomposition complements maximal direct summands and every nonzero direct summand contains an indecomposable direct summand. In this talk, we give equivalent conditions for an infinite direct sum of hollow modules over right perfect ring to be lifting with the finite internal exchange property, without conditions on whole direct sum.

9月15日(水) 第II会場

9:30~12:00

- 13 白 井 智 (東 京 理 大 理)^Z Eventually periodic Gorenstein algebras and Tate–Hochschild cohomol-
ogy rings 15
- Satoshi Usui (Tokyo Univ. of Sci.) Eventually periodic Gorenstein algebras and Tate–Hochschild cohomol-
ogy rings

概要 The notion of Tate–Hochschild cohomology for algebras, introduced by Wang, gives a generalization of Tate cohomology for finite groups. The Tate–Hochschild cohomology carries a structure of a graded ring, and it is in fact a graded-commutative ring, which was also proved by Wang. On the other hand, an algebra is called eventually periodic if its minimal bimodule projective resolution becomes periodic from some step. In this talk, we investigate the relationship between the eventual periodicity of an algebra and the ring structure of the Tate–Hochschild cohomology. We show that a Gorenstein algebra is eventually periodic if and only if its Tate–Hochschild cohomology ring has an invertible homogeneous element.

- 14 越 谷 重 夫 ^Z 準二面体群をシロー 2 部分群に持つ有限群に対するスコット加群のブラ
(千 葉 大 先 進 科 学 セ ン タ ー) ウ ー ア ー 直 既 約 性 10
- İ. Tuvay
(Mimar Sinan Fine Arts Univ.)
- Shigeo Koshitani (Chiba Univ.) The Brauer indecomposability of the Scott module for a finite group
İpek Tuvay with a semidihedral Sylow 2-subgroup
(Mimar Sinan Fine Arts Univ.)

概要 We present a sufficient condition for the kG -Scott module with vertex P to remain indecomposable under the Brauer construction for any subgroup Q of P as $k[QC_G(Q)]$ -module, where k is a field of characteristic 2 and G is a finite group. This is useful to obtain a splendid stable equivalence of Morita type.

- 15 越谷重夫 (千葉大先進科学センター) ^Z 準二面体群をシロー 2 部分群に持つ有限群の主ブロックたちの間の splendid Morita 森田同値 10
 C. Lassueur (TU Kaiserslautern)
 B. Sambale (Leibniz Univ. Hannover)
 Shigeo Koshitani (Chiba Univ.) Splendid Morita equivalences for principal blocks with semidihedral defect groups
 Caroline Lassueur (TU Kaiserslautern)
 Benjamin Sambale (Leibniz Univ. Hannover)

概要 We classify principal blocks of finite groups with semidihedral defect groups up to splendid Morita equivalence. This completes the classification of all principal 2-blocks of tame representation type up to splendid Morita equivalence and shows that Puig’s Finiteness Conjecture holds for such blocks.

- 16 櫻井太朗 (千葉大理) ^Z Principal blocks with four irreducible characters 10
越谷重夫 (千葉大先進科学センター)
 Taro Sakurai (Chiba Univ.) Principal blocks with four irreducible characters
 Shigeo Koshitani (Chiba Univ.)

概要 We show that if the principal p -block of a finite group G has precisely four irreducible ordinary characters, then a Sylow p -subgroup of G has order four or five. Our proof relies on the classification of finite simple groups.

- 17 森脇湧登 (京大数理研) ^Z 符号を用いた新しい共形場理論の構成 15
 Yuto Moriwaki (Kyoto Univ.) Construction of new conformal field theories with codes

概要 Fields of a two-dimensional conformal field theory are real analytic, and the holomorphic fields form a subalgebra. The algebra of holomorphic fields is mathematically formulated and called a vertex algebra. Recently, we have formulated the algebra of real analytic fields and called it a full vertex algebra. We have also constructed a family of full vertex algebras using combinatorial data called codes. These full vertex algebras are expected to be useful for the study of moduli spaces of conformal field theories.

- 18 元良直輝 (東大IPMU) ^Z A 型の Adamović パスについて 10
 Naoki Genra (Univ. of Tokyo) On Adamović path in type A

概要 Adamović constructed injective homomorphisms from affine vertex algebras associated with \mathfrak{sl}_2 to tensor products of Virasoro algebras and some lattice vertex algebras. This implies that modules of Virasoro algebras induce those of affine vertex \mathfrak{sl}_2 algebras, which is “inverse reduction” from the perspective of W-algebras. We generalize these results to cases of \mathfrak{sl}_3 and apply to construct relaxed modules of simple affine vertex \mathfrak{sl}_3 algebras. This is joint work with Drazen Adamović and Thomas Creutzig.

- 19 伊藤眞麻 (京大情報) ^Z Askey–Wilson 多項式から導かれる拡張 hook-content 公式 10
上岡修平 (京大情報)
 Mawo Ito (Kyoto Univ.) A generalized hook-content formula derived from the Askey–Wilson polynomials
 Shuhei Kamioka (Kyoto Univ.)

概要 A new generating function for semi-standard Young diagram having product expression is derived. The weight of the generating function is determined by the moment of Askey–Wilson polynomials and a combinatorial interpretation of general orthogonal polynomials. As a special case we obtain well-known Stanley’s hook-content formula.

- 20 吉永正彦(北大理)^Z 有理ベクトルで平行移動した格子多面体のエルハート準多項式 …………… 15
C. de Vries (ブレーメン大・北大理)

Masahiko Yoshinaga (Hokkaido Univ.) The Ehrhart quasi-polynomials of rationally translated lattice polytopes
Christopher de Vries
(Bremen Univ./Hokkaido Univ.)

概要 Let $P \subset \mathbb{R}^d$ be a convex lattice d -polytope. Let $v \in \mathbb{Q}^d$ be a rational vector. We will discuss relationships between properties of P (e.g., being a zonotope / centrally symmetric) and that of the Ehrhart quasi-polynomial $L_{v+P}(t)$ (e.g., having GCD-property / symmetric).

- 21 百合草寿哉(北大理) Cluster algebras with dense g -vector fans …………… *
Toshiya Yurikusa (Tohoku Univ.) Cluster algebras with dense g -vector fans

概要 The g -vectors of cluster variables in a cluster algebra form a fan, called g -vector fan. We show that cluster algebras associated with weighted orbifolds introduced by Felikson–Shapiro–Tumarkin have dense g -vector fans. As a consequence, we give a classification of skew-symmetrizable cluster algebras with dense g -vector fans except for finitely many types of cluster algebras.

- 22 上田 衛(京大理) Affine twisted Yangians and rectangular W-algebras of type D …………… *
Mamoru Ueda (Kyoto Univ.) Affine twisted Yangians and rectangular W-algebras of type D

概要 We define the affine twisted Yangian of type D and construct surjective homomorphisms from affine twisted Yangians of type D to universal enveloping algebras of rectangular W-algebras of type D.

- 23 蔡 園青(金沢大理工) 古典群の Brylinski–Deligne 拡大の twisted doubling 法について …………… *
Yuanqing Cai (Kanazawa Univ.) Twisted doubling integrals for Brylinski–Deligne extensions of classical groups

概要 In the 1980s, Piatetski-Shapiro and Rallis discovered a family of Rankin–Selberg integrals for the classical groups that did not rely on Whittaker models. This is the so-called doubling method. It grew out of Rallis’ work on the inner products of theta lifts —the Rallis inner product formula.

Recently, a family of global integrals that represent the tensor product L-functions for classical groups (joint with Friedberg, Ginzburg, and Kaplan) and the tensor product L-functions for covers of symplectic groups (Kaplan) was discovered. These can be viewed as generalizations of the doubling method. In this talk, we explain how to develop the doubling integrals for Brylinski–Deligne extensions of all connected classical groups.

- 24 竹ヶ原裕元(室蘭工大理工) 有限アーベル p 群から環積への置換表現の個数に関する p 進的性質について …………… *
Yugen Takegahara
(Muroran Inst. of Tech.) p -adic properties of the numbers of representations in wreath products

概要 Let p be a prime. Given a nonnegative integer ℓ , C_{p^ℓ} denotes a cyclic group of order p^ℓ . Let $C_p \wr H_n$ denote the wreath product of C_p with a subgroup H_n of the symmetric group S_n on n -letters. Given integers u and v with $u \geq 1$ and $u \geq v \geq 0$, set $A_p^{(u,v)} = C_{p^u} \times C_{p^v}$. The number of homomorphisms from $A_p^{(u,v)}$ to $C_p \wr H_n$ is denoted by $h(A_p^{(u,v)}, C_p \wr H_n)$. For a non-zero integer a , $\text{ord}_p(a)$ denotes the exponent of p in the decomposition of a into prime factors. Let $[x]$ denote the largest integer not exceeding a real number x . For each n , $\bar{\tau}_p^{(u,v)}(n)$ denotes $\sum_{j=0}^{u-1} [n/2^j] + [n/2^{u+1}] - [n/2^{u+2}]$ if $p = 2$ and $u = v$ and denotes $\sum_{j=0}^{u-1} [n/p^j] - (u-v)[n/p^u]$ if either $p \geq 3$ or $u \geq v+1$, which is the lower bound of $\text{ord}_p(h(A_p^{(u,v)}, C_p \wr S_n))$. Let A_n be the alternating group on n -letters. The lower bound of $\text{ord}_2(h(A_2^{(u,v)}, C_2 \wr A_n))$ is $\bar{\tau}_2^{(u,v)}(n)$ if $u + \delta_{v0} \leq v + 2$, and is $\bar{\tau}_2^{(u,v)}(n) - 1$ if $u + \delta_{v0} \geq v + 3$.

- 25 河田 成人 (名古屋市大理) 群環上の Scott 加群とテンサー積について *
- Shigeto Kawata (Nagoya City Univ.) On tensor products and Scott lattices over group rings

概要 Let \mathcal{O} be a complete discrete valuation ring of characteristic zero with residue class field of characteristic $p > 0$. Let $\mathcal{O}G$ be the group ring of a finite group G over \mathcal{O} . Suppose that L is an indecomposable $\mathcal{O}G$ -lattice with vertex Q and p' -rank Q -source. Then L is virtually irreducible in the sense of Knörr if and only if the multiplicity of the Scott $\mathcal{O}G$ -lattice with vertex Q in $L \otimes_{\mathcal{O}} L^*$ is one. Here L^* is the dual $\mathcal{O}G$ -lattice of L .

13:00~14:00 特別講演

S. Möller (京大数理研)^Z A geometric classification of the holomorphic vertex operator algebras of central charge 24

Sven Möller (Kyoto Univ.) A geometric classification of the holomorphic vertex operator algebras of central charge 24

概要 Borcherds showed that there is a bijection between the deep holes of the Leech lattice and the Niemeier lattices with non-trivial root system. This allows a geometric classification of these lattices.

Using modular forms we recently established an analogous result for the holomorphic vertex operator algebras of central charge 24 with non-trivial weight-one space.

In this talk I will present a geometric classification of these vertex operator algebras based on this result.

(This is joint work with Nils Scheithauer.)

9月16日(木) 第II会場

9:15~11:15

- 26 矢城 信吾 (日本経済大経営)^Z ACM curves on Del Pezzo surfaces 15
- Shingo Yashiro (Japan Univ. of Econ.) ACM curves on Del Pezzo surfaces

概要 In this talk, we will introduce Curves on Del Pezzo Surfaces in three parts, Part (I): Cohomological Criteria of ACM Curves, Part(II): Minimal Free Resolutions of ACM Curves on Del Pezzo Surfaces and Part (III): Minimal Free Resolutions of Non-ACM Curves on Del Pezzo Surfaces. Moreover, we explain to be related to a dimension of local Cohomology group and Hilbert Functions/Polynomials.

- 27 工藤 陸 (早大理工)^Z 準アフィン代数多様体上のアフィン束のアフィン判定法 15
- Riku Kudou (Waseda Univ.) An affine criterion for affine bundles over quasi-affine varieties

概要 Serre's affine criterion for schemes states that a scheme is affine if and only if the first cohomology of all quasi-coherent sheaves of ideals are zero. In this paper we show that a bundle over a quasi-affine variety, whose fibers are affine, is affine if and only if the first cohomologies of some finite number of quasi-coherent sheaves of ideals are zero, based on the proof of Serre's affine criterion. As an application, we construct counterexamples for Zariski cancellation problem for principal \mathbb{G}_a -bundles over non \mathbb{A}^1 -uniruled quasi-affine varieties. Zariski cancellation problem for an affine variety V asks whether or not the existence of an isomorphism $V \times \mathbb{A}^1 \simeq W \times \mathbb{A}^1$ implies that $V \simeq W$.

- 28 土谷昭善(東大数理)^Z Castelnuovo 凸多面体 15
 Akiyoshi Tsuchiya (Univ. of Tokyo) Castelnuovo polytopes

概要 It is known that the sectional genus of a polarized variety has an upper bound, which is an extension of the Castelnuovo bound on the genus of a projective curve. Polarized varieties whose sectional genus achieves this bound are called Castelnuovo. On the other hand, a lattice polytope is called Castelnuovo if the associated polarized toric variety is Castelnuovo. Kawaguchi characterized Castelnuovo polytopes having interior lattice points in terms of their h^* -vectors. In this talk, as a generalization of this result, a characterization of all Castelnuovo polytopes will be presented.

- 29 S. Kara ^Z グラフに付随する Gorenstein トーリック Fano 多様体の剛性 15
 (Univ. South Alabama)

I. Portakal

(Otto-von-Guericke-Univ. Magdeburg)

土谷昭善(東大数理)

Selvi Kara (Univ. South Alabama) Rigidity of Gorenstein toric Fano varieties arising from graphs

Irem Portakal

(Otto-von-Guericke-Univ. Magdeburg)

Akiyoshi Tsuchiya (Univ. of Tokyo)

概要 A symmetric edge polytope \mathcal{A}_G is a lattice polytope arising from a finite graph G and root system A_n and this polytope is associated to a Gorenstein toric Fano variety X_G with terminal singularities. It is shown by Totaro that a toric Fano variety which is smooth in codimension 2 and \mathbb{Q} -factorial in codimension 3 is rigid, namely, it has no nontrivial infinitesimal deformations. In this talk, we classify all graphs G such that X_G is a toric Fano variety which is smooth in codimension 2 and \mathbb{Q} -factorial in codimension 3.

- 30 鈴木香織(横浜国大経営)^Z 重み付き射影空間への埋め込みの余次元が5の3次元 Fano 多様体 15
 Kaori Suzuki (Yokohama Nat. Univ.) On Fano-3folds of codim 5 with large Fano index

概要 I will explain about the classification of Fano 3-folds with large Fano index when codim 5. Mainly using “Graded Ring Method” by M. Reid and computer software Magma.

- 31 南 範彦(名工大)^Z 低次有理性=高次線織性由来の階層構造たちの関係について —separably
 (-i) rationally connectedness— 15
 Norihiko Minami Relations among hierarchies originating from lower rationality = higher
 (Nagoya Inst. of Tech.) uniruledness —separably (-i) rationally connectedness—

概要 We present a bird’s eye view diagram interrelating various hierarchies originating from lower rationality = higher uniruledness. Special emphasis is paid to the hierarchy of separably (-i) rationally connectedness, from the viewpoint of the nonexistence of a nontrivial section of appropriate sheaves constructed from differential forms.

11:30~12:00 代数学分科会総会

14:25~15:25 特別講演

金 沢 篤 (慶大総合政策)^Z Calabi–Yau 多様体のアトラクター機構とその周辺

Atsushi Kanazawa (Keio Univ.) Attractor mechanisms of Calabi–Yau manifolds and around

概要 The attractor mechanism is concerned with the mass functions on the complex moduli space of a Calabi–Yau manifold. It was originally found by Ferrara–Kallosh–Strominger in their study of blackholes in string theory. In the first half of this talk, I will discuss the mathematical theory and recent development of the attractor mechanisms. In light of mirror symmetry, the attractor mechanisms lead us to the notion of Kähler rigidity. In the second half, I will discuss mirror symmetry of Shioda–Inose K3 surfaces (rigid K3 surfaces) as an application of the Kähler rigidity. To be more precise, we consider generalized K3 surfaces studied by Hitchin, Huybrechts and introduce Mukai lattice polarizations to enlarge classical mirror symmetry (Dolgachev’s formulation).

15:40~16:50

32 桜井 真 (開智学園)^Z 因子化代数とミラー対称性の擬モジュラー形式予想 …………… 15

Makoto Sakurai (Kaichi Gakuen) Factorization algebras and the quasi-modular form conjecture of mirror symmetry

概要 The chiral-factorization algebra theory of Beilinson–Drinfeld is a generalization of (holomorphic) vertex (operator) algebras. Unfortunately, due to the difficulty of Ziv Ran space and Chevalley–Cousin complex for the derived version of chiral conformal blocks, the progress of chiral homology theory was limited until quite recently. In this talk, I will try to incorporate some physics ideas including the mirror symmetry conjecture together with the modularity conjecture of its generating functions. I will especially struggle to obtain a work related to Ekeren–Heluani and Si Li while pursuing the original ideas and definitions of Beilinson–Drinfeld.

33 川谷 康太郎 (阪府大理・大和大理工)^Z 射の圏上の安定性条件の空間 …………… 15Kotaro Kawatani Stability conditions on morphisms on a category
(Osaka Pref. Univ./Yamato Univ.)

概要 We study a deformation of a gluing stability condition on a triangulated category equipped with a semiorthogonal decomposition. More precisely we construct a continuous family of tilt stability conditions by showing a deformation property introduced by Bridgeland’s original paper.

34 是枝 由統 (広島大理)^Z ジェットスキームの有理 2 重点上のファイバーの既約成分の配置 …………… 15

Yoshimune Koreeda (Hiroshima Univ.) On the configuration of the singular fibers of jet schemes of rational double points

概要 Let $X \subset \mathbb{C}^3$ be a surface with a rational double point singularity at the origin O . For $m \geq 0$, there are schemes X_m parametrizing jets on X , called the m -th jet schemes of X along with truncation morphisms $\pi_m : X_m \rightarrow X$. It is known that the irreducible components of the fiber $\pi_m^{-1}(O)$ of the origin correspond to the exceptional curves of the minimal resolution of singularity. We study the configuration of the irreducible components of $\pi_m^{-1}(O)$ for A_n - and D_4 -type singular surfaces, especially the intersections of the irreducible components. We show that the configuration contains enough information to reconstruct the resolution graph.

- 35 佐藤謙太 (九大数理)^Z klt 及び lc 特異点の変形理論 15
 高木俊輔 (東大数理)
 Kenta Sato (Kyushu Univ.) Deformation of klt/lc singularities
 Shunsuke Takagi (Univ. of Tokyo)

概要 klt singularities and lc singularities are the classes of singularities which are defined in terms of resolution of singularities and play an important role in Minimal Model Program. It is well-known that these singularities are stable under a flat deformation with a \mathbb{Q} -Gorenstein total space. In this talk, we will show that the similar result holds without assuming that the total space is \mathbb{Q} -Gorenstein.

- 36 岩見智宏 (九工大工) Threefolds whose numerical Kodaira dimensions 1 or 2 and three-dimensional Miyaoka–Yau type inequality with the 3rd Chern classes driven by symmetric 2-forms *
- Tomohiro Iwami (Kyushu Inst. of Tech.) Threefolds whose numerical Kodaira dimensions 1 or 2 and three-dimensional Miyaoka–Yau type inequality with the 3rd Chern classes driven by symmetric 2-forms

概要 For an semi-stable extremal neighborhood $(X, C) \subset \mathbb{C}^4$ with C is irreducible and reduced, the invariants $l(P), q(P)$ associated to the infinitesimal deformations of C and the abundance property work the existence of three-dimensional flips [S. Mori 1988]. From this fact, the author had reported: (i) three-dimensional Miyaoka–Yau type inequality with c_3 , and such inequality in the case of C irreducible nor reduced (called as an extended extremal neighborhood), (ii) such inequality in the case of driven by symmetric 2-forms, (iii) ubiquity of c_3 in such inequality by the sheaves of associated differential operators [Y. Miyaoka 1987]. Based on these works, the author will report: (a) for an extended extremal neighborhood, to construct of co-fibered products of curves of distinct types [Bogomolov–Tschinkel 2009], (b) to show similar ubiquity of related 0-dimensional supports along (a) as (iii), and (c) to give a necessary condition for certain symmetric 2-forms to have a “connection” by (a) and (b), and give a characterization of threefolds whose numerical Kodaira dimension 1 or 2 without global assumptions as Kodaira dimensions, on which the arguments are alternatives of the ones in [Y. Miyaoka 1988] or [Y. Kawamata 1992].

- 37 安藤哲哉 (千葉大理) テスト集合 —不等式の特性多様体の応用例— *
- Tetsuya Ando (Chiba Univ.) Test set —as an application of characteristic varieties of inequalities—

概要 Let H be a singled linear system on a semialgebraic variety A . A subset $\Omega \subset A$ is called test set, if $f \in H$ is non-negative on Ω then $f \in H$ is always non-negative on A . We present some example of test sets for certain (A, H) .

- 38 天野通大 (明星大) べき零元を含む $\mathbb{Z}_{(p)}$ -代数上のある有限群スキームのカルティエ双対性について *
- Michio Amano (Meisei Univ.) On the Cartier duality of certain finite group schemes over $\mathbb{Z}_{(p)}$ -algebra containing some nilpotent elements

概要 Let $\mathcal{G}^{(\lambda)}$ be a group scheme which deforms \mathbb{G}_a to \mathbb{G}_m . We explicitly describe the Cartier dual of the l -th Frobenius type kernel N_l of the group scheme $\mathcal{E}^{(\lambda, \mu; D)}$ which is an extension of $\mathcal{G}^{(\lambda)}$ by $\mathcal{G}^{(\mu)}$. Here we assume that the base ring A is a $\mathbb{Z}_{(p)}$ -algebra containing some nilpotent elements.

- 39 小原まり子 (大島商船高専) On Algebraic K -theory of duoidal category *
- Mariko Ohara On Algebraic K -theory of duoidal category
 (Oshima Nat. Coll. of Maritime Tech.)

概要 Let \mathcal{C} be a certain duoidal category with coproduct such that the two monoidal products preserve coproduct separately in each variable. We examined the algebraic K -theory of a duoidal category has the similar properties to that of a monoidal category.

- 40 工藤桃成 (東大情報理工) Parameterizing generic curves of genus five and its application to finding
原下秀士 (横浜国大環境情報) curves with many rational points *
- Momonari Kudo (Univ. of Tokyo) Parameterizing generic curves of genus five and its application to finding
Shushi Harashita (Yokohama Nat. Univ.) curves with many rational points

概要 In algebraic geometry, it is important to give good parameterizations of spaces of curves. In particular, the case of non-hyperelliptic curves is the central issue. We construct a very effective parametrization of curves of genus 5 which are neither hyperelliptic nor trigonal. After that, we also present an algorithm for a complete enumeration of generic curves of genus 5 over finite fields with many rational points, where “generic” here means non-hyperelliptic and non-trigonal with mild singularities of the associated sextic model which we propose. As an application, we execute an implementation on computer algebra system MAGMA of the algorithm for curves over the prime field of characteristic 3.

- 41 須山雄介 (阪市大数学研) 2-Fano Bott manifolds *
- Yusuke Suyama (Osaka City Univ.) 2-Fano Bott manifolds

概要 A 2-Fano manifold is a Fano manifold with nef second Chern character. In this talk, we give a necessary and sufficient condition for a Fano Bott manifold to be 2-Fano.

- 42 鈴木拓 (宇都宮大教育) ファノ多様体のスロープ安定性 *
- Taku Suzuki (Utsunomiya Univ.) Slope stability of Fano manifolds

概要 In this talk, we consider the slope stability of Fano manifolds. I conjecture that Fano manifolds are slope stable with respect to curves on them except some cases. I will explain some partial results of this conjecture.

9月17日(金) 第II会場

9:00~12:00

- 43 奥村喜晶 (東洋大理工)^Z A -motive に付随する Galois 表現の合同について 12
- Yoshiaki Okumura (Toyo Univ.) On congruence of Galois representations attached to A -motives

概要 The notion of A -motives is a higher-dimensional generalization of Drinfeld modules, and \mathfrak{p} -adic representations attached to them are one of the most important objects in function field arithmetic. In this talk, we give a criterion for two congruent \mathfrak{p} -adic representations arising from A -motives defined over a global function field to be isomorphic up to semi-simplification when they are restricted to a decomposition group, in terms of Hodge–Pink theory. This is a function field analogue of the criterion for ℓ -adic representations given by Ozeki and Taguchi.

- 44 堀場皓斗 ^Z Galois theoretic study on simultaneous representation of primes by bi-
木田雅成 (東京理大理) nary quadratic forms 12
國府田玄基 (東京理大理)
- Hiroto Horiba Galois theoretic study on simultaneous representation of primes by bi-
Masanari Kida (Tokyo Univ. of Sci.) nary quadratic forms
Genki Koda (Tokyo Univ. of Sci.)

概要 Kaplansky proved that a prime $p \equiv 1 \pmod{16}$ is representable by both or none of $x^2 + 32y^2$ and $x^2 + 64y^2$ whereas a prime $p \equiv 9 \pmod{16}$ is representable by exactly one of these forms. In this talk, we discuss intrinsic Galois structure behind the theorem, and find new theorems like Kaplansky’s. Our theorems exhaust all Kaplansky-type theorems involving positive definite quadratic forms under certain assumption. Moreover, we also find theorems in the indefinite case.

- 45 星 明考 (新潟大理)^Z Davenport and Hasse's theorems and lifts of multiplication matrices of
 金井和貴 (新潟大自) Gaussian periods 10
 Akinari Hoshi (Niigata Univ.) Davenport and Hasse's theorems and lifts of multiplication matrices of
 Kazuki Kanai (Niigata Univ.) Gaussian periods

概要 Let $e \geq 2$ be an integer, p^r be a prime power with $p^r \equiv 1 \pmod{e}$ and $\eta_r(i)$ be Gaussian periods of degree e for \mathbb{F}_{p^r} . By the dual form of Davenport and Hasse's lifting theorem on Gauss sums, we establish lifts of the multiplication matrices of the Gaussian periods $\eta_r(0), \dots, \eta_r(e-1)$ which are defined by F. Thaine. We also give some examples of the explicit lifts for prime degree e with $3 \leq e \leq 23$ which also illustrate relations among lifts of Jacobi sums, Gaussian periods and multiplication matrices of Gaussian periods.

- 46 南 範彦 (名工大)^Z 低次有理性=高次線織性由来の階層構造たちの関係について —有限群の
 Noether 問題への応用— 12
 Norihiko Minami Relations among hierarchies originating from lower rationality = higher
 (Nagoya Inst. of Tech.) uniruledness —applications to Noether's problem for finite groups—

概要 We introduce three kinds of hierarchies among n -folds, originating from lower rationality = higher uniruledness. For an integer i in $[0, n]$, we define $(-i)$ rationality, stable $(-i)$ rationality, and retract $(-i)$ rationality. When the base field is the complex number, thanks to the examples constructed by Schreieder, these hierarchies are all strict, and we can interpret various counter examples to the Noether's program for finite groups over the complex number field as statements of non retract $(-i)$ rationality.

- 47 寺門康裕 (NCTS)^Z Mass formulas on the basic loci of unitary Shimura varieties 12
 Yasuhiro Terakado (NCTS) Mass formulas on the basic loci of unitary Shimura varieties

概要 We study a formula for the mass of a reductive group associated with a point on the basic locus of the reduction of a unitary Shimura variety modulo at a good prime p . We give formulas for the cardinality of the zero-dimensional Ekedahl-Oort stratum on the Shimura variety of $\mathrm{GU}(r, s)$, and for the number of irreducible components of an Ekedahl-Oort stratum in the basic locus of the Shimura variety of $\mathrm{GU}(1, s)$ when p is inert in the underlying quadratic imaginary field. This is joint work with Chia-Fu Yu.

- 48 沖 泰裕 (東大数理)^Z 有理数体上のトーラスの弱近似に関する問題 12
 Yasuhiro Oki (Univ. of Tokyo) A question on the weak approximation on tori over the rational number
 field

概要 For a torus over a global field, Bruhat, Colliot-Thélène, Sansuc and Tits proposed a question which is weaker than the weak approximation at a single finite place. It is related to some researches on arithmetic geometry of Shimura varieties when the torus is defined over the field of rational numbers. In this talk, we consider the above question for tori of certain form over the rational number field. In particular, we give sufficient conditions to the positivity and infinitely many negative examples.

- 49 峰 正博 (上智大理工)^Z 保型 L 関数の値に関する大偏差について 12
 Masahiro Mine (Sophia Univ.) Large deviations for values of automorphic L -functions

概要 One of the modern methods to study the value-distributions of zeta and L -functions is to compare zeta and L -functions with some probabilistic models. In particular, the distributions of extreme values of zeta and L -functions have been studied via the theory of large deviations in probability theory. In this talk, I will talk about large deviations for values of automorphic L -functions attached to holomorphic primitive cusp forms in the level aspect. The main result provides an estimate on the density of cusp forms for which the attached L -functions have extremely large values.

- 50 橋本康史 (琉球大理)^Z セルバークゼータ関数の臨界領域における 2 乗積分について 12
 Yasufumi Hashimoto Square integral of Selberg's zeta function in the critical strip
 (Univ. of Ryukyus)

概要 We study the square integral of Selberg's zeta functions in the critical strip.

- 51 大木孝一 (オーケーラボ)^Z 完備リーマンゼータ関数の行列式表示と行列がエルミートの証明 12
 Kohichi Ohki (OK Lab. Co. Ltd.) The determinant representation of the entire Riemann's Zeta function
 and proof of it's matrix is Hermitian

概要 The Hadamard product was used to obtain a determinant representation of the entire zeta function. By taking the logarithmic derivative of the determinant and Fourier transforming it, we obtain a differential equation including the Laplacian. From the positivity of minus Laplacian, the coefficient is a real number. R.H. is confirmed.

- 52 小林雅人 (神奈川大工)^Z リーマンのゼータ関数の類似の無限級数 12
 佐々木俊二 (上青木中)
 Masato Kobayashi (Kanagawa Univ.) Some infinite series analogous to Riemann's zeta function
 Shunji Sasaki
 (Kamiaoki Junior High School)

概要 We studied some infinite series analogous to Riemann's zeta function:

$$\zeta_1(m) = \sum_{n=1}^{\infty} \frac{1}{n^m + 1}$$

with m a natural number ≥ 2 . We show the exact value of $\zeta_1(2m)$ and some expression of $\zeta_1(2m+1)$ involving certain improper integral of the hyperbolic cotangent function and a rational function.

- 53 武田 渉 (東京理大理)^Z Schur 多重ゼータ関数に対する Jacobi-Trudi 公式のある種の拡張とその
 中筋麻貴 (上智大理工) 応用 12
 Wataru Takeda (Tokyo Univ. of Sci.) Extended Jacobi-Trudi formula for Schur multiple zeta functions and
 Maki Nakasuji (Sophia Univ.) its applications

概要 It is known that the Schur multiple zeta functions of shape λ have the determinant formulas such as Jacobi-Trudi, Giambelli, and Dual Cauchy formulas under the assumption for the diagonal elements of the Young diagram corresponding to λ . We generalize the Jacobi-Trudi formula to that without the assumption in some shape. As one of the applications of this formula, we show the analog of the Pieri formula for the Schur functions for the hook type Schur multiple zeta functions.

- 54 松月大知 (名大多元数理)^Z Finite multiple zeta values with non-all-positive indices in positive char-
 acteristic 12
 Daichi Matsuzuki (Nagoya Univ.) Finite multiple zeta values with non-all-positive indices in positive char-
 acteristic

概要 M. Kaneko and D. Zagier introduced the element $\zeta(s_1, \dots, s_r)_A$ of the ring $\prod_{p:\text{prime}} \mathbb{F}_p / \bigoplus_{p:\text{prime}} \mathbb{F}_p$ called *finite multiple zeta value* (FMZV for short) as a variant of multiple zeta value, where (s_1, \dots, s_r) is a tuple of integers called *index* of the FMZV. It is known that any FMZV with integer index is expressed as \mathbb{Q} -linear combination of 1 and FMZVs with all-positive indices. We show that the same holds for the positive characteristic analogues of FMZVs introduced by C.-Y. Chang and Y. Mishiba.

14:25~15:25 特別講演

竹内大智 (理化学研)^Z Characteristic epsilon cycles of ℓ -adic sheaves on varieties
 Daichi Takeuchi (RIKEN) Characteristic epsilon cycles of ℓ -adic sheaves on varieties

概要 For an ℓ -adic sheaf on a smooth variety over a finite field, the constant term appearing in the functional equation of the L-functions, called the global epsilon factor, is an important arithmetic invariant. When the variety is a curve, Deligne and Laumon show that it decomposes as a product of local epsilon factors. In this talk, I will explain that, attaching some coefficients to the irreducible components of the singular support, we can define a cycle which satisfies a Milnor-type formula for the local epsilon factors of the vanishing cycles complexes modulo roots of unity. I will also explain that, when the variety is projective, it gives a product formula for the global epsilon factor modulo roots of unity for higher dimensional varieties. I will also give an explicit computation, without modulo roots of unity, of the local epsilon factors in a constant sheaf case.

15:40~16:50

55 齋藤耕太 (名大多元数理)^Z 素数表現関数とハウスドルフ次元 12
 Kota Saito (Nagoya Univ.) Prime-representing functions and Hausdorff dimension

概要 Let $c \geq 2$ be any fixed real number. In 2010, Matomäki investigated the set of $A > 1$ such that the integer part of A^{c^k} is a prime number for every $k \in \mathbb{N}$. She proved that the set is uncountable, nowhere dense, and has Lebesgue measure 0. In this talk, we show that the set has Hausdorff dimension 1.

56 D. Tsai (名大多元数理)^Z A recurring pattern in natural numbers of a certain property 12
 Daniel Tsai (Nagoya Univ.) A recurring pattern in natural numbers of a certain property

概要 Numbers such as 198 have the unusual property that the sum of the prime divisors and corresponding exponents larger than 1 in the prime factorization of 198 is equal to that of its reversal 891. Since palindromes satisfy this trivially, we exclude them from our definition. In the sequence of repeated concatenations of the decimal digits of an arbitrary natural number, not a multiple of 10 nor a palindrome, the pattern of which of them have the unusual property is periodic.

57 宮崎隆史 (群馬大理工)^Z 純指数型不定方程式 $a^x + b^y = c^z$ の解の個数について 12
 Takafumi Miyazaki (Gunma Univ.) Number of solutions to the exponential Diophantine equation $a^x + b^y = c^z$

概要 I will briefly report about recent progress on the number of solutions to the exponential Diophantine equation $a^x + b^y = c^z$ in positive integers x, y and z for any fixed coprime positive integers a, b and c greater than 1. The main result states that there are at most two solutions to the equation except for one specific case. This is a joint work with István Pink (University of Debrecen).

58 D. Duverney ^Z 3種類の非正則連分数展開について 10
 (Baggio Engineering School)
 黒沢健 (東京理大理)
 塩川宇賢 (慶大理工)
 Daniel Duverney Three irregular continued fractions of finite sums
 (Baggio Engineering School)
 Takeshi Kurosawa (Tokyo Univ. of Sci.)
 Iekata Shiokawa (Keio Univ.)

概要 We state three general formulas allowing us to transform formal finite sums into formal continued fractions and use them to generalize certain expansions in regular continued fractions given by Hone and Varona.

- 59 飯高 茂 (学習院大*)^Z ムルセンヌ素数の変異型 12
Shigeru Iitaka (Gakushuin Univ.*) Variants of Mersenne primes

概要 Primes in the form $q = 2^e - 1$ are said to be Mersenne primes.

Here we introduce variants of Mersenne primes.

Given an integer m and a odd prime h , if a positive integer a satisfies the simultaneous equations $A = \sigma(a) - m$, $B = \sigma(A) - 1 + 2m$, $\sigma(B) = 3a + 3$ then it is said to be ultra 2 Mersenne perfect number with partner A and shadow B .

Other than Mersenne primes, 499279, 1000151 are variants of Mersenne primes.

- 60 南出 真 (山口大理) 合同約数和の平均に対する誤差項の平均について *
矢代 好克 (中部大工)
谷川 好男

Makoto Minamide (Yamaguchi Univ.) On an error term for the mean of the sum of congruent divisors

Yoshikatsu Yashiro (Chubu Univ.)

Yoshio Tanigawa

概要 For fixed positive integers m_1 and m_2 , we shall define an arithmetical function $f(n)$ by the sum of divisors d of n satisfying $d \equiv k_1 (m_1)$ and $n/d \equiv k_2 (m_2)$. We study an error term of the mean of $f(n)$.

- 61 木内 功 (山口大創成) On sums of sums involving squarefull numbers *
Isao Kiuchi (Yamaguchi Univ.) On sums of sums involving squarefull numbers

概要 We consider several asymptotic formulas for sums of the modified squarefull numbers.

- 62 木内 功 (山口大創成) On sums involving the Euler totient function *
鶴田 侑己 (山口大創成)

Isao Kiuchi (Yamaguchi Univ.) On sums involving the Euler totient function

Yuki Tsuruta (Yamaguchi Univ.)

概要 Let $\gcd(n_1, \dots, n_k)$ denote the greatest common divisor of the positive integers n_1, \dots, n_k , and let ϕ be the Euler totient function defined by $\text{id} * \mu$. For any real number $x > 3$ and any integer $k \geq 2$, we investigate the asymptotic behaviour of formulas for $\sum_{n_1 \dots n_k \leq x} \phi(\gcd(n_1, \dots, n_k))$.

- 63 小山 信也 (東洋大理工) ラマヌジャンのオイラー積の変形について *
黒川 信重 (東工大*)

Shin-ya Koyama (Toyo Univ.) Variations of Ramanujan's Euler product

Nobushige Kurokawa (Tokyo Tech*)

概要 We study the meromorphy of various Euler products of degree two attached to holomorphic Hecke eigen cusp forms for the elliptic modular group, including Ramanujan's Δ -function.

- 64 小林 弘京 (名大多元数理) On the discrete mean of the higher derivative of Hardy's Z -function *
Hirotaka Kobayashi (Nagoya Univ.) On the discrete mean of the higher derivative of Hardy's Z -function

概要 In 1985, Conrey and Ghosh considered the discrete mean value of $Z(\gamma_1)^2$, where $Z(t)$ is called Hardy's Z -function and γ_1 are the zeros of the first derivative of $Z(t)$ with assuming the Riemann Hypothesis. And they obtained an approximate formula. Later, Yildirim generalise their result. He obtained an asymptotic formula of the sum of $Z(\gamma_k)^2$, where γ_k are the zeros of the k -th derivative of $Z(t)$. In this talk, we give more generalised result, namely, an approximate formula of $Z^{(j)}(\gamma_k)^2$, where $Z^{(j)}(t)$ is the j -th derivative of $Z(t)$.

- 65 遠藤 健太 (名大多元数理) ゼータ関数の近似定理の定量的評価について *
- Kenta Endo (Nagoya Univ.) Effective estimate for approximation theorem by zeta-functions

概要 We consider the effectivity problem of Voronin's multi-dimensional denseness theorem for zeta-functions. He himself refined his theorem to an effective form. We will generalize his effective result to the Selberg class under the certain conditions.

- 66 渡辺 文彦 (防衛大) テータ関数の複素冪積の臨界点の個数について *
- Humihiko Watanabe (Nat. Defense Acad. of Japan) The number of critical points of a product of powers of theta functions in two variables

概要 We obtained the following theorem: Under a general situation of parameters, the number of nondegenerate critical points of a product of complex powers of theta functions in two variables coincides with the Euler number of an open dense subset which is contained in an abelian surface and obtained by subtracting from it the normal crossing divisor related to the product of complex powers of theta functions.

幾何学

9月14日(火) 第III会場

10:00~12:00

- 1 宮武夏雄(阪大理)^Z 対角形の調和計量を持つ調和束の Kobayashi–Hitchin 対応について 15
Natsuo Miyatake (Osaka Univ.) Kobayashi–Hitchin correspondence of harmonic bundles with diagonal harmonic metrics

概要 Simpson established Kobayashi–Hitchin correspondence of harmonic bundles on compact Kähler manifolds about 30 years ago. In this talk, we will give a simplified proof of the Kobayashi–Hitchin correspondence of harmonic bundles with diagonal harmonic metrics on compact Kähler manifolds by applying the speaker’s theorem of the existence of the solution of the generalized Kazdan–Warner equations on compact Riemannian manifolds.

- 2 大野走馬(早大理工)^Z Nearly ケーラー多様体上のラリタ=シュウィンガー場 15
富久拓磨(早大理工)
Soma Ohno (Waseda Univ.) Rarita–Schwinger fields on nearly Kähler manifolds
Takuma Tomihisa (Waseda Univ.)

概要 We study Rarita–Schwinger fields on 6-dimensional compact strict nearly Kähler manifolds. In order to investigate them, we clarify the relationship between some differential operators for the Hermitian connection and the Levi–Civita connection. As a result, we show that the space of the Rarita–Schwinger fields coincides with the space of the harmonic 3-forms. Applying the same technique to a deformation theory, we also find that the space of the infinitesimal deformations of Killing spinors coincides with the direct sum of a certain eigenspace of the Laplace operator and the space of the Killing spinors.

- 3 藤岡禎司(京大理)^Z 弱い孤立特異点をもつ Alexandrov 空間への崩壊 15
Tadashi Fujioka (Kyoto Univ.) Collapsing to Alexandrov spaces with isolated mild singularities

概要 Let M_j be a sequence of Riemannian manifolds with a lower curvature bound collapsing to an Alexandrov space X . Yamaguchi’s fibration theorem states that if X is a Riemannian manifold, then M_j admits a structure of locally trivial fibration over X for large j . It is known that the assumption can be relaxed to the condition that each point of X is strained. In this talk, we show this theorem under the condition that X admits isolated singularities stronger than strained points.

- 4 深谷友宏(都立大理)^Z 粗凸空間の間の写像が誘導する境界の間の写像 15
Tomohiro Fukaya (Tokyo Metro. Univ.) Induced maps between boundaries of coarsely convex spaces

概要 The class of coarsely convex spaces is introduced by myself and Shin-ichi Oguni, which is a coarse geometric analogue of the class of Riemannian manifolds of nonpositive curvature. With Yuuhei Ezawa, we studied maps between coarsely convex spaces which induces continuous maps between their boundaries. Our work is based on the results by Dydak and Virk for the case of Gromov hyperbolic spaces and their boundaries. The main part of this talk is based on the preprint arXiv:2103.11160.

- 5 鷺見 拳 (京大 理)^Z 滑らかなコンパクトトロピカルトーリック多様体に対するリーマン・ロッホ不等式 15

Ken Sumi (Kyoto Univ.) Riemann–Roch inequality for smooth compact tropical toric surfaces

概要 For a divisor D on a compact tropical curve C , the value of $h^0(C, D)$ appearing in a Riemann–Roch formula for compact tropical curves is difficult to compute in general and cannot be given only by the tropical module $\Gamma(C, \mathcal{O}(D))$ consisting of global sections of the correspondence tropical line bundle $\mathcal{O}(D)$. For a divisor D on a tropical variety X , we give lower and upper bounds of the value of $h^0(X, D)$, which are defined in terms of global sections and computed more easily than $h^0(X, D)$. As an application of this estimation, we show that a Riemann–Roch inequality holds for smooth compact tropical toric surfaces.

- 6 周 曉丹 ^Z 非アールフォルス正則距離空間における擬等角写像とソボレフ写像 15
(沖縄科学技術大学院大)

Xiaodan Zhou (Okinawa Inst. of Sci. and Tech. Grad. Univ.) Quasiconformal and Sobolev mappings in non-Ahlfors regular metric spaces

概要 We show that a mapping $f: X \rightarrow Y$ satisfying the metric condition of quasiconformality outside suitable exceptional sets is in the Newton–Sobolev class $N_{loc}^{1,1}(X; Y)$. Contrary to previous works, we only assume an asymptotic version of Ahlfors-regularity on X, Y . This allows many non-Ahlfors regular spaces, such as weighted spaces and Fred Gehring’s bowtie, to be included in the theory. Unexpectedly, already in the classical setting of unweighted Euclidean spaces, our theory detects Sobolev mappings that are not recognized by previous results.

14:25~15:25

- 7 河井公大朗 (学習院大 理)^Z Spin(7) 多様体に対する変形ドナルドソン・トーマス接続の変形理論 15
山本 光 (筑波大数理物質)

Kotaro Kawai (Gakushuin Univ.) Deformation theory of deformed Donaldson–Thomas connections for Hikaru Yamamoto (Univ. of Tsukuba) Spin(7)-manifolds

概要 A deformed Donaldson–Thomas connection for a manifold with a Spin(7)-structure, which we call a Spin(7)-dDT connection, is a Hermitian connection on a Hermitian line bundle L over a manifold with a Spin(7)-structure defined by fully nonlinear PDEs. It was first introduced by Lee and Leung as a mirror object of a Cayley cycle by the real Fourier–Mukai transform. We suggest an alternative definition of Spin(7)-dDT connections which seems to be more appropriate by carefully computing the real Fourier–Mukai transform again. Then we study the deformation theory. We show that each of their deformations on an open set of the moduli space is controlled by a subcomplex of an elliptic complex and show its orientability.

- 8 河井公大朗 (学習院大 理)^Z 体積汎関数のミラーと special holonomy 15
山本 光 (筑波大数理物質)

Kotaro Kawai (Gakushuin Univ.) Mirror of volume functionals on manifolds with special holonomy
Hikaru Yamamoto (Univ. of Tsukuba)

概要 We can define the “volume” V for Hermitian connections on a Hermitian complex line bundle over a Riemannian manifold X , which can be considered to be the “mirror” of the standard volume for submanifolds. This is called the Dirac–Born–Infeld (DBI) action in physics.

We first show the short time existence and uniqueness of the negative gradient flow of V . Then we relate the functional V to a deformed Donaldson–Thomas connection for a Spin(7)-manifold (a Spin(7)-dDT connection). We prove the “mirror” of the Cayley equality, which have many applications. For example, we see that any Spin(7)-dDT connection is a global minimizer of V and its value is given topologically and we can relate Spin(7)-dDT connections to G_2 -dDT and dHYM connections. We also prove analogous statements for G_2 -manifolds and Kähler manifolds of dimension 3 or 4.

- 9 桑垣 樹 (阪大 理)^Z Symplectic geometry and exact WKB analysis 15
 Tatsuki Kuwagaki (Osaka Univ.) Symplectic geometry and exact WKB analysis

概要 Exact WKB analysis is a specific way to solve differential equations parametrized by the Planck parameter. I'll describe symplectic/sheaf-theoretic construction expressing solutions of exact WKB analysis, which will lead to a formulation of a variant of the Riemann–Hilbert correspondence.

- 10 只野 誉 (山口 大理) Boju–Funar type theorems via m -Bakry–Émery and m -modified Ricci curvatures *

Homare Tadano (Yamaguchi Univ.) Boju–Funar type theorems via m -Bakry–Émery and m -modified Ricci curvatures

概要 We establish some Boju–Funar type compactness criteria for complete Riemannian manifolds via m -Bakry–Émery and m -modified Ricci curvatures assuming that m -Bakry–Émery and m -modified Ricci curvatures tend slowly to zero as the distance from a fixed point goes to infinity.

- 11 只野 誉 (山口 大理) m -Bakry–Émery Ricci curvatures, Riccati inequalities, and bounded diameters *

Homare Tadano (Yamaguchi Univ.) m -Bakry–Émery Ricci curvatures, Riccati inequalities, and bounded diameters

概要 By using some line integrals in terms of the m -Bakry–Émery and m -modified Bakry–Émery Ricci curvatures, we give various compactness criteria for complete Riemannian manifolds when m is a positive constant, a negative constant, and infinity. Our results generalize previous Myers-type compactness criteria obtained by M. Fernández-López and E. García-Río, M. Limoncu, Z. Qian, G. Wei and W. Wylie, J.-Y. Wu, and W. Wylie, as well as a previous Ambrose-type compactness criterion obtained by K. Kuwae and X.-D. Li. The key ingredients in proving our results are Riccati inequalities obtained from Bochner–Weitzenböck formulas via m -Bakry–Émery and m -modified Bakry–Émery Ricci curvatures.

- 12 森山 貴之 (三重大教養教育院) Quaternionic k -vector fields on quaternionic Kähler manifolds *

新田 貴士 (三重大教育)

Takayuki Moriyama (Mie Univ.) Quaternionic k -vector fields on quaternionic Kähler manifolds

Takashi Nitta (Mie Univ.)

概要 In this talk, we introduce a quaternionic k -vector field on a quaternionic Kähler manifold. We prove that any quaternionic k -vector field corresponds to a holomorphic k -vector field on the twistor space.

15:40~16:40 特別講演

小澤 龍ノ介 (防衛 大)^Z Lin–Lu–Yau 型リッチ曲率が下に有界な有向グラフの幾何解析について

Ryunosuke Ozawa Geometric analysis on directed graphs of Lin–Lu–Yau type Ricci curvature bounded below
 (Nat. Defense Acad. of Japan)

概要 For undirected graphs, the Ricci curvature introduced by Lin–Lu–Yau has been widely studied from various perspectives, especially geometric analysis. In this talk, we discuss generalization problem of their Ricci curvature for directed graphs. We introduce a new generalization by using the mean transition probability kernel which appears in the formulation of the Chung Laplacian. We obtained Ricci curvature of Cartesian products of two directed graphs, Bonnet–Myers type theorem, maximal diameter theorem of Chung type, and characterization of lower Lin–Lu–Yau type Ricci curvature bound.

9月15日(水) 第IX会場

10:10~10:20 2021年度日本数学会幾何学賞受賞者紹介

10:35~11:35 2021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)

河澄 響 矢(東大数理)^Z 写像類群のリー代数を求めて

久野 雄 介(津田塾大学芸)

Nariya Kawazumi (Univ. of Tokyo) In search of the Lie algebra of the mapping class group

Yusuke Kuno (Tsuda Coll.)

概要 Given an oriented surface, one can consider the associated graded Lie algebra of the filtration of its mapping class group that is defined by the lower central series of the fundamental group of the surface. The Johnson homomorphism is an injective graded Lie homomorphism from this Lie algebra to the Lie algebra of symplectic derivations. In this talk, we explain a geometric approach to the Johnson homomorphism using the Goldman–Turaev Lie bialgebra of the surface. In particular, we show that the Kashiwara–Vergne problem, which originates in Lie theory, is equivalent to the problem of finding Magnus expansions of the fundamental group of the surface which are compatible with the structure of the Goldman–Turaev Lie bialgebra. We will also mention several infinitesimal approaches to topology of the mapping class group.

13:15~14:15 2021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)

村上 順(早大理工)^Z ジョーンズ多項式とその応用

Jun Murakami (Waseda Univ.) The Jones polynomial and its applications

概要 The Jones polynomial is the foundation of the quantum topology of low-dimensional manifolds. The Jones polynomial is related to the quantum group $\mathcal{U}_q(\mathfrak{sl}_2)$, and is extended to the colored Jones polynomial and the Witten–Reshetikhin–Turaev invariant of three manifolds, and various quantum invariants. Based on Kashaev’s observation that certain quantum invariant of knots relates to the hyperbolic volume of the knot complement, the volume conjecture is proposed. This conjecture predicts a relation between the colored Jones polynomial of a knot and the volume of the knot complement. On the other hand, the Jones algebra is generalized to the Kauffman bracket skein algebra, which is expected to be a good tool to quantize some classical geometric theory.

In this talk, I would like to explain the representation theoretical aspect of the Jones polynomial, the volume conjecture and its application, and an application of the skein algebra to the $SL(2, \mathbb{C})$ character variety of a knot.

9月16日(木) 第III会場

10:00~12:00

- 13 田内 大 渡(九大IMI)^Z Positivity for the curvature of the diffeomorphism group corresponding to the incompressible Euler equation with Coriolis force 15

米田 剛(東大数理) Positivity for the curvature of the diffeomorphism group corresponding

Taito Tauchi (Kyushu Univ.) to the incompressible Euler equation with Coriolis force
Tsuayoshi Yoneda (Univ. of Tokyo)

概要 We investigate the geometry of the central extension $\widehat{\mathcal{D}}_\mu(S^2)$ of the group of volume-preserving diffeomorphisms of the 2-sphere equipped with an L^2 -metric, for which geodesics correspond to solutions of the incompressible Euler equation with Coriolis force. In particular, we calculate the *Misiolek curvature* of this group. This value is related to the existence of a conjugate point and its positivity directly implies the positivity of the sectional curvature.

- 14 川又将大(広島大理)^Z 一般化されたモンジュ・アンペール方程式の性質とその幾何学的特異解について 15

Masahiro Kawamata (Hiroshima Univ.) On properties of the generalized Monge–Ampère equation and its geometric singular solutions

概要 The set of Monge–Ampère equations is an important class of partial differential equations and has been studied not only by analytical but also by geometrical methods. It is known that the open umbrella which is an important object in singularity theory appears as a geometric singular solution of a Monge–Ampère equation. Therefore, it can be expected that geometric singular solutions of generalized Monge–Ampère equations are also important objects in terms of singularity theory. In this talk, we introduce some concrete examples which have singularities of type cuspidal edge, swallowtail, etc., of geometric singular solutions of generalized Monge–Ampère equations. We also introduce geometric properties of generalized Monge–Ampère equations in terms of exterior differential systems.

- 15 軸丸芳揮(九大IMI)^Z 離散平面曲線の安定性について 15

Yoshiki Jikumaru (Kyushu Univ.) On the stability problem of discrete planar curves

概要 We study planar polygonal curves from the variational methods. We show that equilibrium discrete planar curves for the length functional under the area-constraint condition must be regular polygons. Moreover, we derive the second variation formula for the equilibrium curves and show that non-convex regular polygons and convex regular polygons with the multiplicity are unstable.

- 16 佐藤雄一郎(都立大理)^Z 擬リーマン空間形や光錐内の超曲面の双対性 15

Yuichiro Sato (Tokyo Metro. Univ.) Duality of hypersurfaces in pseudo-Riemannian space forms and light-cones

概要 When we consider hypersurfaces in pseudo-spheres, pseudo-hyperbolic spaces and lightcones, there exist three types of duality, which we call the duality of hypersurfaces. In this talk, we will introduce the notion of palindromic hypersurfaces and show that infinitesimal symmetries can be shifted by the duality of hypersurfaces.

- 17 イエーリツシュヨハネス^Z Cusp winding spectra for some hyperbolic surfaces 15
(名大多元数理)

高橋博樹(慶大理工)

Johannes Jaerisch (Nagoya Univ.) Cusp winding spectra for some hyperbolic surfaces

Hiroki Takahashi (Keio Univ.)

概要 We introduce the multi-cusp winding process for the geodesic flow on a hyperbolic surface modeled by a finitely generated free Fuchsian group with parabolic elements. We use ergodic theory and multifractal analysis to investigate the long-term behavior of the cusp winding process.

- 18 藤井知輝(東京理大理)^Z 平均曲率流のグラフィートランスレーティングソリトンと等径関数 15

Tomoki Fujii (Tokyo Univ. of Sci.) Graphical translating solitons for the mean curvature flow and isoparametric functions

概要 In this talk, we give a construction of a translating soliton which is given as the graph of a function over some domain of a Riemannian manifold whose level sets give isoparametric foliation. The translating soliton constructed in this method is the graph of a function which is given as a composition of an isoparametric function and a solution of a certain ordinary differential equation. In particular, in case where the Riemannian manifold is the sphere, we classify the shape of such translating solitons.

14:25~15:25

- 19 阿賀岡芳夫 (広島大)^Z 3次元 warped product 計量の局所等長埋め込みと Monge–Ampère 方程
橋永貴弘 (北九州工高専) 式 15
Yoshio Agaoka (Hiroshima Univ.*) Local isometric embedding of 3-dimensional warped product metrics
Takahiro Hashinaga and the Monge–Ampère equation
(Kitakyushu Nat. Coll. of Tech.)

概要 We consider the problem of local isometric embeddings of three-dimensional warped product metrics with a two-dimensional base space. We give an (almost) necessary and sufficient condition that this space can be locally isometrically embedded into the four-dimensional Euclidean space. This condition can be expressed as a second-order partial differential equation on the warping function, which is the Monge–Ampère type, in addition to some inequality on the curvature.

- 20 榎本一之 (東京理大)^Z 球面曲線の曲率の積分 15
伊藤仁一 (椋山女学園大教育)
Kazuyuki Enomoto Total integral of curvatures of spherical curves
(Tokyo Univ. of Sci.*)
Jin-ichi Itoh (Sugiyama Jogakuen Univ.)

概要 We study the total integral of the curvature of curves in the unit sphere S^2 in the Euclidean space E^3 . We explain how the total Euclidean curvature (total integral of the curvature as a curve in E^3) is related to the total spherical curvature (total integral of the curvature as a curve in S^2) of its evolute. We use this relation to study the problem of finding the minimal possible value of the total Euclidean curvature in a set of curves where the location and the tangential direction at the endpoints are prescribed.

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

概要 In previous MSJ meetings we gave the classification of maximal antipodal sets of some classical compact symmetric spaces. This talk is a continuation of the previous talk. We give the classification of maximal antipodal sets of $UI(n) \cong U(n)/O(n)$ and their quotient spaces.

- 22 守屋克洋 (兵庫県立大理) 単位球面内の極小曲面の変換 *

概要 For a given minimal surface in the n -sphere, two ways to construct a minimal surface in the m -sphere are given. One way constructs a minimal immersion. The other way constructs a minimal immersion which may have branch points. The branch points occur exactly at each point where the original minimal surface is geodesic. If a minimal surface in the 3-sphere is given, then these ways construct Lawson's polar variety and bipolar surface.

- 23 佐々木優 (東京工高専) F_4 および FI 型コンパクト対称空間の極大対蹠集合 *

概要 We explicitly classify congruent classes of maximal antipodal sets of F_4 and FI by using the exceptional Jordan algebra. Moreover, we construct a new characterization of the compact symmetric space FI .

- 24 佐藤雄一郎 (都立大理) 擬球面内の対角化可能な形作用素を持つ等径超曲面の分類 *
- Yuichiro Sato (Tokyo Metro. Univ.) Classification of isoparametric hypersurfaces with diagonalizable shape operator in pseudo-spheres

概要 As an application of duality of hypersurfaces in pseudo-Riemannian space forms and lightcones, we will give a classification of isoparametric hypersurfaces in pseudo-spheres whose shape operators are diagonalizable.

15:40~16:40 特別講演

古畑 仁 (北大理)^Z 統計多様体の部分多様体論

Hitoshi Furuhata (Hokkaido Univ.) Submanifold theory in statistical manifolds

概要 A statistical manifold is a Riemannian manifold endowed with a torsion-free affine connection satisfying the Codazzi equation. The submanifold theory in such a space is now developing. The words “statistical submanifold” can be found in the late 1980s in the context of statistical inference or information geometry. We will here introduce recent differential geometric researches in this field, for example, the counterpart of the Chen inequality in the Riemannian submanifold theory.

函数論

9月14日(火) 第IV会場

10:00~12:00

- 1 柳原 宏 (山口大工)^Z Julia の補題に関する歪曲評価 15
 星長 翔太 (山口大工)
 Hiroshi Yanagihara (Yamaguchi Univ.) The sharp distortion estimate concerning Julia's lemma
 Shota Hoshinaga (Yamaguchi Univ.)

概要 Let J_α be the class of analytic functions f in D such that $f(D) \subset D$ having the angular derivative α at $1 \in \partial D$. Then for fixed $z_0 \in D$, classical Julia's lemma states that $V_0(z_0, \alpha) = \{f(z_0) : f \in J_\alpha\}$ is a disc. We study the variability region $V_1(z_0, \alpha) = \{f'(z_0) : f \in J_\alpha\}$ and determine the shape of $V_1(z_0, \alpha)$. It is not a disc.

- 2 相川 弘明 (中部大工)^Z Intrinsic ultracontractivity for domains in negatively curved manifolds 15
 M. van den Berg (Univ. of Bristol)
 正宗 淳 (北大理)
 Hiroaki Aikawa (Chubu Univ.) Intrinsic ultracontractivity for domains in negatively curved manifolds
 Michiel van den Berg (Univ. of Bristol)
 Jun Masamune (Hokkaido Univ.)

概要 Let M be a complete, non-compact, connected Riemannian manifold with Ricci curvature bounded from below by a negative constant. We give a sufficient condition for open and connected sets D in M for which the corresponding Dirichlet heat semigroup is intrinsically ultracontractive. That condition is formulated in terms of capacity width. The key ingredient is that the bottom of the spectrum of the Dirichlet Laplacian for D is comparable with the reciprocal of the square of the capacity width for D , if the capacity width is sufficiently small.

- 3 熊谷 駿 (東北大情報)^Z Veech groups of general origamis 15
 Shun Kumagai (Tohoku Univ.) Veech groups of general origamis

概要 An atlas μ on a Riemann surface R whose any transition is half-translation is called a flat structure on R . Affine deformations of a flat surface (R, μ) form a Teichmüller disk $\Delta(R, \mu)$, a curve family isometrically embedded into the Teichmüller space $T(R)$ as a disk. $\Delta(R, \mu)$ projects into the moduli space $M(R)$ by the quotient with the Veech group $\Gamma(R, \mu) < PSL(2, \mathbb{R})$, forming an orbifold. $PSL(2, \mathbb{Z})$ acts on the set of origamis (square-tiled flat surfaces) by transforming a combinatorial graph structure characterizing origami. We may calculate Veech groups of origamis by decomposing the set of origamis into $PSL(2, \mathbb{Z})$ -orbits. As a result, we find the smallest non-trivial origami with the maximal Veech group $PSL(2, \mathbb{Z})$.

- 4 堀田 一敬 (山口大理工)^Z Univalent functions with quasiconformal extensions: Becker's class and estimates of the third coefficient 15
 P. Gumenyuk (Univ. Politecnico di Milano)
 Ikkei Hotta (Yamaguchi Univ.) Univalent functions with quasiconformal extensions: Becker's class and estimates of the third coefficient
 Pavel Gumenyuk (Univ. Politecnico di Milano)

概要 We investigate univalent functions $f(z) = z + a_2z^2 + a_3z^3 + \dots$ in the unit disk \mathbb{D} extendible to k -quasiconformal automorphisms of \mathbb{C} . In particular, we answer a question on estimation of $|a_3|$ raised by Kühnau and Niske. This is one of the results we obtain studying univalent functions that admit quasiconformal extensions via a construction, based on Loewner's parametric representation method, due to J. Becker.

- 5 堀田一敬 (山口大理工)^Z Limits of multiple SLE and a Burgers–Loewner differential equation ··· 15
 香取眞理 (中大理工)
 A. del Monaco
 (Univ. degli Studi di Roma “Tor Vergata”)
 S. Schleißinger (Univ. Würzburg)
- Ikkei Hotta (Yamaguchi Univ.) Limits of multiple SLE and a Burgers–Loewner differential equation
 Makoto Katori (Chuo Univ.)
 Andrea del Monaco
 (Univ. degli Studi di Roma “Tor Vergata”)
 Sebastian Schleißinger
 (Univ. Würzburg)

概要 In this talk we ask whether one can take the limit of multiple SLE as the number of slits goes to infinity.

- 6 堀田一敬 (山口大理工)^Z Additive processes on the unit circle and Loewner chains ········· 15
 長谷部高広 (北大理工)
Ikkei Hotta (Yamaguchi Univ.) Additive processes on the unit circle and Loewner chains
 Takahiro Hasebe (Hokkaido Univ.)

概要 In this talk we defines the notion of generators for a class of decreasing radial Loewner chains which are only continuous with respect to time. For this purpose, “Loewner’s integral equation” which generalizes Loewner’s differential equation is defined and analyzed. The definition of generators is motivated by the Lévy–Khintchine representation for additive processes on the unit circle.

- 7 植木誠一郎 (東海大理) Bergman 空間における Lipschitz 平均条件と積分平均の増大度 ······· *
 Sei-Ichiro Ueki (Tokai Univ.) Mean Lipschitz condition and growth of area integral mean in the Bergman space

概要 We show that the mean Lipschitz condition for f in the weighted Bergman space with admissible Békollé weights is characterized by the growth of the area integral mean of its derivative as well as by the growth of the norm of the difference between f and the dilated function of f . Furthermore we investigate the Bloch and Zygmund-type spaces for admissible weight.

- 8 齋藤三郎 (群馬大*・再生核研) Mysterious properties of the Laurent expansions in connection with geometry ········· *
 奥村博
Saburou Saitoh Mysterious properties of the Laurent expansions in connection with geometry
 (Gunma Univ.* / Inst. of Reproducing Kernels)
 Hiroshi Okumura

概要 Based on the materials in the several papers, we introduce the mysterious and concrete properties of the Laurent expansion in connection with geometry and division by zero calculus. The problem is on the properties at the point at infinity of meromorphic functions and figures, and we found entirely new mathematics and results for the Laurent expansion.

14:25~15:25 特別講演

奥山 裕介 (京都工繊大基盤)^Z 複素力学系と非アルキメデスの力学系 —モデュライ, 退化, 還元—

Yūsuke Okuyama (Kyoto Inst. Tech.) Complex dynamics and non-archimedean dynamics: moduli, degeneration, and reduction

概要 We would give a talk about a few (mutually related) topics from complex and non-archimedean/arithmetic dynamics on (i) a quantitative approximation of the Lyapunov exponent function for rational functions of degree > 1 and quantitative/effective studies of the complex geometry of the dynamical moduli spaces (including our joint work with Thomas Gauthier and Gabriel Vigny), (ii) limiting/asymptotic behaviors of the Lyapunov exponents and the maximal entropy measures for a meromorphic family of rational functions of degree $d > 1$ on $\mathbb{P}^1(\mathbb{C})$ parametrized by \mathbb{D} and possibly degenerating at the origin in the parameter space \mathbb{D} (including our joint work with Laura DeMarco), (iii) GIT-semistable reductions of rational functions of degree > 1 defined over an algebraically closed field that is complete with respect to a non-trivial and non-archimedean absolute value (including our joint work with Hongming Nie). We would try to indicate how complex and non-archimedean dynamics interact with each other.

9月15日(水) 第IV会場

10:00~10:30

- 9 綾野 孝則 (阪市大数学研)^Z 種数2の超楕円関数の定義域の制限 15

V. M. Buchstaber

(Steklov Inst. of Math.)

Takanori Ayano (Osaka City Univ.) Restrictions of the domain of the hyperelliptic functions of genus 2

Victor M. Buchstaber

(Steklov Inst. of Math.)

概要 In this talk, we consider the problem about the relationships between elliptic functions and hyperelliptic functions of genus 2. We consider a hyperelliptic curve V of genus 2 which admits a morphism of degree 2 to an elliptic curve E . We show that the restrictions of the domain of the hyperelliptic functions associated with V to the subspace in \mathbb{C}^2 are elliptic functions and describe them in terms of the Weierstrass elliptic function associated with E . We derive this result by describing the homomorphism between the Jacobian varieties of the curves V and E induced by the morphism from V to E explicitly.

- 10 足立 真訓 (静岡大理)^Z 豊富な法束を持つ葉層の力学的様相 15

J. Brinkschulte (Univ. Leipzig)

Masanori Adachi (Shizuoka Univ.)

Dynamical aspects of foliations with ample normal bundle

Judith Brinkschulte (Univ. Leipzig)

概要 We prove the following result that was conjectured by Brunella: Let X be a compact complex manifold of dimension ≥ 3 . Let \mathcal{F} be a codimension one holomorphic foliation on X with ample normal bundle. Then every leaf of \mathcal{F} accumulates to the singular set of \mathcal{F} .

- 11 阿部 誠 (広島大先進理工) 劣多重調和関数の2次関数による特徴付け *

杉山 俊

(日本電気通信システム)

Makoto Abe (Hiroshima Univ.)

A characterization of subpluriharmonicity by using quadratic functions

Shun Sugiyama

(NEC Comm. Systems, Ltd.)

概要 We give a characterization of a subpluriharmonic function of several complex variables in the sense of Fujita (J. Math. Kyoto Univ., 30:637-649, 1990) by using polynomial functions of degree at most two.

- 12 田島 慎一 (新潟大*) 孤立特異点を持つ complete intersection の Milnor 数の deterministic な
鍋島 克輔 (東京理大理) 計算法について —auxiliary indeterminates の利用— *
- Shinichi Tajima (Niigata Univ.*) A new deterministic method for computing Milnor number of an ICIS
Katsusuke Nabeshima
(Tokyo Univ. of Sci.)

概要 The Milnor number of an isolated complete intersection singularity (ICIS) is considered in the context of symbolic computation. Based on the classical Lê–Greul formula, a new method for computing Milnor numbers is introduced. Key ideas of our approach are the use of auxiliary indeterminates and the concept of local cohomology with coefficients in the field of rational functions of auxiliary indeterminates.

- 13 高田 佑太 (北大理) K3 曲面上の Siegel 円板と Picard 数 *
- 岩崎 克則 (北大理)
Yuta Takada (Hokkaido Univ.) Siegel disks on K3 surfaces and Picard numbers
Katsunori Iwasaki (Hokkaido Univ.)

概要 If a K3 surface admits an automorphism with a Siegel disk, then its Picard number is an even integer between 0 and 18. Conversely, given such an integer p , there exists an automorphism with a Siegel disk on a K3 surface of Picard number p . We can prove this constructing a K3 lattice automorphism using the method of hypergeometric groups. The constructions involve extensive computer searches for appropriate Salem numbers and computations of related algebraic numbers.

- 14 岩井 雅崇 (東北大RACMaS) On the structure of a log smooth pair in the equality case of the Bogomolov–
Gieseker inequality *
- Masataka Iwai (Tohoku Univ.) On the structure of a log smooth pair in the equality case of the Bogomolov–
Gieseker inequality

概要 We study the structure of a log smooth pair when the equality holds in the Bogomolov–Gieseker inequality for the logarithmic tangent bundle and this bundle is semistable with respect to some ample divisor. We also study the case of the canonical extension sheaf.

- 15 大沢 健夫 (名大多元数理) L^2 cohomology with weights and bundle convexity of certain locally
pseudoconvex domains *
- Takeo Ohsawa (Nagoya Univ.) L^2 cohomology with weights and bundle convexity of certain locally
pseudoconvex domains

概要 Employing a variant of Hörmander’s approach to Andreotti–Grauert’s theory, a comparison theorem is proved between some bundle-valued weighted L^2 cohomology groups of a class of locally pseudoconvex bounded domains in complex manifolds. The bundle convexity of such domains is proved as an application. In particular, it turns out that the complement of a complex curve of self-intersection zero in a compact complex algebraic surface is a domain of meromorphy.

- 16 大沢 健夫 (名大多元数理) On the Levi problem on Kähler manifolds under the negativity of canon-
ical bundles on the boundary *
- Takeo Ohsawa (Nagoya Univ.) On the Levi problem on Kähler manifolds under the negativity of canon-
ical bundles on the boundary

概要 It is proved that a bounded C^2 -smooth pseudoconvex domain Ω in a Kähler manifold M can be mapped onto a locally closed analytic set in \mathbb{C}^N holomorphically and properly with connected fibers if the canonical bundle of M is negative on a neighborhood of $\partial\Omega$. A similar result is obtained for Zariski open domains in compact manifolds.

11:00~12:00 特別講演

細野元気 (東北大理)^Z 最良係数の L^2 拡張定理と L^2 理論的正値性

Genki Hosono (Tohoku Univ.) Optimal L^2 extension theorem and L^2 theoretic positivity

概要 In complex analysis and geometry, L^2 theoretic techniques are important. Among them, Hörmander's L^2 estimates for $\bar{\partial}$ -equations and the Ohsawa–Takegoshi L^2 extension theorem are especially important and widely used. Recent study shows that these theorems may characterize curvature-positivity conditions. Such characterizations can be used to describe positivity conditions for singular Hermitian vector bundles, whose curvature is not well-defined in general. In this talk, I'd like to explain the relationship between L^2 theory and positivity conditions.

函数方程式論

9月14日(火) 第V会場

9:00~12:00

- 1 松原 幸栄 (神戸大理)^Z Cohomology 交叉数の局所化公式について 14
 Saiei-Jaeyeong Matsubara-Heo Localization formulas of cohomology intersection numbers
 (Kobe Univ.)

概要 We revisit two types of localization formula of cohomology intersection numbers: one is Cho-Matsumoto type formula valid for any regular integrable connection. The other is stationary phase formula discovered by S. Mizera whose leading term is given by Grothendieck's residue pairing. The latter formula is of hypergeometric nature.

- 2 大内 忠 (上智大)^Z 非線形常微分方程式系の Borel summable 関数による変換と解の構成 .. 14
 Sunao Ōuchi (Sophia Univ.*) Transformation and construction of solutions of a system of nonlinear ordinary differential equations by Borel summable functions

概要 The following system of nonlinear differential equations is studied

$$x^{1+\gamma} \frac{dY}{dx} = A(x)Y + F(x, Y), \quad Y = {}^t(y_1, y_2, \dots, y_n).$$

There are pioneering researches by Hukuhara, Malmquist and others. The theory of Borel summable functions is developed after their studies. By using this theory, we have another look at their studies. It is the main aim to give more precisely the meaning of asymptotic expansion of transformations and solutions.

- 3 反田 美香 (関西学院大理)^Z Simple pole を持つ超幾何微分方程式の完全 WKB 解析 ~ 超幾何関数と WKB 解の関係 ~ 14
 Mika Tanda (Kwansei Gakuin Univ.) Exact WKB analysis of the hypergeometric differential equation with a simple pole

概要 The Gauss hypergeometric differential equation deformed to a differential equation with a simple pole at the origin is investigated from a view point of the WKB analysis. In this case, the relations between Kummer's solutions in the neighborhood of the singular point 1 and the Borel sums of the WKB solutions are established.

- 4 朴 佳南 (関西学院大理工)^Z $E_6^{(1)}$ 型 q パンルヴェ方程式のラックス形式 14
 Kanam Park (Kwansei Gakuin Univ.) A 3×3 Lax form for q -Painlevé equations of type E_6

概要 In a previous work, we introduced a nonlinear q -difference system that includes the q -Garnier system. This was given as a compatibility condition of a matrix Lax form with the product of N -th order square matrices as coefficients. In this talk, we consider one example of the case of $N = 3$ and derive a new Lax form of the q -Painlevé equation with $E_6^{(1)}$ type affine Weyl group symmetry.

- 5 鬼塚 政一 (岡山理大理)^Z Ulam stability for Cayley quantum equations 14
 Masakazu Onitsuka Ulam stability for Cayley quantum equations
 (Okayama Univ. of Sci.)

概要 The main purpose of this talk is to classify the Ulam stability of the nonautonomous Cayley quantum equation $D_q z(t) = \alpha(t) \langle z(t) \rangle_\beta$, where $\alpha(t)$ is a complex valued time-varying coefficient, and $D_q z(t) := \frac{z(qt) - z(t)}{(q-1)t}$, $q > 1$, and $\langle z(t) \rangle_\beta := \beta z(qt) + (1 - \beta)z(t)$, $0 \leq \beta \leq 1$.

- 6 渡辺宏太郎 (防衛大)^Z Multiple existence of positive even function solutions for a two point
田中敏 (東北大) boundary value problem on some very narrow possible parameter set
塩路直樹 14
Kotaro Watanabe Multiple existence of positive even function solutions for a two point
(Nat. Defense Acad. of Japan) boundary value problem on some very narrow possible parameter set
Satoshi Tanaka (Tohoku Univ.)
Naoki Shioji

概要 Multiple existence of positive even function solutions of

$$\begin{cases} u''(x) + (|x|^l + \lambda) u(x)^p = 0, & u(x) > 0, & x \in (-1, 1), \\ u(\pm 1) = 0, \end{cases}$$

are shown, where parameters l and λ are $l \geq 0$ and $\lambda \geq 0$ and exponent p satisfies $p > 1$. It is shown that for fixed $p > 1$, on the majority part of first quadrant of $(l, \lambda) \subset \mathbb{R}^2$, the uniqueness of a positive even function solution of above equation holds and very narrow set remains as the possible region of multiple existence of even function solutions. It may be unexpected that for some triples (l, λ, p) of such narrow set, even function solutions indeed multiply exist and we show this by numerical verification method.

- 7 藤本皓大^Z Singular solutions of ordinary differential equations with $p(t)$ -Laplacian
(阪府大高等教育推進機構) 14
M. Bartušek (Masaryk Univ.)
Kodai Fujimoto (Osaka Pref. Univ.) Singular solutions of ordinary differential equations with $p(t)$ -Laplacian
Miroslav Bartušek (Masaryk Univ.)

概要 We consider the nonlinear differential equation $(a(t)|x'|^{p(t)-2}x')' = b(t)|x|^{q(t)-2}x$, where $a(t) > 0$, $b(t)$, $p(t) > 1$, and $q(t) > 1$ are smooth functions. Sufficient conditions are given for the existence and the nonexistence of singular solutions of the first (second) kind. In addition, we study the existence of proper solutions.

- 8 石橋和葵 (広島商船高专)^Z Mathieu 修正微分方程式に対する解の振動問題 10
Kazuki Ishibashi Oscillation problem for modified Mathieu differential equation
(Hiroshima Nat. Coll. of Maritime Tech.)

概要 In this talk, we consider the modified Mathieu differential equation

$$x'' + (-\alpha + \beta \cosh(\gamma t))x = 0, \quad t \geq 0,$$

where α , β and γ are real numbers. It is determined by the parameters (α, β, γ) whether all non-trivial solutions of modified Mathieu differential equation are oscillatory (respectively, nonoscillatory). The main result provide parametric conditions for oscillation and nonoscillation. To prove the main result, a simple comparison theorem and Riccati technique are required.

- 9 柴田徹太郎 (広島大先進理工)^Z Global structure of bifurcation curves related to inverse bifurcation
problems 14
Tetsutaro Shibata (Hiroshima Univ.) Global structure of bifurcation curves related to inverse bifurcation
problems

概要 We consider the asymptotic behavior of bifurcation curves of nonlinear ODEs with nonlinear diffusion, which come from the porous media type equation. The bifurcation curve λ is a continuous function of the maximum norm $\alpha = \|u_\lambda\|_\infty$ of the solution u_λ corresponding to λ , and is written as $\lambda = \lambda(\alpha)$. We obtain the asymptotic formulas for $\lambda(\alpha)$ as $\alpha \rightarrow \infty$ and $\alpha \rightarrow 0$.

- 10 梶木屋龍治 (佐賀大理工)^Z Bifurcation of nodal solutions for the Moore–Nehari differential equation
 14
 Ryuji Kajikiya (Saga Univ.) Bifurcation of nodal solutions for the Moore–Nehari differential equation

概要 We study the bifurcation of symmetric nodal solutions for the Moore–Nehari equation. Here we call a solution symmetric if it is even or odd. For a nonnegative integer n , we call a solution n -nodal if it has exactly n zeros in $(-1, 1)$. We denote the unique n -nodal symmetric solution by $u_n(x, \lambda)$. We prove that if n is odd, $u_n(x, \lambda)$ does not bifurcate, however if n is even, it bifurcates at a certain point and a bifurcation branch consists of asymmetric solutions, which have exactly m zeros in each intervals $(-1, 0)$ and $(0, 1)$.

- 11 宮本安人 (東大数理)^Z Stable standing waves of nonlinear Schrödinger equations with potentials and general nonlinearities 10
 Yasuhito Miyamoto (Univ. of Tokyo) Stable standing waves of nonlinear Schrödinger equations with potentials and general nonlinearities
 Norihisa Ikoma (Keio Univ.)

概要 The existence and nonexistence of the minimizer of the L^2 -constraint minimization problem $e(\alpha) := \inf\{E(u) \mid u \in H^1(\mathbf{R}^N), \|u\|_{L^2(\mathbf{R}^N)}^2 = \alpha\}$ are studied. Here, $E(u) := \frac{1}{2} \int_{\mathbf{R}^N} |\nabla u|^2 + V(x)|u|^2 dx - \int_{\mathbf{R}^N} F(|u|) dx$, $V(x) \in C(\mathbf{R}^N)$, $0 \not\equiv V(x) \leq 0$, $V(x) \rightarrow 0$ ($|x| \rightarrow \infty$) and $F(s) = \int_0^s f(t) dt$ is a rather general nonlinearity. We show that there exists $\alpha_0 \geq 0$ such that $e(\alpha)$ is attained for $\alpha > \alpha_0$ and $e(\alpha)$ is not attained for $0 < \alpha < \alpha_0$. We study differences between the cases $V(x) \not\equiv 0$ and $V(x) \equiv 0$, and obtain sufficient conditions for $\alpha_0 = 0$. In particular, if $N = 1, 2$, then $\alpha_0 = 0$, and hence $e(\alpha)$ is attained for all $\alpha > 0$.

- 12 足達慎二 (静岡大工)^Z 局所的優線形なシュレディンガー型方程式の群不変正值解の存在について
 渡辺達也 (京都産大理) 14
 Shinji Adachi (Shizuoka Univ.) G -invariant positive solutions for a class of locally superlinear Schrödinger equations
 Tatsuya Watanabe (Kyoto Sangyo Univ.)

概要 In this talk, we are concerned with a nonlinear Schrödinger equation whose nonlinear term contains a positive parameter λ and has a superlinear growth only locally. Moreover, we are interested in the situation where the potential $V(x)$ is invariant under a finite group action G , which enables us to treat the case that $V(x)$ is a non-trapping type. By considering several auxiliary problems, we are able to obtain the existence of a G -invariant positive solution when the parameter λ is sufficiently large.

14:25~15:30

- 13 森竜樹 (武蔵野大工)^Z Representation formulas for stationary solutions of a cell polarization
 辻川亨 (宮崎大*) model 14
 四ツ谷晶二 (龍谷大*)
 Tatsuki Mori (Musashino Univ.) Representation formulas for stationary solutions of a cell polarization
 Tohru Tsujikawa (Univ. of Miyazaki*) model
 Shoji Yotsutani (Ryukoku Univ.*)

概要 We are interested in the global bifurcation diagrams for a nonlinear boundary value problem with nonlocal constraint that appears in a cell polarization model with mass conservation proposed by Y. Mori, A. Jilkin and L. Edelstein-Keshet (SIAM J. Appl. Math., 2011). We obtained primitive representation formulas of all solutions, and investigated a surface consisting of all bifurcation diagrams with heights. However, we could not find any parameterization of the surface. In this talk, we show parameterizations of the surface and concrete representation formulas of all global bifurcation diagrams of the nonlinear boundary value problem.

- 14 富松 瑛太 (東工大 理)^Z 1次元 integral varifold の Allard 型正則性定理 10
 Eita Tomimatsu (Tokyo Tech) Some Allard type regularity theorem for one-dimensional integral varifolds

概要 In this talk, we consider some Allard type regularity theorem for one-dimensional integral varifolds with locally square integrable mean curvature vector. In 1972, Allard proved class 1 and Hölder regularity of varifolds near points at which the multiplicity is close to one, that is the support of varifolds near those points is class 1 and Hölder sub-manifold. We prove class 1 and Hölder regularity of the one-dimensional integral varifolds near points at which the multiplicity is equal to two by using Kolasiński–Menne’s results in 2017 and Regularity theory of elliptic differential equations.

- 15 吉澤 研介 (東北 大理)^Z 端点と曲線長が固定された平面開曲線に対する弾性エネルギーの臨界点について 14
 Kensuke Yoshizawa (Tohoku Univ.) The critical points of the elastic energy among curves pinned at end-points

概要 In this talk we find critical points of the elastic energy among curves whose length is fixed and whose ends are pinned. Applying the shooting method, we obtain the representation formula of all critical points and determine which curve is the global minimizer. Furthermore, with the help of the representation formula, we also obtain geometric properties of curves, such as inflection points, the number of loops.

- 16 牛越 恵理佳 ^Z 極端なアスペクト比を伴う断面をもつ細い弾性体に関する固有値問題 .. 14
 (横浜国大環境情報・阪大基礎工)
 神保 秀一 (北 大 理)
 吉原 広 将 (横浜国大環境情報)
 Erika Ushikoshi Asymptotic behavior of the eigenfrequencies of a thin elastic rod with
 (Yokohama Nat. Univ./Osaka Univ.) non-uniform cross-section for non-isotropic shrinking
 Shuichi Jimbo (Hokkaido Univ.)
 Hiromasa Yoshihara
 (Yokohama Nat. Univ.)

概要 We consider the eigenvalue problem for the Lamé operator, which describes the oscillation of the isotropic elastic bodies in \mathbb{R}^3 of the infinitesimal displacement. In this paper, the elastic body is supposed to be like a rod with non-uniform cross-section, and we consider two cases that the both ends are clamped and only one end is clamped. In that case, we consider the asymptotic behavior of the eigenvalue, when the cross-section of this rod is not necessarily shrieked isotopically, and clarify the characterization formula for the limit value and the limit function.

- 17 田原 秀敏 (上 智 大*) Uniqueness of the solution of some nonlinear singular partial differential equations *
 Hidetoshi Tahara (Sophia Univ.*) Uniqueness of the solution of some nonlinear singular partial differential equations

概要 We consider a nonlinear Fuchsian type partial differential equation of the second order in the complex domain, and show the uniqueness of the solution under a very weak assumption. The result is applied to the problem of removable singularities of the solution.

- 18 渡辺文彦 (防衛大) 種数 2 の超幾何型積分について *
- 水谷康宏 (防衛大)
Humihiko Watanabe On integrals of hypergeometric type of genus 2
(Nat. Defense Acad. of Japan)
Yasuhiro Mizutani
(Nat. Defense Acad. of Japan)

概要 As an analog of Wirtinger integral, we propose a notion of integrals of hypergeometric type of genus 2. We proved a theorem which says that there exists a linear relation among five of such integrals.

- 19 宇佐美広介 (岐阜大工) Asymptotic forms of solutions of perturbed half-linear ordinary differential equations *
- ソケアルイ (岐阜大工)
Hiroyuki Usami (Gifu Univ.) Asymptotic forms of solutions of perturbed half-linear ordinary differential equations
Sokea Luey (Gifu Univ.)

概要 Asymptotic forms of solutions of a class of perturbed half-linear ordinary differential equations are investigated. Our method is based on the analysis of generalized Riccati equations associated with the half-linear equations under consideration.

- 20 石田あかり (阪大情報) Laplace 方程式の Cauchy 問題に対する反復法の安定性評価に関する深さ依存性 *
- Akari Ishida (Osaka Univ.) A depth-dependent stability estimate in an iterative method for solving a Cauchy problem for the Laplace equation

概要 We consider the Cauchy problem for the Laplace operator. We construct approximate solutions by using the iterative method proposed by Bastay, Kozlov and Turesson. In the iterative method, we solve the corresponding boundary value problems repeatedly. Then, we show that the smaller we choose domain where we consider the boundary value problems, more stably we construct them. We also show that this estimate is optimal. Moreover, the iterative method also works with inexact data. In this case, we have the similar result.

- 21 滝本和広 (広島大先進理工) Exact blowup rate near the boundary of boundary blowup solutions to k -Hessian equation *
- Kazuhiro Takimoto (Hiroshima Univ.) Exact blowup rate near the boundary of boundary blowup solutions to k -Hessian equation

概要 We consider boundary blowup problem for k -Hessian equation of the form $F_k[u] = f(x)g(u)$ in a uniformly $(k-1)$ -convex domain $\Omega \subset \mathbb{R}^n$, where $f(x)$ behaves like $\text{dist}(x, \partial\Omega)^\alpha$ as $\text{dist}(x, \partial\Omega) \rightarrow 0$ and $g(u)$ behaves like u^p as $u \rightarrow \infty$. We obtain the exact principal blowup rate of a boundary blowup solution u near the boundary $\partial\Omega$. Moreover, we obtain the asymptotic behavior of a boundary blowup solution u near the boundary up to the second order, under some hypotheses.

- 22 齋藤三郎 (群馬大*・再生核研) Many problems in differential equations from the viewpoint of division by zero calculus *
- Saburoou Saitoh Many problems in differential equations from the viewpoint of division by zero calculus
(Gunma Univ.* / Inst. of Reproducing Kernels)

概要 We think that in the theory of differential equations, we have many fundamental problems still, and so I expect your contribution to the new Journal on the division by zero calculus.

Modern mathematics is still flawed. It is clear that there are basic defects in function theory, differential equations, geometry, and algebra, and it has been seven years since the discovery. This will be a stain on world history and so, we publish the book: S. Saitoh, Introduction to the Division by Zero Calculus, 2021, Scientific Research Publ., Inc.. and we are founding the basic new international journal of Division by Zero Calculus: <https://romanpub.com/dbzc.php>

15:45~16:45 特別講演岩木 耕平 (東大数理)^Z 完全 WKB 解析とその周辺

Kohei Iwaki (Univ. of Tokyo) Exact WKB analysis and related topics

概要 Exact WKB analysis, developed by Voros et.al., is an effective method for global study of (singularly perturbed) ordinary differential equations defined on a complex domain. After recalling fundamental facts about exact WKB analysis, I'll talk about relationships to other research topics, such as cluster algebras, topological recursion, integrable systems of Painlevé type, etc.

9月15日(水) 第V会場

9:00~12:00

- 23 橋詰 雅斗 (広島大理)^Z 劣臨界 Trudinger–Moser 型汎関数における H^1 臨界点の漸近挙動について 14

Masato Hashizume (Hiroshima Univ.) Asymptotic behavior of critical points for subcritical Trudinger–Moser functional

概要 We investigate asymptotic behavior of positive critical points for the subcritical Trudinger–Moser functional. In particular, we prove that if the exponent in the Trudinger–Moser functional is small, then limit of sequence of maximizers vanishes for all point.

- 24 鈴木 貴 (阪大 MMDS)^Z 非線形楕円型固有値問題の解の爆発 5

Takashi Suzuki (Osaka Univ.) Blowup of solutions to nonlinear elliptic eigenvalue problems

概要 We study a family of blowing-up solutions to the nonlinear elliptic eigenvalue problem on two space dimensions with exponentially dominated nonlinearities. Such a problem has been studied a lot, but most of them are concerned on the perturbed nonlinearity from the extremal case. We present several new arguments and new results for the counter part, which includes the case of the mean field limit of the point vortices with stochastic multi-intensities.

- 25 チャンドラエヴァンウィリアム^Z Variational p -harmonious functions: existence and convergence to p -harmonic functions 14

(阪大基礎工)

石渡 通徳 (阪大基礎工)

R. Magnanini (Univ. of Florence)

和田出秀光 (金沢大理工)

Evan William Chandra (Osaka Univ.)

Michinori Ishiwata (Osaka Univ.)

Rolando Magnanini (Univ. of Florence)

Hidemitsu Wadade (Kanazawa Univ.)

Variational p -harmonious functions: existence and convergence to p -harmonic functions

概要 In this talk, we consider the existence of variationally p -harmonious functions and their relation to p -harmonic functions.

- 26 田中 悠也 (東京理大理)^Z Boundedness and blow-up in a quasilinear parabolic-elliptic chemotaxis system with logistic source and nonlinear production 14

Yuya Tanaka (Tokyo Univ. of Sci.) Boundedness and blow-up in a quasilinear parabolic-elliptic chemotaxis system with logistic source and nonlinear production

概要 This talk deals with the quasilinear parabolic-elliptic chemotaxis system with logistic source and nonlinear production. In a special setting Fuest (NoDEA Nonlinear Differential Equations Appl.; 2021; 28; 16) obtained conditions such that solutions blow up in finite time. The purpose of this talk is to give conditions such that solutions remain bounded and such that solutions blow up in finite time in the case of nonlinear production.

- 27 千代 祐太朗 (東京理大理)^Z Boundedness in an attraction-repulsion chemotaxis system with nonlinear diffusion and singular sensitivity 14
 横田 智巳 (東京理大理)
 Yutaro Chiyo (Tokyo Univ. of Sci.) Boundedness in an attraction-repulsion chemotaxis system with nonlinear diffusion and singular sensitivity
 Tomomi Yokota (Tokyo Univ. of Sci.)

概要 This talk deals with a quasilinear attraction-repulsion chemotaxis system. Here the quasilinear means that the system has nonlinear diffusion and singular sensitivity. Global existence and boundedness in a quasilinear Keller–Segel system without repulsion term were proved by Ding (J. Math. Anal. Appl.; 2018; 461; 1260–1270) and Jia–Yang (J. Math. Anal. Appl.; 2019; 475; 139–153). However, there has been no work on the quasilinear attraction-repulsion chemotaxis system. The purpose of this talk is to establish global existence and boundedness of classical solutions to the system by introducing a new test function.

- 28 武内 太貴 (早大理工)^Z On the Keller–Segel system of parabolic-parabolic type in homogeneous Besov spaces framework 12
 Taiki Takeuchi (Waseda Univ.) On the Keller–Segel system of parabolic-parabolic type in homogeneous Besov spaces framework

概要 We show the existence and uniqueness of local strong solutions of Keller–Segel system of parabolic-parabolic type for arbitrary initial data in the homogeneous Besov space which is scaling invariant. We also construct global strong solutions for small initial data, where the solutions belong to the Lorentz space in time direction. The proof is based on the maximal Lorentz regularity theorem of heat equations.

- 29 内藤 雄基 (広島大先進理工)^Z Blow-up criteria for the classical Keller–Segel system in higher dimensions 10
 Yūki Naito (Hiroshima Univ.) Blow-up criteria for the classical Keller–Segel system in higher dimensions

概要 We study the simplest parabolic-elliptic model of chemotaxis in space dimensions $N \geq 3$, and show the optimal conditions on the initial data for the finite time blow-up and the global existence of solutions in terms of stationary solutions. Our argument is based on the study of the Cauchy problem for the transformed equation involving the averaged mass of the solution.

- 30 細野 竜也 (東北大理)^Z Finite time blow-up of solutions to an attraction-repulsion chemotaxis system in higher dimensions 14
 小川 卓克 (東北大理)
 Tatsuya Hosono (Tohoku Univ.) Finite time blow-up of solutions to an attraction-repulsion chemotaxis system in higher dimensions
 Takayoshi Ogawa (Tohoku Univ.)

概要 We consider the Cauchy problem for an attraction-repulsion chemotaxis system in \mathbb{R}^n with the chemotactic coefficients of the attractant β_1 and the repellent β_2 . In particular, these coefficients are important role for the global existence and blow up of the solutions. In this talk, I will discuss the finite time blow-up of the solution under the condition $\beta_1 > \beta_2$ in higher dimensional spaces.

- 31 藤原 瑠 (明大先端数理)^Z 非局所被食者・捕食者モデルの不連続定常解 14
 Ryu Fujiwara (Meiji Univ.) Discontinuous steady states of the nonlocal prey-predator system

概要 We consider steady states of the nonlocal prey-predator system whose nonlocal term is defined by using a positive valued Lipschitz function as its integral kernel. In this talk, we aim to prove the existence of steady states such that they have one or more discontinuous points, and otherwise continuous. We also construct a concrete example that satisfies the sufficient conditions in which discontinuous steady states exist.

- 32 石井裕太 (茨城工高専)^Z Y 字グラフにおける空間非一様な係数を持つ Gierer–Meinhardt モデルの
1 ピーク解について 14

Yuta Ishii (Ibaraki Nat. Coll. of Tech.) On one-peak stationary solutions for the Gierer–Meinhardt model with heterogeneity on Y -shaped metric graph

概要 In this talk, we consider the existence of one-peak stationary solutions for the Gierer–Meinhardt model with heterogeneity on the Y -shaped compact metric graph. In 1986, Takagi studied the non-heterogeneity case in the one-dimensional interval. We show that the location of a concentration point is determined by the function represented by the heterogeneity function and the associated Green’s function. Moreover, we explain the precise location of a concentration point for non-heterogeneity case, compared with the one-dimensional interval case.

- 33 中村健一 (金沢大理工)^Z Front propagation and blocking of the competition-diffusion system in
森田善久 (龍谷大先端理工) a domain of half-lines with a junction 14
荻原俊子 (城西大理)

Ken-Ichi Nakamura (Kanazawa Univ.) Front propagation and blocking of the competition-diffusion system in
Yoshihisa Morita (Ryukoku Univ.) a domain of half-lines with a junction
Toshiko Ogiwara (Josai Univ.)

概要 We consider the 2-component Lotka–Volterra competition-diffusion system in a domain with a family of half-lines joined at a single junction as a model describing the invasion of the superior species into a new habitat. We first give a condition that the superior species can successfully invade beyond the junction and prevail against the inferior one. We also construct a time-independent sub- and super-solution blocking the propagation if the number of the half-lines initially occupied by the inferior species is large enough.

- 34 中村健一 (金沢大理工)^Z 進行波の速度による Lotka–Volterra 2 種競争拡散系の強競争条件の分類
荻原俊子 (城西大理) 14

Ken-Ichi Nakamura (Kanazawa Univ.) A classification of strong competition conditions by the speed of travel-
Toshiko Ogiwara (Josai Univ.) ing waves for Lotka–Volterra competition-diffusion systems

概要 We study the speed of bistable traveling waves for 2-component Lotka–Volterra competition-diffusion systems under strong competition conditions. We give several sufficient conditions determining the sign of the speed. Furthermore, we find a set of interspecific competition coefficients for which the propagation speed is always positive for any diffusion rates and intrinsic growth rates of the biological species.

- 35 中村謙太 速い拡散型二重非線形方程式に対する nonlinear intrinsic scaling の方法
(熊本大数理学総合教育センター) *

Kenta Nakamura (Kumamoto Univ.) Intrinsic scaling method for fast diffusive type doubly nonlinear equa-
Masashi Misawa (Kumamoto Univ.) tions

概要 In this talk, for a fast diffusive type doubly nonlinear parabolic equation, called p -Sobolev type flows, we introduce a new intrinsic scaling method to transform the prototype doubly nonlinear equation to the p -Sobolev type flows. As an application, we show the global existence and regularity for the p -Sobolev type flows with large data.

- 36 宮本安人 (東大数理) Thresholds on growth of nonlinearities and singularity of initial functions for semilinear heat equations *
- 鈴木将満 (東大数理) Thresholds on growth of nonlinearities and singularity of initial functions for semilinear heat equations
- Yasuhito Miyamoto (Univ. of Tokyo) Thresholds on growth of nonlinearities and singularity of initial functions for semilinear heat equations
- Masamitsu Suzuki (Univ. of Tokyo) Thresholds on growth of nonlinearities and singularity of initial functions for semilinear heat equations

概要 Let $N \geq 1$ and $u_0 \geq 0$. We are concerned with existence and nonexistence of a local in time nonnegative solution in a uniformly local Lebesgue space of a semilinear heat equation

$$\begin{cases} \partial_t u = \Delta u + f(u) & \text{in } \mathbb{R}^N \times (0, T), \\ u(x, 0) = u_0(x) & \text{in } \mathbb{R}^N, \end{cases}$$

where $f \in C[0, \infty)$ is nonnegative and nondecreasing. Our existence theorem gives a sharp integrability condition on u_0 in critical and subcritical cases. In a doubly critical case existence and nonexistence results can be determined by special treatment. When $f(u) = u^{1+2/N}[\log(u+e)]^\beta$, $\beta > -3.146(1+2/N)$, a complete classification of existence and nonexistence of a nonnegative solution is obtained.

- 37 田中智之 (名大多元数理) Unconditional well-posedness for some nonlinear periodic one-dimensional dispersive equations *
- L. Molinet (Univ. de Tours) Unconditional well-posedness for some nonlinear periodic one-dimensional dispersive equations
- Tomoyuki Tanaka (Nagoya Univ.) Unconditional well-posedness for some nonlinear periodic one-dimensional dispersive equations
- Luc Molinet (Univ. de Tours) Unconditional well-posedness for some nonlinear periodic one-dimensional dispersive equations

概要 We consider the Cauchy problem for one-dimensional dispersive equations with a general nonlinearity in the periodic setting. Our main hypotheses are both that the dispersive operator behaves for high frequencies as a Fourier multiplier by $i|\xi|^\alpha \xi$, with $1 \leq \alpha \leq 2$, and that the nonlinear term is of the form $\partial_x f(u)$ where f is the sum of an entire series with infinite radius of convergence. Under these conditions, we prove the unconditional local well-posedness of the Cauchy problem in $H^s(\mathbb{T})$ for $s \geq 1 - \frac{\alpha}{2(\alpha+1)}$. This leads to some global existence results in the energy space $H^{\alpha/2}(\mathbb{T})$, for $\alpha \in [\sqrt{2}, 2]$.

- 38 千頭昇 (名工大) Optimal well-posedness of Hardy–Hénon parabolic equation *
- 池田正弘 (理化学研 AIP・慶大理工) Optimal well-posedness of Hardy–Hénon parabolic equation
- 谷口晃一 (東北大 AIMR) Optimal well-posedness of Hardy–Hénon parabolic equation
- Noboru Chikami (Nagoya Inst. of Tech.) Optimal well-posedness of Hardy–Hénon parabolic equation
- Masahiro Ikeda (RIKEN/Keio Univ.) Optimal well-posedness of Hardy–Hénon parabolic equation
- Koichi Taniguchi (Tohoku Univ.) Optimal well-posedness of Hardy–Hénon parabolic equation

概要 The Cauchy problem for the Hardy–Hénon parabolic equation is studied in the critical and subcritical regime in weighted Lebesgue spaces on the Euclidean space \mathbb{R}^d . Well-posedness for singular initial data and existence of non-radial forward self-similar solution of the problem are previously shown only for the Hardy and Fujita cases ($\gamma \leq 0$) in earlier works. The weighted spaces enable us to treat the potential $|x|^\gamma$ as an increase or decrease of the weight, thereby we can prove well-posedness to the problem for all γ with $-\min\{2, d\} < \gamma$ including the Hénon case ($\gamma > 0$). As a byproduct of the well-posedness, the self-similar solutions to the problem are also constructed for all γ without restrictions. A non-existence result of local solution for supercritical data is also shown. Therefore our critical exponent s_c turns out to be optimal in regards to the solvability.

- 39 中安 淳 (京大理) Homogenization of Hamilton–Jacobi equations on the Sierpinski gasket
 *
- Atsushi Nakayasu (Kyoto Univ.) Homogenization of Hamilton–Jacobi equations on the Sierpinski gasket

概要 Study homogenization problem for Hamilton–Jacobi equations on the Sierpinski gasket. This is a convergence problem of a sequence of viscosity solutions of the Hamilton–Jacobi equations whose Hamiltonian is given by iteration based on the self-similarity of the Sierpinski gasket. We will show the convergence of supersolutions.

- 40 大西 勇 (広島大理) ある jump 項を持つ放物型非線形偏微分方程式の解の長時間経過後の特
 徴づけ *
- Isamu Ohnishi (Hiroshima Univ.) Characterization of a long-term behavior of solutions to nonlinear parabolic PDEs with a jumping effect

概要 I presented existence and some properties of global solutions of a certain nonlinear PDE with a jump term in last March. In this time, I'll continue to make a presentation about a more advanced result, which means that characteristic property of a long time behavior of the nonlinear PDE with the jump term.

- 41 池田 幸太 (明大総合数理) 樟脳粒の数理モデルに対する中心多様体縮約理論 *
- Kota Ikeda (Meiji Univ.) Center manifold theory for a mathematical model of camphor boats

概要 Various collective motions of camphor boats, called jamming, clustering, and swarming state observed in a one-dimensional circuit, have been studied. It is expected that the center manifold theories proposed in previous works are useful for the analysis of the collective motion of camphor boats. However, spatial discontinuity in our model, in particular the existence of Dirac delta functions in a linearized operator, does not fulfill the requirement in the reduction process. Then we have developed a new theory in $(H^1)^*$ -framework. Unfortunately, a reduced equation obtained by our method has no nonlinear terms, and cannot exhibit any collective motions. In this talk, I will develop a new theory in L^2 -framework.

- 42 劉 逸侃 (北大電子研) Uniqueness for the simultaneous determination of multiple coefficients
 in a fractional evolution equation by a single measurement *
- Yikan Liu (Hokkaido Univ.) Uniqueness for the simultaneous determination of multiple coefficients in a fractional evolution equation by a single measurement

概要 In this talk, we investigate the inverse problem on determining multiple coefficients simultaneously in a fractional evolution equation by a single measurement on the boundary. With a suitably chosen Dirichlet boundary condition, we prove the unique determination of at most two space-dependent coefficients (possibly with an extra unknown fractional order). The key ingredient turns out to be the time-analyticity of the decomposed solution, which enables the construction of Dirichlet-to-Neumann maps in the frequency domain and thus the application of inverse spectral results. This is a joint work with Kian Yavar (Aix-Marseille University), Zhiyuan Li (Shandong University of Technology) and Masahiro Yamamoto (The University of Tokyo).

13:00~14:00 特別講演

下條昌彦(都立大理)^Z 単安定な反応項をもつ対数拡散方程式の解の挙動について

Masahiko Shimojo Spreading and extinction of solutions to the logarithmic diffusion equation with a logistic reaction
(Tokyo Metro. Univ.)

概要 Logarithmic diffusion is observed in several fields of sciences, such as the central limit approximation of Carleman's model based on the Boltzman equation, a model for long Van-der-Waals interactions in thin fluid films, and the evolution of conformal metric under the Ricci flow on the plane. This lecture focuses on spreading and extinction phenomena of the solution to the logarithmic diffusion equation on a line, in the presence of a logistic reaction term. A new mathematical framework will be introduced to understand the extinction and interfacial phenomena from the point of entire solutions.

9月16日(木) 第V会場

9:00~12:00

- 43 浜向直(北大理)^Z Asymptotic shape of solutions to the mean curvature flow equation with
三栖邦康(北大理) discontinuous source terms 14
Nao Hamamuki (Hokkaido Univ.) Asymptotic shape of solutions to the mean curvature flow equation with
Kuniyasu Misu (Hokkaido Univ.) discontinuous source terms

概要 We consider the asymptotic shape of solutions to the level-set mean curvature flow equation with a negative driving force and a discontinuous source term. This equation is a model of crystal growth phenomenon called a two-dimensional nucleation. A typical source term in our mind is a characteristic function of a set Ω . It turns out that, if Ω satisfies some weak convexity condition, then the asymptotic shape of the solution is given by the unique solution of the corresponding stationary problem with the Dirichlet boundary condition. We also give a game-theoretic interpretation of the solution as the limit of value functions. Applying this interpretation, we construct a solution with non-trivial growth speed when Ω consists of two disks touching each other.

- 44 可香谷隆(九大IMI)^Z 発散型ノイマン境界条件付き完全非線形放物型方程式の可解性及び漸近
柳青(福岡大理) 挙動について 14
Takashi Kagaya (Kyushu Univ.) Singular Neumann boundary problems for a class of fully nonlinear
Qing Liu (Fukuoka Univ.) parabolic equations

概要 In this talk, we discuss singular Neumann boundary problems for a class of nonlinear parabolic equations in one space dimension. Our boundary problem describes motion of a planar curve sliding along the boundary with a zero contact angle, which can be viewed as a limiting model for the capillary phenomenon. We study the uniqueness and existence of solutions by using the viscosity solution theory. We also show the convergence of the solution to a traveling wave as time proceeds to infinity when the initial value is assumed to be convex.

- 45 勝呂剛志(東北大理)^Z 一般化エントロピーを用いた準線形移流拡散方程式のある解に対する漸
小川卓克(東北大理) 近挙動の同定 14
Takeshi Suguro (Tohoku Univ.) Asymptotic behavior of a solution to the drift-diffusion equation for a
Takayoshi Ogawa (Tohoku Univ.) fast-diffusion case via a generalized entropy

概要 We consider the asymptotic behavior of a solution to the drift-diffusion equation for a fast-diffusion case. By combining the entropy dissipation method with the logarithmic Sobolev and moment inequalities for a generalized entropy, we show that the asymptotic profile for a solution behaves like the Talenti type function.

- 46 佐藤光汰朗 (東北大理)^Z On some quasistatic evolution equation with irreversibility and energy-
赤木剛朗 (東北大理) conservation 14
Kotaro Sato (Tohoku Univ.) On some quasistatic evolution equation with irreversibility and energy-
Goro Akagi (Tohoku Univ.) conservation

概要 This talk is concerned with some quasistatic evolution equation with irreversibility and energy-conservation. Main results consist of well-posedness for the initial-boundary value problem and qualitative properties of solutions such as irreversibility (unidirectionality), static equilibrium condition and energy balance. Proofs rely on the so-called minimizing movement scheme. The main difficulty resides in deriving a priori estimate for the time-derivative of approximate solutions, since the equation is elliptic rather than parabolic, and therefore, standard arguments do not imply estimates for the time-derivative.

- 47 濱本直樹 (阪府大理)^Z ソレノイダル場に対する最良不確定性不等式 12
Naoki Hamamoto (Osaka Pref. Univ.) Sharp uncertainty principle inequality for solenoidal fields

概要 We solve the L^2 version of Maz'ya's open problem (Integral Equations Operator Theory 2018) on the sharp uncertainty principle inequality

$$\int_{\mathbb{R}^N} |\nabla u|^2 dx \int_{\mathbb{R}^N} |u|^2 |x|^2 dx \geq C_N \left(\int_{\mathbb{R}^N} |u|^2 dx \right)^2$$

for solenoidal vector fields $u = u(x)$ on \mathbb{R}^N . The best value of the constant turns out to be $C_N = \frac{1}{4} \left(\sqrt{N^2 - 4(N-3)} + 2 \right)^2$ which exceeds the original value $N^2/4$ for unconstrained fields. Moreover, we show the attainability of C_N and specify the profiles of the extremal solenoidal fields.

- 48 樋口健太 (立命館大理工)^Z Semiclassical resonances for systems near a non-trapping energy for
scalar Schrödinger operators 14
Kenta Higuchi (Ritsumeikan Univ.) Semiclassical resonances for systems near a non-trapping energy for
scalar Schrödinger operators

概要 It is well-known that (scalar) Schrödinger operators do not have resonances near a non-trapping energy of the underlying classical mechanics (shown by Helffer–Sjöstrand (1986) for analytic potentials, Martinez (2002) for smooth potentials). However, we found that systems of Schrödinger operators create resonances near a non-trapping energy when a closed directed cycle is composed by a couple of non-trapping trajectories. We give an example of such resonances for a system appearing in the Born–Oppenheimer approximation of polyatomic molecules, and describe their precise asymptotic distribution in the semiclassical limit in terms of the geometry of such directed cycles.

- 49 松井直己 (東京理大理)^Z Minimal-mass blow-up solutions for nonlinear Schrödinger equations
with potentials 14
Naoki Matsui (Tokyo Univ. of Sci.) Minimal-mass blow-up solutions for nonlinear Schrödinger equations
with potentials

概要 For a nonlinear Schrödinger equation with a L^2 -critical nonlinear term and a small perturbation term, it is known that all subcritical mass solutions are global in time and bounded in H^1 . On the other hand, a critical mass solution of the equation may blow up. In this talk, we consider the existence of critical-mass (i.e. minimal-mass) blow-up solutions of the nonlinear Schrödinger equation with a potential term added as a small perturbation term and their behaviour near the blow-up time.

- 50 長田 祐輝 (都立大理)^Z 3波相互作用のある非線形シュレディンガー方程式系に対する ground state energy の漸近展開 14

Yuki Osada (Tokyo Metro. Univ.) Asymptotic expansion of the ground state energy for nonlinear Schrödinger system with three wave interaction

概要 In this talk, we consider the asymptotic behavior of the ground state and its energy for the nonlinear Schrödinger system with three wave interaction on the parameter γ as $\gamma \rightarrow \infty$. In addition we prove the existence of the positive threshold γ^* such that the ground state is a scalar solution for $0 \leq \gamma < \gamma^*$ and is a vector solution for $\gamma > \gamma^*$.

- 51 浜野 大 (埼玉大理工)^Z 長距離型ポテンシャルをもつ非線形シュレディンガー方程式の散乱解について 10
池田 正弘 (理化学研 AIP・慶大理工)

Masaru Hamano (Saitama Univ.) Scattering solutions of the nonlinear Schrödinger equation with a long range potential
Masahiro Ikeda (RIKEN/Keio Univ.)

概要 In this talk, we deal with the nonlinear Schrödinger equation with a long range potential. We consider the scattering solutions with the radial initial data below the “radial” ground state to the corresponding elliptic equation. Here, the “radial” ground state is a least energy solution among radial solutions to the elliptic equation. In particular, we prove that if the radial initial data below the “radial” ground state has the positive virial functional, then the corresponding solution to the nonlinear Schrödinger equation scatters.

- 52 砂川 秀明 (阪市大理)^Z On the derivative nonlinear Schrödinger equation with weakly dissipative structure 10
Chunhua Li (Yanbian Univ.)

西井 良徳 (阪大理)

佐川 侑司 (埼玉大理工)

Hideaki Sunagawa (Osaka City Univ.) On the derivative nonlinear Schrödinger equation with weakly dissipative structure
Chunhua Li (Yanbian Univ.)

Yoshinori Nishii (Osaka Univ.)

Yuji Sagawa (Saitama Univ.)

概要 We consider the initial value problem for cubic derivative nonlinear Schrödinger equation in one space dimension. Under a suitable weakly dissipative condition on the nonlinearity, we show that the small data solution has a logarithmic time decay in L^2 .

- 53 西井 良徳 (阪大理)^Z Non-decay of the energy for a system of semilinear wave equations ... 10
Yoshinori Nishii (Osaka Univ.) Non-decay of the energy for a system of semilinear wave equations

概要 We consider the global Cauchy problem for a two-component system of cubic semilinear wave equations in two space dimensions. We give a criterion for large time non-decay of the energy for small amplitude solutions in terms of the radiation fields associated with the initial data.

14:25~15:30

- 54 津田谷 公利 (弘前大理工)^Z On Glassey’s conjecture for semilinear wave equations in FLRW spacetime 14
若杉 勇太 (広島大先進理工)

Kimitoshi Tsutaya (Hirosaki Univ.) On Glassey’s conjecture for semilinear wave equations in FLRW spacetime
Yuta Wakasugi (Hiroshima Univ.)

概要 Consider nonlinear wave equations in the spatially flat Friedmann–Lemaître–Robertson–Walker (FLRW) spacetimes. We show blow-up in finite time of solutions and upper bounds of the lifespan of blow-up solutions to give the FLRW spacetime version of Glassey’s conjecture for the time derivative nonlinearity.

- 55 津田谷公利 (弘前大理工)^Z Blow up of solutions of space derivative nonlinear wave equations in
 若杉勇太 (広島大先進理工) FLRW spacetime 14
 Kimitoshi Tsutaya (Hirosaki Univ.) Blow up of solutions of space derivative nonlinear wave equations in
 Yuta Wakasugi (Hiroshima Univ.) FLRW spacetime

概要 Consider nonlinear wave equations in the spatially flat Friedmann–Lemaître–Robertson–Walker (FLRW) spacetimes. We show blow-up in finite time of solutions and upper bounds of the lifespan of blow-up solutions for the space derivative nonlinear term.

- 56 廣澤史彦 (山口大理)^Z 伝播速度が時間に依存する半離散波動方程式のエネルギー評価について
 14
 Fumihiko Hirose (Yamaguchi Univ.) On the energy estimates of semi-discrete wave equations with time dependent propagation speed

概要 Discretization is a fundamental step in numerical analysis for the problems described by differential equations, and the difference between the continuous model and discrete model is one of the most important problems. In this talk, we consider the difference in the effect of the time-dependent propagation speed on the energy estimate of the solutions for the wave equation and the semi-discrete wave equation which is a discretization with respect to space variables.

- 57 高瀬裕志 (東大数理)^Z Inverse problems for first-order hyperbolic equations 14
 Hiroshi Takase (Univ. of Tokyo) Inverse problems for first-order hyperbolic equations

概要 We consider inverse source and coefficient problems for a first-order hyperbolic equation with a time-dependent principal part. Under the assumption that the coefficients of the equation generate the vector field which has maximal integral curves with finite lengths, we prove global Lipschitz stability for the inverse problems through a global Carleman estimate.

- 58 村井宗二郎 (産業技術高専) 外部領域における磁場付き Schrödinger 方程式の Strichartz 評価とその
 応用 *
 Sojiro Murai Strichartz estimates for magnetic Schrödinger equation in exterior do-
 (Tokyo Metropolitan Coll. of Indus. Tech.) main and its application

概要 Our purpose of this talk is to derive Strichartz estimates for solutions of magnetic Schrödinger equations in exterior to the star-shaped obstacle. For its proof we need the smoothing estimates for solutions of perturbed equations and the Strichartz estimates for solutions of free equations. Moreover as an application of them, we shall investigate the scattering theory for these equations with a power type nonlinearity.

- 59 古屋貴士 (北大理) 半線形シュレディンガー方程式に対する散乱問題とその逆問題について
 *
 Takashi Furuya (Hokkaido Univ.) The direct and inverse scattering problem for the semilinear Schrödinger
 equation

概要 We study the direct and inverse scattering problem for the semilinear Schrödinger equation $\Delta u + a(x, u) + k^2 u = 0$ in \mathbb{R}^d . We show well-posedness in the direct problem for small solutions based on the Banach fixed point theorem, and the solution has the certain asymptotic behavior at infinity. We also show the inverse problem that the semilinear function $a(x, z)$ is uniquely determined from the scattering amplitude.

- 60 中村 玄 (北 大 理) 非線形双曲型方程式の初期値境界値逆問題 *
- M. Vashisth
(Indian Inst. of Tech., Jammu)
- 渡 邊 道 之 (岡 山 理 大 理)
Gen Nakamura (Hokkaido Univ.) Inverse initial boundary value problem for a non-linear hyperbolic partial differential equation
- Manmohan Vashisth
(Indian Inst. of Tech., Jammu)
- Michiyuki Watanabe
(Okayama Univ. of Sci.)

概要 We are concerned with an inverse initial boundary value problem for a non-linear wave equation in space dimension greater than 1. This equation is the perturbation of the usual linear wave equation with a time dependent potential by a space-time divergence of a vector whose components are quadratic with respect to the space-time gradient of the displacement. By many boundary measurements at the boundary of the spatial domain over finite time interval and the final overdetermination, we can uniquely determine the potential and the coefficients of these quadratics.

- 61 中村 玄 (北 大 理) 粘弾性方程式に対する Holmgren–John の一意接続定理 *
- Gen Nakamura (Hokkaido Univ.) Holmgren–John unique continuation theorem for viscoelastic equations

概要 We gave a result on the Holmgren–John type global unique continuation result for a general viscoelastic equation with a memory term.

15:45～16:45 特別講演

- 岡本 葵 (阪 大 理)^Z 空間 3 次元における非線形 Klein–Gordon 方程式のほとんど確実な大域的適切性
- Mamoru Okamoto (Osaka Univ.) Almost sure global well-posedness for a nonlinear Klein–Gordon equation in three dimensions

概要 In this talk, we consider the Cauchy problem for a quadratic nonlinear Klein–Gordon equation on the three-dimensional torus. We prove that the Cauchy problem is almost surely globally well-posed for initial data in the support of the Gibbs measure. Since the Wiener measure is supported on negative Sobolev spaces in three dimensions, the cubic nonlinearity in the potential energy is not well-defined in the deterministic sense. By renormalizing the potential part of the energy, we construct the renormalized Gibbs measure. We then consider the renormalized quadratic nonlinear Klein–Gordon equation, which is corresponding to the renormalized energy. We use a paracontrolled operator to obtain the well-posedness of the Cauchy problem for the renormalized equation as in the paper by Gubinelli–Koch–Oh. Once the local well-posedness is achieved, by applying Bourgain’s invariant measure argument, we obtain the almost sure global well-posedness. This talk is based on a joint work with Tadahiro Oh (Univ. Edinburgh) and Leonardo Tolomeo (Univ. Bonn).

9月17日(金) 第V会場

9:00~12:00

- 62 加藤正和(室蘭工大工)^Z 初期値の減衰が遅い場合のポテンシャル項付き非線形波動方程式の解の
久保英夫(北大理) 時間大域存在と爆発 12
Masakazu Kato Existence of a global solution to a nonlinear wave equation with non-
(Muroran Inst. of Tech.) negative potential and slowly decreasing initial data
Hideo Kubo (Hokkaido Univ.)

概要 We study the existence of a global radially symmetric solution to a semi-linear damped wave equation with non-negative potential in three space dimensions and non-compactly supported initial data. The first aim of this talk is finding the critical exponent for the semi-linear equations with small initial data. The second aim of this talk is to look for the upper and lower bounds for the life span of the blow-up solutions.

- 63 北村駿介(北大理)^Z 空間変数による重み付き1次元半線形波動方程式の古典解のライフスパン
森澤功暁(北大理) ン評価 14
高村博之(北大理)
Shunsuke Kitamura (Tohoku Univ.) The lifespan of classical solutions of semilinear wave equations with
Katsuaki Morisawa (Tohoku Univ.) spatial weights and compactly supported data in one space dimension
Hiroyuki Takamura (Tohoku Univ.)

概要 In this talk, we consider initial value problems for semilinear wave equations with spatial weights in one space dimension. The lifespan estimates of classical solutions for compactly supported data are established in all the cases of polynomial weights. The results are classified into two cases according to the total integral of the initial speed.

- 64 津田谷公利(弘前大理工)^Z Blow up of solutions of semilinear wave equations in de Sitter spacetime
若杉勇太(広島大先進理工) 14
Kimitoshi Tsutaya (Hiroshima Univ.) Blow up of solutions of semilinear wave equations in de Sitter spacetime
Yuta Wakasugi (Hiroshima Univ.)

概要 We study the Cauchy problem of the semilinear wave equation in de Sitter spacetime. We prove the blow-up of classical solution as well as an estimate of lifespan for small initial data.

- 65 若杉勇太(広島大先進理工)^Z 吸収型非線形項と空間変数に依存する摩擦項をもつ波動方程式の解のエ
ネルギー減衰について 14
Yuta Wakasugi (Hiroshima Univ.) Energy decay of solutions to the wave equation with space-dependent
damping and absorbing nonlinearity

概要 We study the initial-boundary value problem of the wave equation with space-dependent damping and absorbing nonlinearity. The aim is to prove the decay property of the energy and weighted L^2 norm of solutions. In particular, we treat slowly decaying initial data and study the relationship between the decay rate of solutions and the condition of the data.

- 66 石垣祐輔(東工大理)^Z On L^1 estimates of solutions of compressible viscoelastic system 14
Yusuke Ishigaki (Tokyo Tech) On L^1 estimates of solutions of compressible viscoelastic system

概要 We consider the large time behavior of solutions of compressible viscoelastic system around a motionless state in a three-dimensional whole space. We show that if the initial perturbation belongs to $W^{2,1}$, and is sufficiently small in $H^4 \cap L^1$, the solutions grow in time at the same rate as $t^{\frac{1}{2}}$ in L^1 due to diffusion wave phenomena of the system caused by interaction between sound wave, viscous diffusion and elastic wave.

- 67 大石健太 (早大基幹理工)^Z 粘性非圧縮磁気流体に対する自由境界問題の時間局所適切性 12
柴田良弘 (早大理工)
Kenta Oishi (Waseda Univ.) Local well-posedness for free boundary problem of viscous incompressible magnetohydrodynamics
Yoshihiro Shibata (Waseda Univ.)

概要 Consider the motion of incompressible magnetohydrodynamics (MHD) with resistivity in a domain bounded by a free surface. An electromagnetic field generated by some currents in an external domain keeps an MHD flow in the domain. On the free surface, free boundary conditions for MHD flow and transmission conditions for electromagnetic fields are imposed. In this talk, we establish the local well-posedness in the general setting of domains. To prove this, we make full use of the maximal L_p - L_q regularity theorem for the Stokes equations with free boundary conditions and for the magnetic field equations with transmission conditions.

- 68 杉崎聡平 (東工大情報理工)^Z 流体の方程式の球対称な定常解の漸近安定性について 14
西畑伸也 (東工大情報理工)
橋本伊都子 (金沢大理工)
Souhei Sugizaki (Tokyo Tech) Asymptotic stability of radially symmetric stationary solutions for the
Shinya Nishibata (Tokyo Tech) compressible Navier–Stokes equations
Itsuko Hashimoto (Kanazawa Univ.)

概要 We study the decay rates of the stationary solution for the compressible Navier–Stokes equations. Precisely, we obtain the decay rates on its first and second derivative. In addition, we show the asymptotic stability of the time dependent solution of the compressible Navier–Stokes equations.

- 69 大山広樹 (九大数理)^Z Asymptotic limit of fast rotation for the incompressible Navier–Stokes
高田了 (九大数理) equations in a 3D layer 14
Hiroki Ohyama (Kyushu Univ.) Asymptotic limit of fast rotation for the incompressible Navier–Stokes
Ryo Takada (Kyushu Univ.) equations in a 3D layer

概要 In this talk, we consider the initial value problem for the Navier–Stokes equation with the Coriolis force in a three-dimensional infinite layer. We prove the unique existence of global solutions for initial data in the scaling invariant space when the speed of rotation is sufficiently high. Furthermore, we consider the fast rotation limits, and show that the global solution converges to that of 2D incompressible Navier–Stokes equations in some global in time space-time norms.

- 70 金丸諒 (フォトン算数クラブ)^Z Logarithmically improved extension criteria involving the pressure for
山本立規 (早大理工) the Navier–Stokes equations in \mathbb{R}^3 14
Ryo Kanamaru (Photon Sansu Club) Logarithmically improved extension criteria involving the pressure for
Tatsuki Yamamoto (Waseda Univ.) the Navier–Stokes equations in \mathbb{R}^3

概要 This talk is concerned with the extension criterion involving the pressure for the Navier–Stokes equations in \mathbb{R}^3 . We prove that if a strong solution u on $[0, T)$ and the pressure π associated with u satisfy the condition

$$\int_0^T \frac{\|\pi(\tau)\|_{\dot{B}_{\infty, \infty}^{-3/p}}^r}{\log(e + \|u(\tau)\|_{H^s})} d\tau < \infty \quad \text{for } \frac{2}{r} + \frac{3}{p} = 2 \text{ with } 3 \leq p \leq \infty,$$

then there is $T' > T$ such that u can be continued to the solution on $[0, T')$. Our method is based on the interpolation inequality due to Gérard–Meyer–Oru (1997) and the trilinear estimate due to Guo–Kučera–Skalák (2018).

- 71 少林文孝 (早大理工)^Z Removability of time-dependent singularities of the Navier–Stokes equations 14
小藺英雄 (早大理工)
牛越恵理佳
 (横浜国大環境情報・阪大基礎工)
Fumitaka Wakabayashi (Waseda Univ.) Removability of time-dependent singularities of the Navier–Stokes equations
Hideo Kozono (Waseda Univ.)
Erika Ushikoshi
 (Yokohama Nat. Univ./Osaka Univ.)

概要 Let Ω be a bounded domain in $\mathbb{R}^N (N \geq 3)$ and $\xi \in C^\alpha([0, T]; \Omega)$ for $1/N < \alpha \leq 1$. Suppose that u is a smooth solution of the Navier–Stokes equations in $\bigcup_{0 < t < T} (\Omega \setminus \{\xi(t)\}) \times \{t\}$, namely, $\{\xi(t)\} \times \{t\}$ is supposed to be moving singularities in $\Omega \times [0, T]$. We give the condition for the removability of the time-dependent singularities of u at $\{\xi(t)\} \times \{t\}$.

- 72 津田和幸 (九州産大理工)^Z The Fujita–Kato approach for the Navier–Stokes equations with moving boundary and its application 14
R. Farwig
 (ダルムシュタット工科大)
Kazuyuki Tsuda The Fujita–Kato approach for the Navier–Stokes equations with moving boundary and its application
 (Kyushu Sangyo Univ.)
Reinhard Farwig (TU Darmstadt)

概要 The initial value problem of the Navier–Stokes system on a non-cylindrical space-time domain is considered. The aim of the paper is to prove existence and uniqueness of locally-in-time strong solutions for large initial values and to extend them to global ones for small initial data in L^q spaces. The proof uses the Fujita–Kato approach based on decay estimates of evolution operators defined by modified Stokes operators with a uniformly bounded H^∞ -calculus and works in time weighted Hölder spaces. Furthermore, the result is applied to show regularity of time periodic solutions obtained by Farwig, Kozono, Tsuda and Wegmann (2020).

- 73 岩瀨司 (東北大理)^Z Ill-posedness for two dimensional compressible Navier–Stokes equations with scaling critical regularity 14
小川卓克 (東北大理)
Tsukasa Iwabuchi (Tohoku Univ.) Ill-posedness for two dimensional compressible Navier–Stokes equations with scaling critical regularity
Takayoshi Ogawa (Tohoku Univ.)

概要 We study the ill-posedness issue for the compressible viscous heat-conductive flows in two dimensions. In the scaling invariant spaces, the discontinuity of solutions on initial data is obtained in almost all Besov spaces and a similar result also holds in Sobolev spaces.

14:25~15:30

- 74 中里亮介 (東北大理)^Z 臨界 Fourier–Besov 空間に於ける Hall 効果を伴う非圧縮性磁気粘性流体方程式系の時間大域適切性 14
Ryosuke Nakasato (Tohoku Univ.) Global well-posedness for the Hall-magnetohydrodynamic system in critical Fourier–Besov spaces

概要 We investigate the initial value problem for the incompressible magnetohydrodynamic system with the Hall-effect in the whole space. In this talk, we focus on a solution as a perturbation from a non-zero constant equilibrium state. The aim of this talk is to establish the existence of the global-in-time solution in the critical Fourier–Besov spaces. In order to prove our results, we establish the various type product estimates in the space-time mixed space and smoothing estimates for the solution of the linear equation, which has the non-symmetric diffusion derived from the Hall-term.

- 75 三浦達彦(京大理)^Z Linear stability and enhanced dissipation for the two-jet Kolmogorov type flow on the unit sphere 14
 Tatsu-Hiko Miura (Kyoto Univ.) Linear stability and enhanced dissipation for the two-jet Kolmogorov type flow on the unit sphere

概要 The two-jet Kolmogorov type flow is a stationary solution to the vorticity form of the Navier–Stokes equations on the 2D unit sphere given by the zonal spherical harmonic function of degree two. In this talk we consider the linearized equation round the two-jet Kolmogorov type flow. We prove the exponential decay of a solution to the linearized equation towards an equilibrium which grows as the viscosity coefficient decreases. Moreover, we show that the perturbation operator in the linearized equation does not have eigenvalues except for zero by making use of the mixing structure of the perturbation operator which is expressed by a recurrence relation for the spherical harmonics. Using this result, we get the enhanced dissipation without rate for a solution to the linearized equation in the sense that the solution rescaled in time decays arbitrarily fast as the viscosity coefficient tends to zero.

- 76 三浦達彦(京大理)^Z Rate of the enhanced dissipation for the two-jet Kolmogorov type flow
 前川泰則(京大理) on the unit sphere 14
 Tatsu-Hiko Miura (Kyoto Univ.) Rate of the enhanced dissipation for the two-jet Kolmogorov type flow
 Yasunori Maekawa (Kyoto Univ.) on the unit sphere

概要 As in the previous talk, we consider the linearized equation around the two-jet Kolmogorov type flow for the vorticity equation on the 2D unit sphere. Our aim is to determine the rate of the enhanced dissipation for the two-jet Kolmogorov type flow. We derive the resolvent estimate along the imaginary axis of the linearized operator based on the abstract theory developed by Ibrahim–Maekawa–Masmoudi (2019). Combining this result with the Gearhart–Prüss type theorem given by Wei (2021), we show that a solution to the linearized equation decays at the rate $O(e^{-\sqrt{\nu}t})$ when the viscosity coefficient ν is sufficiently small as in the case of the plane Kolmogorov flow.

- 77 顧仲陽(東大数理)^Z 境界が曲がっている領域における有界平均振動ベクトル場のヘルムホルツ
 儀我美一(東大数理) ツ分解 10
 Zhongyang Gu (Univ. of Tokyo) On the Helmholtz decomposition of a space of vector fields with bounded
 Yoshikazu Giga (Univ. of Tokyo) mean oscillation in a curved domain

概要 We establish the Helmholtz decomposition for a space of vector fields with bounded mean oscillation in perturbed half spaces and bounded domains of a Euclidean space. There are several possible definitions for a space of bounded mean oscillation in a domain. In our research, we introduce a new space where the tangential and the normal components to the boundary are handled separately.

- 78 吉田夏海(山梨大教育) Asymptotics toward the rarefaction waves to the Cauchy problem for
 the scalar non-viscous diffusive dispersive conservation laws *
 Natsumi Yoshida (Univ. of Yamanashi) Asymptotics toward the rarefaction waves to the Cauchy problem for
 the scalar non-viscous diffusive dispersive conservation laws

概要 We study the large time asymptotics of solutions to the Cauchy problem for the scalar non-viscous diffusive dispersive conservation laws where the far field states are prescribed. Especially, we deal with the case when the flux function is fully convex with a growth condition. 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.

- 79 吉田夏海 (山梨大教育) Global asymptotic stability of a multiwave pattern for the generalized Korteweg–de Vries–Burgers–Kuramoto equation *
- Natsumi Yoshida (Univ. of Yamanashi) Global asymptotic stability of a multiwave pattern for the generalized Korteweg–de Vries–Burgers–Kuramoto equation

概要 We study the asymptotic decay of solutions toward a multiwave pattern (rarefaction wave and diffusive dispersive contact wave) of the Cauchy problem for the the generalized Korteweg–de Vries–Burgers–Kuramoto equation where the far field states are prescribed. Especially, we deal with the case when the flux function is convex or concave but linearly degenerate on some interval. Then the Cauchy problem has a unique global in time solution which tends toward a multiwave pattern (rarefaction wave and diffusive dispersive contact wave) as time goes to infinity. The proof is given by a technical energy method and the careful estimates for the interactions between the nonlinear waves.

- 80 大縄将史 (東京海洋海洋環境) 拡大管内の衝撃波の漸近安定性 *
- 鈴木政尋 (名工大工) Asymptotic stability of shock waves in expanding nozzles
- Masashi Ohnawa (Tokyo Univ. of Marine Sci. and Tech.)
- Masahiro Suzuki (Nagoya Inst. of Tech.)

概要 We consider stationary shock waves appearing in nozzle flows modeled by one-dimensional compressible Euler equation of barotropic type. The shock wave connects an upstream supersonic state to a downstream subsonic state discontinuously. If the discontinuity is located in an expanding part of the nozzle, we claim the asymptotic stability of the stationary shock wave whatever large the strength of the shock or the gradient of the section of the nozzle may be.

- 81 柴田良弘 (早大理工) 松村–西田理論の L_p - L_q 枠での拡張 *
- Yoshihiro Shibata (Waseda Univ.) Matsumura–Nishida theory in the L_p - L_q framework

概要 In this talk, I will present the global well-posedness for the Navier–Stokes–Fourier equations describing the motion of compressible viscous fluid flow in the isothermal situation in a three dimensional exterior domain with non-slip boundary condition. This problem was solved by a celebrated work due to Matsumura and Nishida, Commun. Math. Phys. 89 (1983), 445–464. They used energy method, and so to estimate the L_∞ norm of first derivatives of the velocity field and the mass density they need their third derivatives. In this talk, I report that the L_2 of third derivatives is replaced by L_6 norm of second derivatives yields the global wellposedness in the minimal assumption of the derivatives. The proof is based on the L_p - L_q maximal regularity and the decay estimate of Stokes semigroup.

- 82 柴田良弘 (早大理工) 周期的に動く領域での Navier–Stokes 方程式 *
- Yoshihiro Shibata (Waseda Univ.) On the Navier–Stokes equations in a periodically moving exterior domain

概要 I present a unique existence theorem of periodic solutions in a periodically moving three dimensional exterior domain for the Navier–Stokes equations with non-slip boundary conditions. The key issue is to prove the maximal regularity for periodic solutions of Stokes equations by using the operator valued transference theorem for the R-bounded solution operators of the resolvent problem for the Stokes equations in an 3 dimensional exterior domain. This is one of a series of joint works with Thomas Eicher and Mads Kyed concerning the periodic solutions appearing in Math. Fluid Mechanics.

- 83 古川 賢 (理化学研) Dirichlet 境界条件の下でのプリミティブ方程式における静水圧近似の数学的正当化 *
- 儀我美一 (東大数理)
- 柏原崇人 (東大数理)
- Ken Furukawa (RIKEN) Mathematical justification of the hydrostatic approximation in the primitive equations under the Dirichlet boundary conditions
- Yoshikazu Giga (Univ. of Tokyo)
- Takahito Kashiwabara (Univ. of Tokyo)

概要 The primitive equations are derived from a scaled Navier–Stokes system via a formal limit procedure. In this talk, we justify this procedure mathematically under the Dirichlet boundary conditions. Although there are some results on the derivation under the slip boundary conditions, there were no results under the Dirichlet boundary conditions. In the proof of our main, we also obtained large data global well-posedness for the scaled Navier–Stokes equations under an assumption of a small aspect ratio for the domain.

15:45～16:45 特別講演

鈴木政尋 (名工大)^Z プラズマ境界層の数学解析

Masahiro Suzuki (Nagoya Inst. of Tech.) Mathematical analysis of plasma boundary layers

概要 In this talk, we discuss mathematically the formation of a plasma sheath near the surface of materials immersed in a plasma, and study qualitative information of such a plasma sheath layer. Analyzing the Euler–Poisson equations, Bohm derived the Bohm criterion which is required for the formation. The sheath corresponds to a stationary solution of the Euler–Poisson equations. To validate rigorously the Bohm criterion, we show the existence and stability of stationary solutions in several domains under the criterion. Plasma physics tells us that the thickness of sheath is the same order of the Debye length which is a small number. To investigate the thickness, we also consider the quasi-neutral limit as letting the Debye length in the Euler–Poisson equations be zero. Throughout these discussions, we make it clear how the Bohm criterion and the thickness depend on the shape of domains.

実函数論

9月16日(木) 第IV会場

10:45~12:00

- 1 青山 耕治 (千葉大 社会)^Z Meir-Keeler 型写像の特徴付け 15
 Koji Aoyama (Chiba Univ.) Characterizations of a Meir-Keeler type mapping

概要 The aim of this talk is to provide characterizations of a Meir-Keeler type mapping in a metric space endowed with a transitive relation.

- 2 松下 慎也 ^Z 主双対分割法の改良について 15
 (秋田県立大システム科学技術)

Shin-ya Matsushita (Akita Pref. Univ.) On modified primal-dual splitting algorithms

概要 The primal-dual splitting algorithms are existing algorithms that do solve convex optimization problems, and the generated sequences weak convergence to a solution. In this talk, we introduce and investigate modified primal-dual splitting algorithms.

- 3 福田 亮治 (大分大 理工)^Z k -加法的測度の強零集合に関する考察 15

本田 あおい (九工大 情報工)

岡崎 悦明 (フアジシステム研)

Ryoji Fukuda (Oita Univ.) On strong zero-set with respect to a k -additive measure

Aoi Honda (Kyushu Inst. of Tech.)

Yoshiaki Okazaki

(Fuzzy Logic Systems Inst.)

概要 For a non-additive set function μ , constructive k -additivity is defined as a set function which can be expressed using a σ -additive signed measure on a set space (a family of all finite sub-sets with their cardinality not more than k). We define a sub-additive non-negative measure $\bar{\mu}$ for a constructively k -additive measure. This sub-additive measure $\bar{\mu}$ satisfies that a measurable set A is a strongly μ -null set if and only if it is a weakly $\bar{\mu}$ -null set.

- 4 米田 慧司 (九大 数理)^Z Higher-order interpolation inequalities with weights for radial functions
 高田 了 (九大 数理) 15

Keiji Yoneda (Kyushu Univ.) Higher-order interpolation inequalities with weights for radial functions

Ryo Takada (Kyushu Univ.)

概要 We consider higher-order interpolation inequalities of the Gagliardo-Nirenberg type with power weights for radial functions. We show that those inequalities hold for a better range of admissible power weights if we restrict ourselves to the space of radially symmetric functions. The key of the proof is to reduce the problem to a radial improvement for the weighted Hardy-Littlewood-Sobolev inequalities.

14:25~15:00

- 5 山口 哲志 (茨城大 理工)^Z An extension of the VMO- H^1 duality and the Riesz transforms 15
 Satoshi Yamaguchi (Ibaraki Univ.) An extension of the VMO- H^1 duality and the Riesz transforms

概要 In 1977, Coifman and Weiss gave a proof of the VMO- H^1 duality. We consider generalized Campanato spaces and atomic Hardy spaces with variable growth condition and give an extension of the duality to these spaces. We also apply this duality to the Riesz transforms.

- 6 川澄亮太^z Weighted boundedness of the Hardy–Littlewood maximal operator on
 中井英一 (茨城大理) Orlicz–Morrey and weak Orlicz–Morrey spaces 15
 Ryota Kawasumi Weighted boundedness of the Hardy–Littlewood maximal operator on
 Eiichi Nakai (Ibaraki Univ.) Orlicz–Morrey and weak Orlicz–Morrey spaces

概要 For the Hardy–Littlewood maximal operator M , the weighted boundedness on the Lebesgue and weak Lebesgue spaces are well known. We extend these boundedness to the Orlicz–Morrey and weak Orlicz–Morrey spaces. The weighted Orlicz–Morrey space and its weak version contain weighted Orlicz, Morrey and Lebesgue spaces and their weak versions as special cases. Then we also get the boundedness for these function spaces as corollaries. For example, we get the boundedness of M from the weak $\exp L^p(\mathbb{R}^n, w)$ to itself, if w is in the Muckenhoupt class A_∞ .

- 7 雨谷康平 対称マルコフ半群に基づく一般化分数べき積分作用素 *
- 中井英一 (茨城大理)
 貞末岳 (大阪教育大数学教育)
 Kohei Amagai Generalized fractional integral operators based on symmetric Markovian
 Eiichi Nakai (Ibaraki Univ.) semigroups
 Gaku Sadasue (Osaka Kyoiku Univ.)

概要 It is known that the fractional integral operator \mathcal{I}_α based on a symmetric Markovian semigroup with Varopoulos dimension d is bounded from L^p to L^q , if $0 < \alpha < d$, $1 < p < q < \infty$ and $-d/p + \alpha = -d/q$, like the usual fractional integral operator defined on the d dimensional Euclidean space. We introduce generalized fractional integral operators based on symmetric Markovian semigroups and extend the L^p – L^q boundedness to Orlicz spaces.

- 8 厚芝幸子 (東京女大現代教養) Attractive points and convergence theorems for generic 2-generalized
 hybrid mappings *
- Sachiko Atsushiba Attractive points and convergence theorems for generic 2-generalized
 (Tokyo Woman’s Christian Univ.) hybrid mappings

概要 In this talk, we deal with approximation of attractive points of generic 2-generalized hybrid mappings. We also prove some weak and strong convergence theorems for the mappings.

- 9 眞中裕子 (日大短大) The projection methods with Bregman distance in Banach spaces *
- Hiroko Manaka (Nihon Univ.) The projection methods with Bregman distance in Banach spaces

概要 Bregman proposed a generalization for the cyclic metric projection method of computing points in the intersection of linear closed subspaces of a Hilbert space, invented by von Neumann. Alber and Butnariu achieve distinction of the study of this Bregman projection method for finding the solution of the consistent convex feasibility problem of computing a common point of the closed convex subspaces in a reflexive Banach space. We will talk about the results of the split feasibility problem with these projection methods in uniformly convex and smooth Banach spaces, which are, strongly convergence theorems using the hybrid methods with these projection methods in mathematical programming in order to find a solution of the split feasibility problem in these Banach spaces.

15:15~16:15 特別講演

中村 昌平 (阪大 理)^Z X線トモグラフィー原理を用いたフーリエ拡張作用素の解析

Shohei Nakamura (Osaka Univ.) A study of the Fourier extension operator via X-ray tomography principle

概要 In this talk, we investigate how large mass can Fourier transform of the function supported on the sphere in \mathbb{R}^n have on affine subspaces. In particular, we establish bounds on quantities of the form $X(|\widehat{gd\sigma}|^2)$, where $g \in L^p(\mathbb{S}^{n-1})$, $d\sigma$ is Lebesgue measure on \mathbb{S}^{n-1} , and X denotes the X-ray transform. As an application, we establish some natural variants of conjectures of Stein and Mizohata–Takeuchi from the 1970s. This talk is based on joint works with Professor Jonathan Bennett in University of Birmingham.

9月17日(金) 第IV会場

9:45~12:00

- 10 久保田 翔大 (千葉大融合理工)^Z 非斉次緩和型全変動汎関数に対する空間1次元における劣微分作用素の分解定理 15

Shodai Kubota (Chiba Univ.) Decomposition Theorem of the subdifferential of 1D-regularized total variation with nonhomogeneous coefficients

概要 We consider a convex function defined as a 1D-regularized total variation with nonhomogeneous coefficients. This convex function is based on KWC energy, proposed by [Kobayashi et al.; Phys. D, 140 (2000), 141–150], to describe the grain boundary motion. In this talk, we prove that the subdifferential of the total variation is decomposed to a weighted singular diffusion and a linear nonhomogeneous diffusion. This result is to enhance the previous regularity result, proposed by [Rybka et al.; Math. Methods appl. Sci, 36(17): 2359–2370, 2013] for quasilinear equation with singularity.

- 11 内藤 大暉 (京都教育大)^Z 片側障害物問題の長時間挙動について 15
深尾 武史 (京都教育大)

Hiroaki Naito (Kyoto Univ. of Edu.) Long time behavior of single obstacle problems
Takeshi Fukao (Kyoto Univ. of Edu.)

概要 In this talk, we consider the long time behavior of single obstacle problems. Single obstacle problems for second- and fourth-order parabolic equations in the bounded domain are considered. Note that in the fourth-order case, there is no “conservation of positivity” where the solution is positive if the initial value is positive. In this study, the long time behavior of the solution is discussed in the framework of the abstract equation governed by the subdifferential operator.

- 12 千代 祐太郎 (東京理大理)^Z Global existence and boundedness in an attraction-repulsion chemotaxis system with signal-dependent sensitivities without logistic source 15
水上 雅昭 (京都教育大)
横田 智巳 (東京理大理)

Yutaro Chiyo (Tokyo Univ. of Sci.) Global existence and boundedness in an attraction-repulsion chemotaxis system with signal-dependent sensitivities without logistic source

Masaaki Mizukami (Kyoto Univ. of Edu.)
Tomomi Yokota (Tokyo Univ. of Sci.)

概要 This talk deals with a fully parabolic attraction-repulsion chemotaxis system with signal-dependent sensitivities. Global existence and boundedness of classical solutions to the system with logistic source have already been obtained by taking advantage of the effect of logistic dampening in our previous work (J. Math. Anal. Appl.; 2020;489;124153). The purpose of this talk is to show existence of global bounded classical solutions despite the loss of logistic dampening.

- 13 来間 俊介 (東京理大理)^Z A singular nonlocal phase field system with inertial term 15
Shunsuke Kurima (Tokyo Univ. of Sci.) A singular nonlocal phase field system with inertial term

概要 In this talk we consider a singular nonlocal phase field system with inertial term. The system has the logarithm of the absolute temperature θ under time derivative. Although the system has a difficult mathematical point caused by the combination of $(\ln \theta)_t$, the inertial term and the nonlocal diffusion term for the order parameter φ , we can establish existence of solutions by a key estimate.

- 14 小杉 千春 (日本女大理)^Z 平面上での圧縮性弾性体の伸縮運動を表す初期値境界値問題の弱解の一
愛木 豊彦 (日本女大理) 一意性について 15
Chiharu Kosugi (Japan Women's Univ.) Uniqueness of weak solutions for the model representing motions of
Toyoehiko Aiki (Japan Women's Univ.) compressible elastic materials on plane

概要 We talk about uniqueness of weak solutions to the initial and boundary value problem for beam equations with viscosity term. The problem was proved as a mathematical model presenting shrinking and stretching motions of the elastic ring on a plane. In our problem we consider the stress function having a singularity to obtain an estimate for the strain from below. This type of stress functions was investigated in the study of compressible rubber like solids. By using the estimate, we already proved existence of a weak solution. The aim of this talk is to provide the uniqueness of the weak solution by applying the dual equation method. The existence of a strong solution is one of our future work.

- 15 熊崎 耕太 (長崎大教育)^Z 気泡ゴム内の拡散物質の浸透を表す自由境界問題の時間大域的可解性 .. 15
Kota Kumazaki (Nagasaki Univ.) Global existence of a solution of a free boundary problem describing
diffusants penetration into rubber

概要 In this talk, we consider a free boundary problem describing the penetration of diffusants into rubber. Our problem is posed on a halfline with a moving boundary at one of the ends and consists of a diffusion equation for diffusants and an ordinary differential equation describing the growth rate of the front of the penetration region. One of the features of our problem is that it takes into account the stopping effect of the moving boundary due to physical characteristics. Recently, we prove the existence of a globally-in-time solution without the stopping effect and investigated the large-time behaviour of a solution thereof. In this talk, we discuss the existence of a globally-in-time solution in consideration of the stopping effect.

- 16 内田 俊 (大分大理工)^Z Nonlinear evolution equation associated with Hypergraph Laplacian .. 15
池田 正弘 (理化学研・慶大理工)
Shun Uchida (Oita Univ.) Nonlinear evolution equation associated with Hypergraph Laplacian
Masahiro Ikeda (RIKEN/Keio Univ.)

概要 In this talk, we consider an ordinary differential equation associated with the so-called “Hypergraph Laplacian.” Main purpose of this talk is to explain basic properties of this nonlinear multivalued operator from the viewpoint of evolution equation theory. More precisely, we prove the Poincaré–Wirtinger type inequality and show the large time behavior of solution to Cauchy problem and solvability of time-periodic problem.

14:25~15:00

- 17 渡邊 紘 (大分大理工)^Z 放物型・双曲型単独保存則の1次元初期値問題に対するエントロピー解の界面の進行速度 15

Hiroshi Watanabe (Oita Univ.) Propagation speed of the interface for entropy solutions to 1D Cauchy problems for scalar parabolic-hyperbolic conservation laws

概要 We consider one-dimensional Cauchy problems (CP) for scalar parabolic-hyperbolic conservation laws. The equation has both properties of hyperbolic equations and those of parabolic equations. Our recent research have provided the existence of shock wave type solutions and rarefaction wave type super-, sub-solutions to (CP). These functions can be used to investigate the behavior of entropy solutions to (CP). In this talk, we estimate the propagation speed of the interface for entropy solutions to (CP). To see this, we construct entropy super-solutions using our recent works.

- 18 山崎 教昭 (神奈川大工)^Z Quasi-variational approach to doubly nonlinear evolution inclusions of
 剣持 信幸 (千葉大*) time-dependent subdifferentials 15
 白川 健 (千葉大教育)

Noriaki Yamazaki (Kanagawa Univ.) Quasi-variational approach to doubly nonlinear evolution inclusions of
 Nobuyuki Kenmochi (Chiba Univ.*) time-dependent subdifferentials
 Ken Shirakawa (Chiba Univ.)

概要 In this talk we consider abstract doubly quasi-variational evolution inclusions governed by time-dependent subdifferentials with the unknown-dependent constraints. Then, we establish an abstract result on the existence of solutions to our evolution inclusions. Also, we apply our abstract results to quasi-variational inequalities with time-dependent gradient constraints.

- 19 永田 拓人 (大分大工) 温度一様分布下での熱粘弾塑性方程式の構造保存型差分法とその誤差
 吉川 周二 (大分大理工) 評価 *

Takuto Nagata (Oita Univ.) An error estimate for the structure-preserving finite difference scheme
 Shuji Yoshikawa (Oita Univ.) of thermoviscoelastoplasticity under uniform temperature distribution

概要 We show an error estimate for structure-preserving finite difference scheme of the thermoviscoelastoplastic system. On the system, we adopt a stop operator representing perfect elasto-plasticity as a hysteresis operator. We assume that a relation between elasto-plastic stress and temperature is described by a simple multiplication. We first derive a structure-preserving finite difference scheme inheriting an energy conservation law, an increasing law of entropy and a momentum conservation law. Under uniform temperature distribution, we shall prove an error estimate between strict and approximate solutions. Main tools of the proof are the energy method for a structure-preserving finite difference method and the discrete version of variational inequality for a stop operator.

- 20 白川 健 (千葉大教育) Optimal heat controls of 1D Warren–Kobayashi–Lobkovsky–Carter type
 久保田 翔大 (千葉大融合理工) systems with dynamic boundary conditions *
 中屋 敷亮太 (サレジオ工高専)

Ken Shirakawa (Chiba Univ.) Optimal heat controls of 1D Warren–Kobayashi–Lobkovsky–Carter type
 Shodai Kubota (Chiba Univ.) systems with dynamic boundary conditions
 Ryota Nakayashiki (Salesian Polytech.)

概要 In this talk, we deal with the optimal control problem motivated by planar grain boundary motion. In this light, the regularized version of the phase-field model, proposed by [Warren et al.; Acta Materialia, 51 (2003), 6035–6058], is adopted as the corresponding state system. Under suitable assumptions, the existence and necessary condition for the optimal control will be demonstrated as the main results of this talk.

15:15~16:15 特別講演

應 和 宏 樹 (新潟大 自然)^Z 保存則方程式の L^p 衝撃波許容条件

Hiroki Ohwa (Niigata Univ.) An L^p shock admissibility condition for conservation laws

概要 We estimate the L^p ($p > 0$) local distance between piecewise constant solutions to the Cauchy problem of conservation laws and propose a shock admissibility condition for having an L^p local contraction of such solutions. Moreover, we prove that there exist L^p locally contractive solutions on some set of initial functions, to the Cauchy problem of conservation laws with convex or concave flux functions. As a result, for conservation laws with convex or concave flux functions, we see that rarefaction waves have an L^q ($q \geq 1$) local contraction and shock waves have an L^r ($0 < r \leq 1$) local contraction.

函数解析学

9月14日(火) 第VI会場

9:30~10:45

- 1 岩田 順敬 (関西大化学生命工)^Z Banach 環上の加群における Campbell–Baker–Hausdorff の公式 …… 15
 Yoritaka Iwata (Kansai Univ.) Campbell–Baker–Hausdorff formula for unbounded operators defined in the $B(X)$ -module

概要 The Campbell–Baker–Hausdorff formula is known as

$$e^A e^B = \exp \left[A + B + \frac{1}{2}[A, B] + \frac{1}{12}[A, [A, B]] - \frac{1}{12}[B, [A, B]] + \dots \right].$$

For example, this equality is used for operators A and B included in Lie Algebra. On the other hand, it is not able to obtain such a convergent power series representation, if operators A and B are unbounded (cf. Hille–Yosida theorem). In this talk, based on the logarithmic representation of infinitesimal generators, Campbell–Baker–Hausdorff type formula is introduced by means of the alternative infinitesimal generators.

- 2 森岡 悠 (愛媛大理工)^Z 多次元量子ウォークに対する時間定常的散乱理論 …… 15
 小松 堯 (産業数理研究所Calc)
 今野 紀雄 (横浜国大工)
 瀬川 悦生 (横浜国大環境情報)
 Hisashi Morioka (Ehime Univ.) Time-independent scattering theory for multi-dimensional quantum walks
 Takashi Komatsu
 (Math. Res. Inst. Calc for Industry)
 Norio Konno (Yokohama Nat. Univ.)
 Etsuo Segawa (Yokohama Nat. Univ.)

概要 We consider the time-independent scattering theory for quantum walks on the multi-dimensional square lattice. In particular, we derive generalized eigenfunctions for the time-evolution operator of a quantum walk. The scattering matrix naturally appears in the asymptotic behavior of generalized eigenfunctions. Due to the bias of the shift of quantum walkers, we introduce an anisotropic Banach space and characterize generalized eigenfunctions for quantum walks.

- 3 川本 昌紀 (愛媛大理工)^Z 時間減衰する調和振動子に対する波動作用素の存在・非存在について …… 15
 石田 敦英 (東京理大教養)
 Masaki Kawamoto (Ehime Univ.) Existence and nonexistence of wave operators for time-decaying harmonic oscillators
 Atsuhide Ishida (Tokyo Univ. of Sci.)

概要 Controlled time decaying harmonic oscillator decelerates the velocity of a quantum particle however the particle never be trapped by harmonic potentials. This phenomena changes the threshold of the power of decay order of the potential energy in order to exist the usual wave operators. In this talk, we introduce these facts more precisely.

- 4 守屋 創 (金沢大理工)^Z 量子相対エントロピー密度を用いた Gibbs 変分原理 …… 15
 Hajime Moriya (Kanazawa Univ.) Gibbs variational formula for thermal equilibrium states in terms of quantum relative entropy density

概要 We prove the Gibbs variational formula in terms of quantum relative entropy density that characterizes translation invariant thermal equilibrium states in quantum lattice systems. It is a natural quantum extension of the similar statement established by Follmer for classical systems. We shall advocate our viewpoint: Avoid the unique-phase assumption if it is not essential. We finally address some issues of mathematical physics and modular theory of operator algebra.

- 5 渡辺 秀司 (群馬大理工) 超伝導の BCS-Bogoliubov モデルにおける絶対零度近傍での臨界磁場の作用素論的研究 *
- Shuji Watanabe (Gunma Univ.) An operator-theoretical treatment of the critical magnetic field near absolute zero temperature in the BCS-Bogoliubov model

概要 We study several properties of the critical magnetic field near absolute zero temperature in the BCS-Bogoliubov model of superconductivity from the viewpoint of operator theory. We show that the critical magnetic field is smooth with respect to the temperature, and point out the behavior of both the critical magnetic field and its derivative near absolute zero temperature.

- 6 板倉 恭平 (立命館大総合科学技術研究機構) Strong radiation condition and stationery wave operators for one-body Stark operators *
- 足立 匡義 (京大人間環境) Stark operators
- 伊藤 健一 (東大数理) Stark operators
- E. Skibsted (Aarhus Univ.) Stark operators
- Kyohei Itakura (Ritsumeikan Univ.) Strong radiation condition and stationery wave operators for one-body Stark operators
- Tadayoshi Adachi (Kyoto Univ.) Stark operators
- Kenichi Ito (Univ. of Tokyo) Stark operators
- Erik Skibsted (Aarhus Univ.) Stark operators

概要 For a perturbed one-body Stark operator, we present existence and completeness of stationery wave operators, construction of associated generalized Fourier transforms and characterization of asymptotic behavior of generalized eigenfunctions of minimal growth order. A key element of our procedure is an improved, possibly optimal, version of radiation condition bounds obtained previously. This talk is based on a joint work with T. Adachi, K. Ito and E. Skibsted.

11:00~12:00 特別講演

- 水谷 治哉 (阪大理工)^Z ポテンシャルを伴うシュレディンガー方程式に対する時間大域的ストリッカード評価
- Haruya Mizutani (Osaka Univ.) Global-in-time Strichartz estimates for Schrödinger equations with potentials

概要 The Strichartz estimate, which is known to be one of fundamental tools to study scattering theory for nonlinear dispersive equations, has been extensively studied and extended to various settings, including the case of Schrödinger equations with an external linear potential. In this talk, I will discuss recent progress on the (global-in-time) Strichartz estimates for the Schrödinger equation with a decaying potential. Two types of conditions are considered: potentials belonging to a scaling-critical Lebesgue space and slowly decaying repulsive potentials. If time permits, I will also report on a recent work, joint with Xiaohua Yao (CCNU), for the case of fractional and higher-order Schrödinger equations.

9月15日(水) 第VI会場

9:00~10:45

- 7 里見貴志(東大数理)^Z ユニモジュラー局所コンパクト群上の畳み込みに関する不等式と Kemperman の定理への応用 15

Takashi Satomi (Univ. of Tokyo) An inequality about convolutions on unimodular locally compact groups and the application to Kemperman's theorem

概要 Let G be a unimodular locally compact group that has no open compact subgroups and $f: \mathbb{R}_{\geq 0} \rightarrow \mathbb{R}$ be a convex (down) function that satisfies $f(0) = 0$. In this talk, I report the inequality $\int_G f \circ (\phi_1 * \phi_2)(g) dg \leq 2 \int_0^{\|\phi_1\|} f(x) dx + (\|\phi_2\| - \|\phi_1\|) f(\|\phi_1\|)$ holds for any integrable functions $\phi_1, \phi_2: G \rightarrow [0, 1]$ that satisfy $\|\phi_1\| \leq \|\phi_2\|$, where $\|\cdot\|$ is the L^1 -norm on G (a similar inequality holds when $\|\phi_2\| \leq \|\phi_1\|$ too). When $G = \mathbb{R}$, there are functions ϕ_1, ϕ_2 that the equality is attained. Thus, this inequality can be considered to give the maximum of $\int_G f \circ (\phi_1 * \phi_2)(g) dg$ explicitly when L^1 -norm and L^∞ -norm of ϕ_1, ϕ_2 are fixed. Furthermore, Kemperman's theorem $\text{vol}(A_1 A_2) \geq \text{vol}(A_1) + \text{vol}(A_2)$, that is a generalization of the Brunn-Minkowski theorem for $G = \mathbb{R}$, is deduced from this inequality.

- 8 林拓磨(阪大情報)^Z Geometric realization of real absolutely irreducible representations of connected real semisimple algebraic groups 15

Takuma Hayashi (Osaka Univ.) Geometric realization of real absolutely irreducible representations of connected real semisimple algebraic groups

概要 The finite dimensional real irreducible representations of connected real Lie groups and finite dimensional real Lie algebras were classified by the works of Cartan, Malcev, Dynkin, Borel, Tits, Fell, and Onishchik through algebraic approaches. In this talk, I will explain a geometric approach to a criterion of the existence of Galois descent on complex irreducible representations of connected real semisimple algebraic groups and to their explicit construction. In particular, we will obtain a geometric realization of real absolutely irreducible representations.

- 9 C. Reyes-Bustos (東工大情報理工)^Z Heat kernel for the asymmetric quantum Rabi model 15

Cid Reyes-Bustos (Tokyo Tech) Heat kernel for the asymmetric quantum Rabi model

概要 The quantum Rabi model (QRM) is one of most fundamental models describing quantum light-matter interactions. Recently, a closed formula for the heat kernel of the QRM was obtained by the speaker and Masato Wakayama using a method based on the expansion of the Trotter-Kato product formula by using discrete Fourier analysis. In this talk we extend the computation to obtain the heat kernel formula for the asymmetric quantum Rabi model (AQRM), obtained by adding a bias term to the QRM Hamiltonian. The computation of the heat kernel for the AQRM may be considered the first step towards the goal of a complete generalization and characterization of the method for computing heat kernels started with the QRM.

- 10 C. Reyes-Bustos (東工大情報理工)^Z Degeneracy and hidden symmetry of the asymmetric quantum Rabi model 15
 若山正人(東京理大理) model 15
Cid Reyes-Bustos (Tokyo Tech) Degeneracy and hidden symmetry of the asymmetric quantum Rabi model
 Masato Wakayama (Tokyo Univ. of Sci.)

概要 The quantum Rabi model (QRM) and its generalizations are some of the most fundamental models in the study of quantum interaction. In this talk we discuss the hidden symmetry of the asymmetric quantum Rabi model (AQRM) and the degeneracies in its spectrum (crossings in the spectral curves). In particular, we show the existence, in the general case, of the recently discovered operators commuting with the AQRM Hamiltonian and discuss their properties. Notably, a quadratic relation between the AQRM Hamiltonian and the commuting operator reveals a (conjectural) relation between the symmetry and degeneracy via the constraint polynomials. In addition, we introduce a geometric picture for the the spectral curves that gives further insights into the AQRM and its spectrum.

- 11 笹木集夢(東海大理)^Z Visible actions and criteria for multiplicity-freeness of representations of Heisenberg groups 15
 Atsumu Sasaki (Tokai Univ.) Visible actions and criteria for multiplicity-freeness of representations of Heisenberg groups

概要 This talk gives a brief summary on a geometric criterion for a quasi-regular representation of the Heisenberg group to be multiplicity-free by coadjoint orbits and visible actions on Heisenberg complex homogeneous spaces.

- 12 小木曾岳義(城西大理) マルコフ3数の2種類の変形と、その相互関係 *

概要 In this talk, I talk about two kinds of deformations q -deformation and t -deformation of Markov triples in two different directions. One is generalization in direction of using the q -deformation of rational number introduced by S. Morier-Genoud and V. Ovsienko in connection with cluster algebras, quantum topology and analytic number theory. The other is a generalization in direction of using castling transforms on prehomogeneous vector spaces introduced by M. Sato which plays an important role in the study of representation theory and number theory.

11:00~12:00 特別講演

- 中島秀斗(統計数理研)^Z 等質開凸錐に付随するゼータ関数の関数等式とその係数行列について
 Hideto Nakashima (Inst. of Stat. Math.) Functional equations of zeta functions associated with homogeneous cones and their gamma matrices

概要 A homogeneous cone can be regarded as an open orbit of a certain prehomogeneous vector space so that one can construct the associated zeta functions. The theory of zeta functions associated with prehomogeneous vector spaces by F. Sato (1982) ensures the existence of functional equations which these zeta functions satisfy. In this talk, I will give explicit formulas of functional equations of zeta functions associated with homogeneous cones, and discuss the property of their gamma matrices.

9月16日(木) 第VI会場

9:00~10:45

- 13 瀬尾 祐貴 (大阪教育大教育)^Z n -変数作用素べき平均の商に対する上限について 15

Yuki Seo (Osaka Kyoiku Univ.) The upper boundary for the ratio between n -variable operator power means

概要 In this talk, we show estimates of the upper boundary for the ratio between n -variable operator power means due to Lawson–Lim–Pálfa by terms of the generalized condition number in the sense of Turing, which are a partial improvement of the known results.

- 14 平松 空 (大阪教育大)^Z 正作用素の行列式と Oppenheim の不等式 15

瀬尾 祐貴 (大阪教育大教育)

Sora Hiramatsu (Osaka Kyoiku Univ.) Determinant for positive operators and Oppenheim's inequality
Yuki Seo (Osaka Kyoiku Univ.)

概要 In this talk, by virtue of the Specht ratio, we show Oppenheim type inequalities for the normalized determinant of positive invertible operators on a Hilbert space, and we moreover discuss Hadamard type inequalities for positive definite matrices.

- 15 伊藤 公智 (前橋工科大)^Z A family of weighted operator means including the weighted Heinz and Lehmer means 15

Masatoshi Ito (Maebashi Inst. of Tech.) A family of weighted operator means including the weighted Heinz and Lehmer means

概要 Recently, we proposed the notion of a transpose symmetric path of weighted \mathfrak{M} -means for a symmetric operator mean \mathfrak{M} , and also we obtained a family of operator means including the weighted Heron, logarithmic and Heinz means. On the other hand, Kubo, Nakamura, Ohno and Wada discussed a path of operator monotone functions named the Barbour path.

In this talk, we introduce a new family of operator means by using a generalization of the Barbour path, which includes the weighted Heinz and Lehmer means. This family leads relations among the weighted Heinz, Lehmer and some fundamental means.

- 16 渡邊 恵一 (新潟大理)^Z 線形縮小作用素がメビウスの演算と距離に関して Lipschitz 連続であることについて 15

Keiichi Watanabe (Niigata Univ.) On Lipschitz continuity of linear contractions with respect to the Möbius operations and metric

概要 For every linear operator between inner product spaces whose operator norm is less than or equal to one, we show that the restriction is Lipschitz continuous with respect to the Möbius operations and metric.

- 17 森 迪也 (理化学研THEMS)^Z Continuous coexistency preservers on effect algebras 15

P. Šemrl (Univ. Ljubljana)

Michiya Mori (RIKEN) Continuous coexistency preservers on effect algebras
Peter Šemrl (Univ. Ljubljana)

概要 Let H be a complex Hilbert space. The effect algebra $E(H)$ is the collection of effects, i.e., positive semi-definite operators on H with norm at most one. Two effects $A, B \in E(H)$ are said to coexist (and written $A \sim B$) if there are effects $E, F, G \in E(H)$ with $A = E + F$, $B = E + G$ and $E + F + G \in E(H)$. We obtained the following theorem. Assume that $2 \leq \dim H < \infty$. For every continuous map $\phi: E(H) \rightarrow E(H)$ that satisfies $A \sim B \Leftrightarrow \phi(A) \sim \phi(B)$ for any pair $A, B \in E(H)$, there exists a unitary or antiunitary operator $U: H \rightarrow H$ such that either $\phi(A) = UAU^*$ ($A \in E(H)$) or $\phi(A) = U(I - A)U^*$ ($A \in E(H)$) holds. We give examples that imply the optimality of this result.

- 18 岡安 類 (大阪教育大)^Z Injective factors with trivial bicentralizer 15
 Rui Okayasu (Osaka Kyoiku Univ.) Injective factors with trivial bicentralizer

概要 I will give an alternative proof that an injective factor on a separable Hilbert space with trivial bicentralizer is ITPFI. The proof is given in parallel with each type of factors and it is based on the strategy of Haagerup. As a consequence, the uniqueness theorem of injective factors except type III_0 follows from Araki-Woods' result. In this talk, I talk about some key points in the proof.

- 19 鈴木 悠平 (北大 理) C^* -simplicity has no local obstruction *
 Yuhei Suzuki (Hokkaido Univ.) C^* -simplicity has no local obstruction

概要 C^* -simplicity of a group is the simplicity of the reduced group C^* -algebra. In 2016, I solved a problem of de la Harpe in '06: Is there a non-discrete C^* -simple group? However the solution was not fully satisfactory as the provided C^* -simple groups (and their operator algebras) are very close to discrete groups. All previously known examples are of this form. In this talk, I give yet another construction of non-discrete C^* -simple groups. The statement in the title then follows. This in particular gives the first examples of non-elementary C^* -simple groups (in Wesolek's sense).

Based on arXiv:2103.10404.

- 20 増田 俊彦 (九大 数理) Classification of outer actions of discrete amenable groupoids on injective factors *
 Toshihiko Masuda (Kyushu Univ.) Classification of outer actions of discrete amenable groupoids on injective factors

概要 We will classify outer actions of measurable discrete amenable groupoids on injective factors. We do not use model action for classification.

- 21 飯田 安保 (金沢 医大) 上半平面での Zygmund F -algebra における等長写像について *
 Yasuo Iida (Kanazawa Med. Univ.) Isometries of the Zygmund F -algebra on the upper half plane

概要 In 2019 the speaker introduced the Zygmund F -algebra $N \log^\alpha N(D)$ ($\alpha > 0$) of holomorphic functions f on the upper half plane $D = \{z \in \mathbf{C} \mid \text{Im } z > 0\}$ that satisfy

$$\sup_{y>0} \int_{\mathbf{R}} \varphi_\alpha(\log(1 + |f(x + iy)|)) dx < +\infty,$$

where $\varphi_\alpha(t) = t\{\log(c_\alpha + t)\}^\alpha$ for $t \geq 0$ and $c_\alpha = \max(e, e^\alpha)$. In this talk we shall characterize linear isometries of $N \log^\alpha N(D)$ onto $N \log^\alpha N(D)$.

11:00~12:00 特別講演

- 山崎 丈明 (東洋大 理工)^Z Operator means and operator inequalities
 Takeaki Yamazaki (Toyo Univ.) Operator means and operator inequalities

概要 In this talk, we shall introduce several results of operator means in the viewpoint of operator inequalities. Here an operator means a bounded linear operator on a complex Hilbert space. This talk can be divided into two parts. In the first part, we shall consider operator means of two positive definite operators. Especially, we shall introduce the axiom of operator mean defined by Kubo-Ando. Then we shall introduce some important examples of operator means. Moreover, we shall introduce the interpolation property for operator means. At the end of the first part, we shall introduce an operator inequality which is called the Ando-Hiai inequality (AH), and then we will introduce generalizations of AH. In the second part, we shall introduce recent results of operator means of n -operators, where n is greater than 3. We will focus on generalizations of AH for operator means of n -operators.

統計数学

9月14日(火) 第VII会場

9:15~11:40

- 1 平井 祐紀 (阪大基礎工)^Z Itô–Föllmer calculus in infinite dimensions 15
 Yuki Hirai (Osaka Univ.) Itô–Föllmer calculus in infinite dimensions

概要 The Itô–Föllmer calculus, pioneered by Föllmer (1981), is a deterministic counterpart to classical Itô’s stochastic calculus. We extend some results in the Itô–Föllmer calculus to infinite dimensions. In particular, we give the $C^{1,2}$ -type Itô formula and a generalized C^1 -transformation formula of quadratic variations for Banach space valued paths.

- 2 星野 浄生 (阪府大理)^Z Identification of random functions from the stochastic Fourier coefficients by the process with quadratic variation 15
 Kiyoyuki Hoshino (Osaka Pref. Univ.) Identification of random functions from the stochastic Fourier coefficients by the process with quadratic variation

概要 Let $(V_t)_{t \in [0, L]}$ be a real random function with right-continuous quadratic variation $[V]_t$. Our concern is whether and how a noncausal type stochastic differential $dX_t^{a,b} := a(t) dV_t + b(t) dt$ is determined from its stochastic Fourier coefficients (SFCs for short) $(e_n, dX^{a,b}) := \int_0^L \overline{e_n(t)} dX_t^{a,b}$ with respect to a CONS $(e_n)_{n \in \mathbb{N}}$ of $L^2[0, L]$. In this talk, we use the notion of stochastic derivative to show the following: (i) when $(e_n)_{n \in \mathbb{N}}$ is the Haar system, any stochastic differential $dX^{a,b}$ is determined from its SFCs $((e_n, dX^{a,b}))_{n \in \mathbb{N}}$, (ii) when each e_n is of bounded variation, $dX^{a,b}$ is determined from its SFCs $((e_n, dX^{a,b}))_{n \in \mathbb{N}}$ on a certain condition, where $dX^{a,b}$ is defined by any stochastic integral $\int dV$ which is the inverse of the stochastic derivative.

- 3 清水 良輔 (京大情報)^Z フラクタル上の非線形ポテンシャル論の構成 15
 Ryosuke Shimizu (Kyoto Univ.) Construction of nonlinear potential theory on fractals

概要 We give a method to construct p -energies on fractals, especially the standard two-dimensional Sierpinski carpet, as scaling limits of discrete p -energies. When $p = 2$, this energy becomes a Dirichlet form and has been actively studied by probabilists since one can obtain diffusion processes through the theory of Dirichlet forms. We also show that the domain of p -energy can be written as Lipschitz–Besov type function space on metric measure space.

- 4 塩沢 裕一 (阪大理)^Z Compactness of semigroups generated by symmetric non-local Dirichlet forms with unbounded coefficients 15
 Jian Wang (Fujian Normal Univ.) Compactness of semigroups generated by symmetric non-local Dirichlet forms with unbounded coefficients
 Yuichi Shiozawa (Osaka Univ.) Compactness of semigroups generated by symmetric non-local Dirichlet forms with unbounded coefficients
 Jian Wang (Fujian Normal Univ.) Compactness of semigroups generated by symmetric non-local Dirichlet forms with unbounded coefficients

概要 In this talk, we present sharp criteria for compactness and non-compactness of the Markovian semigroup on $L^2(\mathbb{R}^d)$ associated with a symmetric non-local Dirichlet form with unbounded coefficient. Using these criteria, for a class of Dirichlet forms, we give a necessary and sufficient condition for the associated Markovian semigroups to be compact in terms of the coefficient growth rates at infinity.

- 5 村山拓也 (中大理工)^Z On the continuity of half-plane capacity with respect to Carathéodory convergence 15
 Takuya Murayama (Chuo Univ.) On the continuity of half-plane capacity with respect to Carathéodory convergence

概要 We consider the continuity of half-plane capacity as a function of boundary hulls with respect to the Carathéodory convergence. In particular, our interest lies in the case that hulls are unbounded. Under the assumption that every hull is contained in a fixed hull with finite imaginary part and half-plane capacity, we show that the half-plane capacity is indeed continuous. We also discuss the extension of this result to the case that the underlying domain is finitely connected. This extension is based on Brownian motion with darning.

- 6 今村卓史 (千葉大理)^Z KPZ モデルと有限温度フェルミオンに関連する行列式点過程との関係 15
 M. Mucciconi (Univ. Warwick)
 笹本智弘 (東工大理)
 Takashi Imamura (Chiba Univ.) A relation between KPZ models and the determinantal point process
 Matteo Mucciconi (Univ. Warwick) associated with fermions at positive temperature
 Tomohiro Sasamoto (Tokyo Tech)

概要 In this talk we report a relation between marginals of two probability measures. One is the q -Whittaker measure, which is related to some typical models in the KPZ class such as q -TASEP, q -pushTASEP etc. The other is the periodic Schur measure, which is a typical model of the determinantal point processes and describes free fermions at positive temperature.

- 7 矢野孝次 (京大理)^Z Arcsine law for a piecewise linear random interval map 15
 Kouji Yano (Kyoto Univ.) Arcsine law for a piecewise linear random interval map

概要 We report that a random interval map by choosing randomly two piecewise linear maps whose orbits converge to 0 or 1 obeys Thaler–Zweimüller’s arcsine law. This talk is based on a joint work with Genji Hata.

- 8 高橋博樹 (慶大理工)^Z Distribution of random cycles for random uniformly expanding interval maps 15
 鈴木新太郎 (慶大理工)
 Hiroki Takahashi (Keio Univ.) Distribution of random cycles for random uniformly expanding interval
 Shintaro Suzuki (Keio Univ.) maps

概要 We consider an i.i.d. random dynamical system generated by finitely many, fully branched uniformly expanding interval maps with a finite number of branches. For almost every sample, we show that random cycles weighted with random Lyapunov exponents equidistribute with respect to the sample-independent, absolutely continuous stationary measure as the periods of the random cycles tend to infinity. This result is an analogue of Bowen’s theorem on periodic orbits of topologically mixing Axiom A diffeomorphisms. Our method of proof is purely deterministic, relying on the property that the canonical skew product map has a symbolic representation by the full shift over finite alphabet.

- 9 日野正訓 (京大理) Singularity of energy measures on a class of inhomogeneous Sierpinski gaskets *
 安井円香
 Masanori Hino (Kyoto Univ.) Singularity of energy measures on a class of inhomogeneous Sierpinski
 Madoka Yasui gaskets

概要 We study energy measures of canonical Dirichlet forms on inhomogeneous Sierpinski gaskets. We prove that the energy measures and suitable reference measures are mutually singular under mild assumptions.

- 10 中島由人 (京大人間環境) 平面上の非有界なディジットからなる集合のハウスドルフ次元について *
- Yuto Nakajima (Kyoto Univ.) The Hausdorff dimension of some planar sets with unbounded digits

概要 We consider some parameterized planar sets with unbounded digits. We investigate these sets by using the method of “*transversality*”, which is the main tool in investigating self-similar sets with overlaps. We calculate the Hausdorff dimension of these sets for typical parameters in some region with respect to the 2-dimensional Lebesgue measure. In addition, we estimate the local dimension of the exceptional set of parameters.

- 11 山本謙一郎 (長岡技術科学大工) 区分単調写像の大偏差原理について *
- 鄭容武 (広島大工)
- Kenichiro Yamamoto Large deviation principle for piecewise monotonic maps
(Nagaoka Univ. of Tech.)
- Yong Moo Chung (Hiroshima Univ.)

概要 We show that a piecewise monotonic map with positive topological entropy satisfies the level-2 large deviation principle with a unique measure of maximal entropy as reference under the conditions that the corresponding Markov diagram is irreducible and that the periodic measures of the map are dense in the set of ergodic measures. This result can apply to a broad class of piecewise monotonic maps, such as monotonic mod one transformations and piecewise monotonic maps with two monotonic pieces.

14:25~15:25 特別講演

- 江崎翔太 (福岡大理)² 長距離相互作用飛躍型無限粒子系の確率解析
- Syota Esaki (Fukuoka Univ.) Stochastic analysis for long range interacting particle systems with jumps

概要 In this talk, we would like to consider infinite particle systems with jumps. Unlabelled systems (dynamical systems on the configuration space) were constructed by Esaki [Tohoku J, 2019] using Dirichlet form technique. Then, we would like to give infinite dimensional stochastic differential equation (ISDE) representations for each particle on the dynamics. However, the coordinate function can NOT be in the domain of the Dirichlet form associated with the unlabelled dynamics. Hence, we need to “label” the unlabelled dynamics and construct Dirichlet forms associated with these “labelled dynamics”. After labelling, we can obtain ISDE representations for each particle using this new Dirichlet form. To show our theorem we assume some conditions. We call them non-collision, non-explosion and no-big jump conditions. We would like to introduce sufficient conditions for these conditions in this talk. Using these sufficient conditions we can apply our theorem to the systems of alpha-stable particles with logarithmic interactions associated with Dyson, Ginibre, Airy and Bessel random point fields, which are related to the random matrix theory. If we have time to talk, we would like to talk discrete versions of these results and our results of the pathwise uniqueness of these ISDEs. This is a joint work with Hideki Tanemura (Keio University).

15:45~16:45 特別講演

金 大 弘 (熊本大先端)^Z Scattering lengths for positive additive functionals and their related problems

Daehong Kim (Kumamoto Univ.) Scattering lengths for positive additive functionals and their related problems

概要 There is a large physics literature involving the concept of scattering length of a potential. When a potential is positive, it has a close relation to potential theory. In 1974, Mark Kac gave a probabilistic representation for the scattering length of positive potential in terms of 3-dimensional Brownian motion and studied some applications of the probabilistic method to scattering problems. In this talk, we will introduce the concept of scattering length of positive additive functionals of symmetric Markov processes. The additive functionals considered here are not necessarily continuous. After giving a systematic presentation of the fundamentals of the scattering length, we study the problems of semi-classical asymptotics for scattering length under relativistic stable processes, which extend previous results for the case of positive continuous additive functionals. We also give an equivalent criterion for the fractional Laplacian with a measure-valued non-local operator as a perturbation to have a purely discrete spectrum in terms of the scattering length, by considering the connection between scattering length and the bottom of the spectrum of Schrödinger operator.

9月15日(水) 第VII会場

10:00~11:40

12 平 尾 将 剛 (愛知県立大情報)^Z On random point configurations on Q -polynomial schemes 15

Masatake Hirao (Aichi Pref. Univ.) On random point configurations on Q -polynomial schemes

概要 In this talk we discuss on random point configurations on Q -polynomial schemes, which has deeply connection with classical combinatorial objects, e.g., orthogonal arrays and combinatorial t -design. We compare random point configurations, including determinantal point processes, jittered samplings and poisson point processes, with designs in Q -polynomial association schemes. Moreover, we also discuss some other energies and discrepancies if possible.

13 松 原 和 樹 (埼玉大教育)^Z Some constructions of ordered multi-designs 15
景 山 三 平 (広島 大*)

Kazuki Matsubara (Saitama Univ.) Some constructions of ordered multi-designs

Sanpei Kageyama (Hiroshima Univ.*)

概要 We have newly introduced a combinatorial structure, called an ordered multi-design (OMD). In this talk, necessary conditions for the existence of an $OMD_\lambda(k \times c, v)$ are discussed, and several methods of constructing an $OMD_\lambda(k \times c, v)$ are presented. Finally, it is shown that the necessary conditions are also sufficient for the existence of an $OMD_\lambda(3 \times 2, v)$ with one possible exception. Note that the ordered multi-design with $c = 1$ coincides with the ordered design defined along with an orthogonal array and a perpendicular array in Rao (1961).

- 14 丸山祐造 (神戸大経営)^Z On admissible estimation of a mean vector when the scale is unknown 15
 Yuzo Maruyama (Kobe Univ.) On admissible estimation of a mean vector when the scale is unknown

概要 We consider admissibility of generalized Bayes estimators of the mean of a multivariate normal distribution when the scale is unknown under quadratic loss. The priors considered put the improper invariant prior on the scale while the prior on the mean has a hierarchical normal structure conditional on the scale. This conditional hierarchical prior is essentially that of Maruyama and Strawderman (2021, *Biometrika*). This paper completes the determination of admissibility/inadmissibility for this class of priors.

- 15 米永航志朗 (北大経済)^Z 異なる共分散行列を持つウィッシュャート行列と正規ベクトルの積の精密
 鈴川晶夫 (北大経済) 分布 15
 Koshiro Yonenaga (Hokkaido Univ.) Exact distribution of the product of a Wishart matrix and a normal
 Akio Suzukawa (Hokkaido Univ.) vector with uncommon covariance matrices

概要 In this report, we consider the distribution of the product of a Wishart matrix and a normal vector with uncommon covariance matrices. We present the stochastic representation, density function and exact moments of the product. While the stochastic representation and density function are directly derived from the result of previous researches, the derivation of exact moments is based on higher order moments of elements of a non-singular Wishart matrix. In addition, the stochastic representation, density function and exact moments of the product remain valid for the product of a singular Wishart matrix and a normal vector. In a numerical illustration, we investigate some properties of the product by computing the moments.

- 16 栗田絵梨 (東京理大理)^Z 2-step 単調型欠測をもつ多変量尖度による多変量正規性検定統計量につ
 瀬尾隆 (東京理大理) いて 15
 Eri Kurita (Tokyo Univ. of Sci.) Multivariate normality test statistic based on multivariate kurtosis with
 Takashi Seo (Tokyo Univ. of Sci.) two-step monotone type of missing data

概要 In this talk, we consider a test for multivariate normality with two-step monotone type of missing data. For multivariate normality tests in the case of complete data, Mardia (1970) has defined the sample measure of multivariate kurtosis and given its exact mean and exact variance to test multivariate normality. In this talk, we define a new sample measure of multivariate kurtosis for two-step monotone type of missing data. Furthermore, we derive asymptotic results of the mean and variance by perturbation method. From this result, we can obtain a multivariate normality test statistic in the case of two-step monotone type of missing data. Finally, the accuracy of the normal approximation for this test statistic is investigated by Monte Carlo simulations.

- 17 山形浩一 (電通大)^Z Trace non-increasing maps から誘導される単調計量 10
 Koichi Yamagata Monotone metrics induced from trace non-increasing maps
 (Univ. of Electro-Comm.)

概要 Quantum monotone metric was introduced by Petz, and it was proved that quantum monotone metrics on the set of quantum states with trace one were characterized by operator monotone functions. In this paper, we introduce an extension of quantum monotone metrics which have monotonicity under completely positive, trace non-increasing (CPTNI) maps and additive noise. We prove that our extended monotone metrics can be characterized only by static operator monotone functions from few assumptions without assuming continuities of metrics. We show that our monotone metrics have some natural properties such as additivity of direct sum, convexity and monotonicity with respect to positive operators.

9月16日(木) 第VII会場

9:45~11:45

- 18 劉言 (早大理工)^Z Detection of relevant change in frequency domain 15
 後藤佑一 (早大理工)
 谷口正信 (早大理工)
 Yan Liu (Waseda Univ.) Detection of relevant change in frequency domain
 Yuichi Goto (Waseda Univ.)
 Masanobu Taniguchi (Waseda Univ.)

概要 We consider the problem of detecting relevant changes in the frequency domain. In this talk, we introduce relevant changes in the framework of nonparametric functionals. We propose a consistent test statistic for detecting relevant changes in the frequency domain. Specifically, we construct a new CUSUM statistic of the nonparametric estimator for the spectral density of time series, and elucidate the consistency of it with the relevant change. The CUSUM statistic consisting only of periodograms is not available here because it is not consistent. The proposed statistic has good features such as asymptotic convergence to the Brown bridge, and can be applied to the detection of relevant changes in hidden structures of integer-valued time series. We will also show some numerical examples and applications of this method to the real data based on the above theoretical results.

- 19 後藤佑一 (早大理工)^Z Homogeneity tests for one-way models with dependent errors 15
 新垣航一 (早大理工)
 劉言 (早大理工)
 谷口正信 (早大理工)
 Yuichi Goto (Waseda Univ.) Homogeneity tests for one-way models with dependent errors
 Koichi Arakaki (Waseda Univ.)
 Yan Liu (Waseda Univ.)
 Masanobu Taniguchi (Waseda Univ.)

概要 In this talk, we introduce homogeneity tests for one-way models with dependent errors. Existing tests are constructed under the assumption of independence between groups. However, this assumption is quite restrictive and impractical. Hence, we propose a test that allows us to deal with correlated groups. A proposed test statistic can be used for both fixed effects model and random effects model. First, we show that, under the null hypothesis, the proposed test statistic converges to the chi-square distribution. From this result, an asymptotically size alpha test can be constructed. Then, we prove the consistency of the test, that is, the power of the test converges to 1 under the alternative hypothesis. Furthermore, we show our test has a non-trivial power under the local alternative hypothesis. In real data analysis, we test whether or not there exist random effects in three industries.

- 20 後藤 佑一 (早大理工)^Z Test for conditional variance of integer-valued time series 15
藤森 洸 (信州大経法)
Yuichi Goto (Waseda Univ.) Test for conditional variance of integer-valued time series
Kou Fujimori (Shinshu Univ.)

概要 Integer-valued time series have been attracted attention recently. We consider models whose conditional expectations have dependence structures. In this talk, we discuss the test for conditional variance. This test can be applied to various testing problems such as the goodness of fit test, the specification test of intensity function, and the test for equidispersion. First, we propose an M-estimator and show the strong consistency and the asymptotic normality. Next, the asymptotic null distribution of a proposed test statistic is derived, which enables us to construct an asymptotically size alpha test. Then, the consistency of the proposed test is established, that is, the power of the test converges to 1 as the sample size increases. Moreover, we show that our test has a nontrivial power under the local alternative hypothesis. Finally, the number of patients with Escherichia coli in the state of Germany is analyzed.

- 21 吉田 朋広 (東大数理)^Z Adaptive estimation for a degenerate diffusion process 15
Nakahiro Yoshida (Univ. of Tokyo) Adaptive estimation for a degenerate diffusion process

概要 Parametric estimation of a degenerate diffusion system from time-discrete observations is discussed. The first component of the degenerate diffusion system has a parameter θ_1 in a non-degenerate diffusion coefficient and a parameter θ_2 in the drift term. The second component has a drift term parameterized by θ_3 and no diffusion term. Asymptotic normality is established in two different situations: an adaptive estimator for θ_3 with some initial estimators for (θ_1, θ_2) , and an adaptive one-step estimator for $(\theta_1, \theta_2, \theta_3)$ with some initial estimators for them. The convergence of the estimators for θ_3 is much faster than the other parameters. This is a joint work with A. Gloter.

- 22 吉田 朋広 (東大数理)^Z Edgeworth expansion for the Euler–Maruyama approximation 15
Nakahiro Yoshida (Univ. of Tokyo) Edgeworth expansion for the Euler–Maruyama approximation

概要 We present an Edgeworth expansion for the Euler–Maruyama approximation of a diffusion process. Our methodology is based upon the martingale expansion, that established Edgeworth expansions under asymptotic mixed normality. The asymptotic expansion formula is given by the adaptive random symbol (tangent) and the anticipative random symbol (torsion) described by the Malliavin calculus. Identification of these random symbols is a task in this work. A joint work with M. Podolskij and B. Veliyev.

- 23 シュシャオフエイ (早大理工)^Z Higher order asymptotics of minimax estimators for time series 15
劉言 (早大理工)
谷口正信 (早大理工)
Xiaofei Xu (Waseda Univ.) Higher order asymptotics of minimax estimators for time series
Yan Liu (Waseda Univ.)
Masanobu Taniguchi (Waseda Univ.)

概要 We consider the minimax estimation of time series in view of higher order asymptotic theory. Under the framework of Bayesian inference, we focus on the Bayes estimator and the Bayesian Whittle estimator for parameter estimation. It is shown that these estimators are minimax with respect to the Bayes risk of higher order bias appeared in their asymptotic expansion. Our theoretical discovery is justified by simulation studies even when the sample size is small.

- 24 小池 祐太 (東大数理)^Z Gaussian approximation to high-dimensional Wishart matrices under a moment assumption 15
 Xiao Fang
 (Chinese Univ. of Hong Kong)
- Yuta Koike (Univ. of Tokyo) Gaussian approximation to high-dimensional Wishart matrices under a moment assumption
 Xiao Fang
 (Chinese Univ. of Hong Kong)

概要 Given an $n \times d$ matrix X with i.i.d. entries with mean 0 and variance 1, we consider Gaussian approximation to the scaled Wishart matrix XX^\top/\sqrt{d} when both n and d tend to infinity. Here, X^\top denotes the transpose of X . It is known that, when X is Gaussian, such Gaussian approximation is possible in terms of the Wasserstein distance if $n^3 = o(d)$. Besides, the condition $n^3 = o(d)$ is conjectured to be sharp. In this talk, we show that the same Gaussian approximation result holds when entries of X have finite sixth moment.

14:25~15:25 特別講演

中山 優吾 (京大情報)^Z ガウシアンカーネルに基づく高次元データの分類問題

Yugo Nakayama (Kyoto Univ.) High-dimensional data classification based on Gaussian kernel

概要 We consider classification and clustering for high-dimension, low-sample-size (HDLSS) data. These topics have been studied as supervised and unsupervised techniques in the field of machine learning. In this talk, we consider support vector machine (SVM) proposed by Vapnik and principle component analysis (PCA) for each issue. We focus on nonlinearity that is one of the key analyzing high-dimensional space. The Kernel trick is a very interesting and powerful tool for nonlinearity. Kernel functions can be used in many applications as they provide a simple bridge from linearity to nonlinearity for algorithms which can be expressed in terms of inner products. In this talk, we apply it to SVM and PCA for classification issues and study their properties for high-dimensional data. In particular, we investigate them with the Gaussian kernel which is the most commonly used. However, we note that their performances are influenced by the scale parameter involved in the Gaussian kernel. By discussing their asymptotic properties for it, we propose a choice of the scale parameter yielding a high performance. Finally, we examine the validity of the choice by numerical simulations and actual data analyses.

15:45~16:45 特別講演

矢野 恵佑 (統計数理研)^Z 予測分布論の最近の展開

Keisuke Yano (Inst. of Stat. Math.) Recent development of predictive densities

概要 Predictive density is a probability density of future observations based on current observations. It can be used not only to estimate future observations but also to quantify their uncertainty. It has a wide spectrum of application in statistics, information theory, and machine learning. An important class of predictive densities is the class of Bayesian predictive densities, that is, the posterior mixture of densities of future observations. In this talk, I present my recent studies on (i) Bayesian predictive densities in high dimensions and (ii) model assessment based on quasi-Bayesian predictive densities. As for (i), I discuss Bayesian predictive densities for sparse Poisson models and hierarchical Bayes models and present several theoretical results such as the minimaxity. As for (ii), I introduce an information criterion, Posterior Covariance Information Criterion (PCIC), that generalizes Widely-Applicable Information Criterion (WAIC), a model evaluation method based on Bayesian predictive densities, so as to cover a wide range of predictive settings including covariate shift adaptation, causal inference, and quasi-Bayesian prediction. I show that PCIC shares several favorable features of WAIC and illustrate its applicability.

9月17日(金) 第VII会場

午 前

- 25 藤田 敏治 (九工大工) 合流型推移をもつ決定過程—乗法型評価— …………… *
- Toshiharu Fujita (Kyushu Inst. of Tech.) Decision process with converging branch system—Multiplicative reward system—

概要 We consider multiplicative reward system on a finite-stage deterministic converging decision process model. Converging decision process has converging transition, which is one of the nonserial branch systems proposed by Nemhauser. We apply bidecision approach to our model and give a recursive method.

- 26 鈴木 聡 (島根大総理工) 準凸計画問題に対する KKT 最適性条件 …………… *
- Satoshi Suzuki (Shimane Univ.) KKT optimality condition for quasiconvex programming

概要 In this talk, we study KKT optimality condition for quasiconvex programming. We introduce KKT optimality condition in terms of Greenberg–Pierskalla subdifferential. We show two constraint qualifications for KKT optimality condition. Especially, we investigate a necessary and sufficient constraint qualification for KKT optimality condition.

- 27 地 壽 頌子 (大阪工大情報) A construction for spanning bipartite block designs …………… *
- 宮本 暢子 (東京理大理工) Shoko Chisaki (Osaka Inst. of Tech.) A construction for spanning bipartite block designs
- 藤原 良 (筑波大*) Nobuko Miyamoto (Tokyo Univ. of Sci.) Ryoh Fuji-Hara (Univ. of Tsukuba*)

概要 It is usually to design an experiment using treatments and its blocks in the design of experiments. Now consider a set of edges of a complete bipartite graph as a treatments set and suppose the treatments have a structure. Then, we propose a new combinatorial structure (named spanning bipartite block design) to achieve better estimation accuracy. In this talk, we introduce spanning bipartite block designs and its constructions.

- 28 行木 孝夫 (北大理) てんかん発作時の高周波振動に現れる力学系 …………… *
- 津田 一郎 (中部大創発学院・中部大AI数理データサイエンスセンター) Discrete dynamical system for high frequency oscillation in epileptic seizures
- 梶川 駿介 (京大医) Ichiro Tsuda (Chubu Univ./Chubu Univ.)
- 松橋 眞生 (京大医) Shunsuke Kajikawa (Kyoto Univ.)
- 池田 昭夫 (京大医) Masao Matsuhashi (Kyoto Univ.)
- Akio Ikeda (Kyoto Univ.)

概要 We focused on the high-frequency oscillation of the EEG waveform in the epileptic focus during seizures, and applied chaotic time series analysis. As a result, a type of discrete dynamical system is found. In the presentation the orbit structure of the dynamical system is discussed.

- 29 柿 沢 佳 秀 (北 大 経 済) レングス・バイアスデータに対する非対称カーネル密度推定について … *
Yoshihide Kakizawa (Hokkaido Univ.) On asymmetric kernel density estimation for biased data

概要 For the data supported on $[0, \infty)$ or $[0, 1]$, the so-called boundary bias problem is one of the interests, and asymmetric kernel (AK) density estimation has been well studied. In this talk, we consider a situation where a random sample $\{X_1, \dots, X_n\}$ is not directly available but the data $\{Y_1, \dots, Y_n\}$ is instead observed from the length-biased density, and we propose two density estimators, on the basis of the AK method.

- 30 佃 康 司 (九 大 数 理) 二つの母共分散行列の共通主成分性に対する高次元検定 …………… *
松 浦 峻 (慶 大 理 工)
Koji Tsukuda (Kyushu Univ.) High-dimensional testing for common principal components hypothesis
Shun Matsuura (Keio Univ.) on two covariance matrices

概要 For analyzing multivariate data seen as a realization of samples from more than one populations, the common principal component analysis is widely employed. Hence, testing its assumption, the population covariance matrices are simultaneously diagonalizable (CPC hypothesis), has been discussed in the literature. However, test procedures proposed so far have not assumed a so-called high-dimensional situation that means there are a lot of observed variables compared with the sample sizes. In this presentation, we propose a procedure to test the CPC hypothesis on two population covariance matrices when two sample sizes are less than the number of variables based on the asymptotic normality of the trace of products of four independent Wishart matrices under a high-dimensional regime.

- 31 江 頭 健 斗 (筑波大数理物質) 高次元における多クラス SVM の漸近的性質 …………… *
Kento Egashira (Univ. of Tsukuba) Asymptotic properties of multicategory support vector machine under high dimensional settings

概要 We investigate asymptotic properties of the multicategory support vector machine (MSVM) theoretically under high dimensional settings. First, we show that MSVM includes a huge bias caused by heterogeneity of covariance matrices or sample imbalance under high dimensional settings. To overcome such difficulties, we propose a bias corrected-MSVM (BC-MSVM) and show that the BC-MSVM can enjoy consistency properties about misclassification rates. Finally, we check the performances of our proposed method by numerical simulations.

- 32 橋 本 真 太 郎 (広島大先進理工) 非正則モデルに対するベイズ予測型確率一致事前分布について …………… *
Shintaro Hashimoto (Hiroshima Univ.) Predictive probability matching priors for non-regular models

概要 Probability matching priors for Bayesian prediction in non-regular case are considered. For one-parameter family of distributions, the resulting priors match the posterior predictive quantile with the frequentist one up to the order of $o(n^{-2})$, and they are solutions of a certain differential equation (denoted by matching equation). Although predictive probability matching priors depend on a nominal rate α in general, we provide a prior which satisfy the matching equation for every nominal rate α in non-regular location and scale models. A multi-parameter extension including location-scale model is also discussed.

- 33 小 池 健 一 (日 大 商) Bobrovsky–Mayor–Wolf–Zakai の下界の改良 …………… *
橋 本 真 太 郎 (広島大先進理工)
Ken-ichi Koike (Nihon Univ.) Improvement of Bobrovsky–Mayor–Wolf–Zakai bound
Shintaro Hashimoto (Hiroshima Univ.)

概要 We show a difference-type lower bound for the Bayes risk as an extension of the Borovkov–Sakhanenko bound. The resulting bound asymptotically improves the Bobrovsky–Mayor–Wolf–Zakai bound which is a difference-type extension of the Van Trees bound. Some examples are also given.

応 用 数 学

9月14日(火) 第VIII会場

午 前

- 1 藤田 慎也 (横浜市大データサイエンス) グラフの安全集合に関する最近の結果と未解決問題について *
- Shinya Fujita (Yokohama City Univ.) Recent results and open problems on safe sets in graphs

概要 Some recent results and open problems on safe sets in graphs will be reviewed.

- 2 弘畑 和秀 (茨城工高専) Vertex-disjoint chorded cycles and degree sum conditions *
- R. J. Gould (Emory Univ.)
A. Keller Rorabaugh (Univ. of Tennessee)
Kazuhide Hirohata (Ibaraki Nat. Coll. of Tech.) Vertex-disjoint chorded cycles and degree sum conditions
Ronald J. Gould (Emory Univ.)
Ariel Keller Rorabaugh (Univ. of Tennessee)

概要 Let k be a positive integer. In 1963, Corradi and Hajnal proved that if G is a graph of order at least $3k$ and the minimum degree of G is at least $2k$, then G contains k vertex-disjoint cycles. Finkel proved an analogous result for chorded cycles, and Chiba et al. improved Finkel's result. In this talk, we consider the extension of these results.

- 3 R. E. L. Aldred (Univ. of Otago) 閉曲面上のグラフにおける距離が離れたマッチングの拡張問題とその一
藤 沢 潤 (慶大商) 般化 *
- Robert E. L. Aldred (Univ. of Otago) Generalization of the distance restricted matching extension problem in
Jun Fujisawa (Keio Univ.) graphs on surfaces

概要 In this talk, we show the following result. Let G be a 5-connected triangulation of sufficiently large face-width, and let H_1, H_2, \dots, H_m be connected subgraphs of G of order at most 4 such that any two of them are at distance at least 9 in G . Then $G - (H_1 \cup H_2 \cup \dots \cup H_m)$ has a perfect matching if it has an even order. We also discuss the case where H_i is much larger.

- 4 盧 暁南 (山梨大工) Searching for edges in a multi-partite graph *
- Xiao-Nan Lu (Univ. of Yamanashi) Searching for edges in a multi-partite graph

概要 In this talk, I am devoted to introducing a new graph searching problem restricted on multi-partite graphs. This problem is motivated by the studies in combinatorial interaction testing, which is a method commonly used for software testing in computer science and engineering. In particular, I will focus on the problems for the complete multi-partite graph where each partite set has exactly two vertices. Then, some results on upper bounds derived from algorithmic approaches will be proposed.

- 5 石川 彩香 (横浜国大理工) セゲディウォークが対応する佐藤ゼータ関数 *
- Ayaka Ishikawa (Yokohama Nat. Univ.) The Sato zeta function corresponding to the Szegedy walk

概要 The Szegedy walk is a quantum walk that is a generalization of the Grover walk. Konno and Sato gave the eigenvalues of the Grover transition matrix using the Sato zeta function. However, such a relationship between a graph zeta function and the Szegedy walk is not yet known. In this talk, we show a new graph zeta function associated with the Szegedy walk. We also give a determinant expression called the Ihara expression. It is the significant expression for a graph zeta function and a useful one to get the eigenvalues for the transition matrix of a quantum walk.

- 6 黄海 仲星 (横浜国大理工) Strongly trapped space-inhomogeneous quantum walks in one dimension
齋藤 湊 (神奈川大工) *
- Chusei Kiumi (Yokohama Nat. Univ.) Strongly trapped space-inhomogeneous quantum walks in one dimension
Kei Saito (Kanagawa Univ.)

概要 Localization is a characteristic phenomenon of space-inhomogeneous quantum walks in one dimension. Additionally, eigenvectors of time evolution operators are deeply related to the amount of localization. In this research, we introduce the analytical method for the eigenvalue problem using a transfer matrix to quantitatively evaluate localization by deriving the time-averaged limit distribution and reveal the condition of strong trapping.

- 7 西井 康郎 (筑波大システム情報) フランクル予想の補集合上の近似 *
- Yasuo Nishii (Univ. of Tsukuba) Approximation of Frankl's conjecture in the complement family

概要 In this study, we propose an approximation of Frankl's conjecture in the complement \mathcal{C} of a union-closed family \mathcal{F} in the power set of $U = \{1, \dots, n\}$. Frankl's conjecture is the statement that at least half the members of \mathcal{F} contain some common element k in U and it is equivalent to at most half the members of \mathcal{C} containing some k . This study proves that at most $1/2 + 1/2n$ of the members in \mathcal{C} contain some common element k . In addition, we show that, for arbitrarily small $\epsilon > 0$ and any constant c such that $1 > c > 0$, almost all union-closed families \mathcal{F} have at least $1/2 - \epsilon$ of the members which contain some k when $|\mathcal{F}| > c \cdot 2^n$.

14:25~15:30

- 8 吉田 裕哉 (名大多元数理)^Z 古典量子差分プライバシーの数学的側面 15
- Yuuya Yoshida (Nagoya Univ.) Mathematical aspects of classical-quantum differential privacy

概要 Let $\epsilon > 0$ be a real number and $n \geq 2$ be an integer. An n -tuple $(p_i)_{i=1}^n$ of probability vectors is called (classical) ϵ -differentially private (ϵ -DP) if $e^\epsilon p_j - p_i$ has no negative entries for all $i, j = 1, \dots, n$. An n -tuple $(\rho_i)_{i=1}^n$ of density matrices is called classical-quantum ϵ -differentially private (CQ ϵ -DP) if $e^\epsilon \rho_j - \rho_i$ is positive semi-definite for all $i, j = 1, \dots, n$. Differential privacy (DP) was born in the study to utilize private data while protecting them (privacy-preserving data mining, PPDM). In this talk, I talk about mathematical aspects of classical-quantum differential privacy (CQ-DP).

- 9 奈良知恵 (明大MIMS)^Z 連続的平坦化:正24胞体の2次元スケルトン 15
- 伊藤 仁一 (嵯山女学園大教育)
- Chie Nara (Meiji Univ.) Continuous flattening: the 2-skeleton of a regular 24-cell
Jin-ichi Itoh (Sugiyama Jogakuen Univ.)

概要 We can continuously flatten the surface of a regular octahedron onto any of its faces without stretching and cutting. This is accomplished by moving creases to change the shapes of some faces successively, following Sabitov's volume preserving theorem. We extend this result to a regular 24-cell by considering the 2-dimensional skeleton of a polytope, corresponding to the surface of a three-dimensional polyhedron.

- 10 八 森 正 泰 (筑波大システム情報)^Z Nonpure な単体的複体における分割可能性の階層 15
 Masahiro Hachimori Hierarchy of partitions on nonpure simplicial complexes
 (Univ. of Tsukuba)

概要 For nonpure simplicial complexes, we define four kinds of strengthenings of partitionability: (A) layer-compatibly partitionable, (B) h -compatibly partitionable, (C) sequentially partitionable, and (D) ps-partitionable. While (A) and (B) are equivalent, the rest form a hierarchy so that (A)(or (B)) implies (C) and (C) implies (D). We discuss the gaps between (A)(or (B)) and (C), (C) and (D), and (D) and partitionability.

- 11 池 田 裕 弥 (広島大先進理工)^Z ベクトル束上のデザイン 10
 Yuya Ikeda (Hiroshima Univ.) Designs on vector bundles

概要 Let M be a homogenous G -space. Fix H as a G -representation consisting of continuous functions on M and denote by S the G -invariant averaging operator on M . A finite subset X of M is called a “design” for (H, S) if the averaging operator S on M is same as the averaging operator on X for H . Designs on spheres, unitary groups and some other compact symmetric spaces have been studied by many researchers in the area of combinatorics. In this talk, we consider G -equivariant vector bundles E on M , and generalize the concept of designs for G -representations H consisting of continuous sections of E , and G -intertwining operators S on H .

15:45~16:45 特別講演

- 城 本 啓 介 (熊本大自然)^Z マトロイドの臨界問題について
 Keisuke Shiromoto (Kumamoto Univ.) Critical Problem for matroids

概要 The *Critical Problem* in matroid theory is the problem for finding the maximum dimension of a subspace that contains no element of a fixed subset S of \mathbb{F}_q^k . This problem was introduced by H. Crapo and G.-C. Rota in 1970 to formulate a number of problems in extremal combinatorial theory including fundamental graph-theoretic problems. The *critical exponent* for the representable matroid M_S over \mathbb{F}_q from a given subset $S \subseteq \mathbb{F}_q^k - \{\mathbf{0}\}$ is defined by

$$c(M_S; q) := k - \max\{\dim D : D \leq \mathbb{F}_q^k \text{ and } D \cap S = \emptyset\}.$$

Thus the Critical Problem is equivalent to determine the critical exponent of a representable matroid. One of the most interesting aspects of this problem is that the critical exponent is an analogue of the *chromatic number* of a graph. Another interesting aspect of this problem is that the critical exponent is corresponding to the *covering dimension* of a linear code over a finite field. This problem also has some applications to other research areas, for instance, the problem of correcting a black and white pixel image with respect to two possible corrected images, one light and one dark.

In this talk, we will introduce some historical prospects and some open problems related to this problem. In addition, we will show the combinatorial approaches including coding theory to these problems.

9月15日(水) 第VIII会場

10:00~12:00

- 12 佐藤 巖 (小山工高専)^Z Grover/Zeta 対応 15
 今野 紀雄 (横浜国大工)
 小松 堯
 (産業数理研究所Calc・広島大先進理工)
Iwao Sato (Oyama Nat. Coll. of Tech.) Grover/Zeta correspondence
Norio Konno (Yokohama Nat. Univ.)
Takashi Komatsu
 (Math. Res. Inst. Calc for Industry/Hiroshima Univ.)

概要 Recently the Ihara zeta function for the finite graph was extended to infinite one by Clair and Chinta et al. In this paper, we obtain the same expressions by a different approach from their analytical method. Our new approach is to take a suitable limit of a sequence of finite graphs via the Konno–Sato theorem. This theorem is related to explicit formulas of characteristic polynomials for the evolution matrix of the Grover walk. The walk is one of the most well-investigated quantum walks which are quantum counterpart of classical random walks. We call the relation between the Grover walk and the zeta function based on the Konno–Sato theorem “Grover/Zeta Correspondence” here.

- 13 小松 堯 ^Z Walk/Zeta 対応 15
 (産業数理研究所Calc・広島大先進理工)
 今野 紀雄 (横浜国大工)
 佐藤 巖 (小山工高専)
Takashi Komatsu Walk/Zeta correspondence
 (Math. Res. Inst. Calc for Industry/Hiroshima Univ.)
Norio Konno (Yokohama Nat. Univ.)
Iwao Sato (Oyama Nat. Coll. of Tech.)

概要 Our previous work presented explicit formulas for the generalized zeta function and the generalized Ihara zeta function corresponding to the Grover walk and the positive-support version of the Grover walk on the regular graph via the Konno–Sato theorem, respectively. In this talk, extends these walks to a class of walks including random walks, correlated random walks, quantum walks, and open quantum random walks on the torus by the Fourier analysis.

- 14 和田 和幸 (八戸工高専)^Z 非フレドホルムスプリットステップ量子ウォークのウィッテン指数 15
 鈴木 章斗 (信州大工)
 田中 洋平 (信州大工)
 寺西 功哲 (北大理)
 松澤 泰道 (信州大教育)
Kazuyuki Wada The Witten index of the non-Fredholm split-step quantum walks
 (Nat. Inst. of Tech., Hachinohe Coll.)
Akito Suzuki (Shinshu Univ.)
Yohei Tanaka (Shinshu Univ.)
Noriaki Teranishi (Hokkaido Univ.)
Yasumichi Matsuzawa (Shinshu Univ.)

概要 We establish the index theorem for one-dimensional split-step quantum walks without assuming Fredholm properties. We employ the spectral shift function induced by the fourth-order difference operator with a rank one perturbation on the half-line. Under some conditions, the Witten index only depends on parameters of two-side limits. Especially, a half-integer index appears.

- 15 安藤 清 (国立情報学研)^Z A constructive characterization of 4-connected graphs 15
 Kiyoshi Ando (Nat. Inst. of Informatics) A constructive characterization of 4-connected graphs

概要 Tutte gave a constructive characterization of 3-connected graphs.

Theorem (Tutte's Wheel Theorem, 1961) Every 3-connected graph can be obtained from a wheel by repeated applications of edge additions and proper vertex-splittings.

In this talk we give a 4-connected analogue of Tutte's Wheel Theorem.

- 16 野口 健太 (東京理大理工)^Z 特別な 2-因子のみをもつ 3-正則グラフについて 15
 松本 直己 (慶大 DMC)
 八島 高将 (成蹊大理工)
 Kenta Noguchi (Tokyo Univ. of Sci.) Cubic graphs having only k -cycles in each 2-factor
 Naoki Matsumoto (Keio Univ.)
 Takamasa Yashima (Seikei Univ.)

概要 We consider the class of 2-connected cubic graphs having only k -cycles in each 2-factor, and obtain the following two results: (i) Every 2-connected cubic graph having only 8-cycles in each 2-factor is isomorphic to a unique Hamiltonian graph of order 8; and (ii) A 2-connected cubic planar graph G has only k -cycles in each 2-factor if and only if $k = 4$ and G is the complete graph of order 4.

- 17 久保田 匠 (横浜国大工)^Z Combinatorial necessary conditions for regular graphs to induce periodic quantum walks 15
 Sho Kubota (Yokohama Nat. Univ.) Combinatorial necessary conditions for regular graphs to induce periodic quantum walks

概要 We derive combinatorial necessary conditions for discrete-time quantum walks defined by regular mixed graphs to be periodic. If the quantum walk is periodic, all the eigenvalues of the time evolution matrices must be algebraic integers. Focusing on this, we explore which ring the coefficients of the characteristic polynomials should belong to. On the other hand, the coefficients of the characteristic polynomials of η -Hermitian adjacency matrices have combinatorial implications. From these, we can find combinatorial implications in the coefficients of the characteristic polynomials of the time evolution matrices, and thus derive combinatorial necessary conditions for mixed graphs to be periodic. For example, if a k -regular mixed graph with n vertices is periodic, then $2n/k$ must be an integer. As an application of this work, we determine periodicity of mixed complete graphs and mixed graphs with a prime number of vertices.

9月16日(木) 第VIII会場

9:30~10:45

- 18 小川 知之 (明大総合数理)^Z Four-scroll attractor model の幾何学的構造について 15
 関坂 歩幹 (明大研究・知財)
 Toshiyuki Ogawa (Meiji Univ.) Geometrical structures of a four-scroll attractor model
 Ayuki Sekisaka (Meiji Univ.)

概要 We consider a four-scroll attractor model proposed by Pehlivan. This model has chaotic attractor and several interesting structures. In this talk, this model has the Poisson structure, and it characterizes unbounded orbits.

- 19 坂上 貴之 (京大理)^Z 端点を持つ有限長渦層の線形安定性と回転運動 15
 B. Protas (McMaster Univ.)
 S. Llewellyn Smith
 (UCSD)
Takashi Sakajo (Kyoto Univ.) Rotating and translating vortex sheet equilibria with endpoints
Bartosz Protas (McMaster Univ.)
Stefan Llewellyn Smith (UCSD)

概要 The rotating and translating equilibria of open finite vortex sheets with endpoints in two-dimensional potential flows are considered. First, we show that they are linearly unstable. Moreover, while in the rotating case unstable perturbations grow exponentially fast in time, the growth of such perturbations in the translating case is algebraic. Second, we analyze equations describing the time evolution of a straight vortex sheet in linear external fields. Third, it is demonstrated that the results concerning the linear stability analysis of the rotating sheet are consistent with the infinite-aspect-ratio limit of the stability results known for Kirchhoff's ellipse.

- 20 坂上 貴之 (京大理)^Z トーラス面上の反応拡散方程式のスポットダイナミクス 15
王 鵬皓 (京大理)
Takashi Sakajo (Kyoto Univ.) Spot dynamics of a reaction-diffusion equation on the surface of a torus
Penghao Wang (Kyoto Univ.)

概要 Quasi-stationary states consisting of localized spots in a reaction-diffusion system are considered when they are on the surface of a torus. Suppose that the localized spots persist stably. Then the evolution equation of the spot cores is derived analytically based on the higher-order matched asymptotic expansion with the analytic expression of the Green's function of the Laplace–Beltrami operator on the surface. The analytic representation yields equilibria with a single spot, two spots, and the ring configuration where N localized spots are equally spaced along a latitudinal line. The theoretical results and the linear stability of these spot equilibria are compared numerically by using the Brusselator reaction-diffusion model.

- 21 榎原 航也 (岡山理大理)^Z バイドメインモデルにおける解の漸近挙動 15
奈良 光紀 (岩手大理工)
俣野 博 (明大MIMS)
森 洋一朗
 (Univ. of Pennsylvania)
Koya Sakakibara Asymptotic behavior of solutions of the bidomain model
 (Okayama Univ. of Sci.)
Mitsunori Nara (Iwate Univ.)
Hiroshi Matano (Meiji Univ.)
Yoichiro Mori (Univ. of Pennsylvania)

概要 We study the asymptotic behavior of fronts and pulses of the bidomain model. We show that a zigzag-shaped solution appears as a Hopf bifurcation from an unstable front and confirm that the type of bifurcation depends on the parameters. In addition, for the pulse solution, we show that it either becomes a zigzag pulse or tears off and disappears.

11:00~12:00 特別講演

横山 知郎 (岐阜大工)^Z トポロジカルな流れの解析とその応用について
Tomoo Yokoyama (Gifu Univ.) Topological flow analysis and its application

概要 First, we review a relation between dynamical systems and topology and fundamental results in hyperbolic dynamical systems and Hamiltonian systems. Moreover, we recall classifications and existing topological invariants of dynamical systems. Especially, we discuss the finiteness and completeness of topological invariants of flows on surfaces. Second, we review the representability and implementability of topological invariants. We introduce a partially Cyclically Ordered rooted Tree (COT) representation of “generic” flows on compact surfaces, which is complete for flows of finite type on surfaces and implementable. Moreover, all generic transitions of generic Hamiltonian flows on compact surfaces can be described as abstract graphs, whose edges are generic transitions between pairs of generic Hamiltonian flows. In addition, we introduce several applications of topological invariants of flows to data. Third, to analyze dynamical systems directly, we introduce new topological invariants for flows and homeomorphisms, called abstract weak orbit spaces. In fact, the invariants are refinements of Morse graphs of flows on compact metric spaces, Reeb graphs of Hamiltonian flows with finitely many singular points on surfaces, and the CW decompositions which consist of the unstable manifolds of singular points for Morse flows on closed manifolds. Though the CW decomposition of a Morse flow is finite, the intersection of the unstable manifold and the stable manifold of closed orbits of a Morse–Smale flow need not consist of finitely many connected components. Therefore we show some kinds of the finiteness of Morse–Smale flows on compact manifolds. Moreover, we consider when the time-one map reconstructs the topology of the original flow. We show that the orbit space of a Hamiltonian flow with finitely many singular points on a compact surface is homeomorphic to the abstract weak orbit space of the time-one map by taking an arbitrarily small reparametrization and that the abstract weak orbit spaces of a Morse flow on a compact manifold and the time-one map are homeomorphic. In addition, we state several examples whose Morse graphs are singletons but whose abstract weak orbit spaces are not singletons. Finally, we discuss the application possibilities of the topological invariants.

14:25~15:35

- 22 野津 裕史 (金沢大理工)^Z 一般化 Lie 微分に基づく上対流微分の時間 2 次精度近似 15
D. O. Medeiros (Univ. of São Paulo)
C. M. Oishi
(São Paulo State Univ.)
Hirofumi Notsu (Kanazawa Univ.) A second-order approximation in time of the upper-convected time derivative based on the generalized Lie derivative
Débora O. Medeiros
(Univ. of São Paulo)
Cassio M. Oishi (São Paulo State Univ.)

概要 A temporal second-order approximation is presented for dealing with the upper-convected time derivative based on the generalized Lie derivative. The upper-convected time derivative is usually encountered in the constitutive equation of the popular viscoelastic models and is reformulated in the framework of the generalized Lie derivative. For the temporal second-order approximation based on the framework, we prove the truncation error of second-order in time. Combining with the finite difference method, we also prove the final truncation errors of second-order in time and of first- or second-order in space. The theoretical results are observed in numerical experiments for model equations.

- 23 栄伸一郎 (北大理)^Z 修正ヘルムホルツ方程式の円領域上の Neumann 問題に対する基本解近
 落合啓之 (九大IM1) 似解法 15
 田中吉太郎 (公立はこだて未来大)

Shin-ichiro Ei (Hokkaido Univ.) Method of fundamental solutions for Neumann problems of the modified
 Hiroyuki Ochiai (Kyushu Univ.) Helmholtz equation in disk domains
 Yoshitaro Tanaka
 (Future Univ.-Hakodate)

概要 The method of the fundamental solutions (MFS) is used to construct an approximate solution for a partial differential equation in a bounded domain. It is demonstrated by combining the fundamental solutions shifted to the points outside the domain. In this talk, the existence of the approximate solution by the MFS for the Neumann problems of the modified Helmholtz equation in disk domains is rigorously shown. We reveal the sufficient condition of the existence of the approximate solution. Moreover, using the energy method, we show the convergence of the approximate solution by the MFS to the exact solution with exponential order, that is, $N^2 a^N$ order, where a is a positive constant less than one and N is the number of collocation points.

- 24 森竜樹 (武蔵野大工)^Z Semi-analytical methods of obtaining bifurcation diagrams for a cell
 辻川亨 (宮崎大*) polarization model 15
 四ツ谷晶二 (龍谷大*)

Tatsuki Mori (Musashino Univ.) Semi-analytical methods of obtaining bifurcation diagrams for a cell
 Tohru Tsujikawa (Univ. of Miyazaki*) polarization model
 Shoji Yotsutani (Ryukoku Univ.*)

概要 We are interested in the global bifurcation structure of solutions for a nonlinear boundary value problem with nonlocal constraint that appears in a cell polarization model with mass conservation proposed by Y. Mori, A. Jilkin and L. Edelstein-Keshet (SIAM J. Appl. Math., 2011). We obtained primitive representation formulas of all solutions, and investigated a surface consisting of all bifurcation diagrams with heights. However, we could not find any parameterization of the surface. Recently, we have obtained parameterizations of the surface. In this talk, we propose new methods in view of them. By virtue of them, the speed of numerical computation becomes much faster and the approximate values obtained are going to be more accurate.

- 25 大田靖 (桃山学院大経営)^Z Inverse parabolic problem with the Heaviside function arising in finance
 鍛冶俊輔 (名城大理工) 15

Yasushi Ota (St. Andrew's Univ.) Inverse parabolic problem with the Heaviside function arising in finance
 Shunsuke Kaji (Meijo Univ.)

概要 The inverse problem arising in finance is both mathematically and practically interesting problem. First, we attempt to solve the inverse problem arising in binary option model. Using a standard linearization and contraction arguments, we prove the stability and uniqueness of the solution of the inverse problem which originates from the diffusion equation with the initial condition given by the Heaviside function. Second, we numerically identify the local volatilities from given artificial prices of the binary option. In accordance with theory we propose the effective identification around the at-the-money level.

15:50~16:50 特別講演

秋山正和 (明大 MIMS)^Z 生物の左右性形成に関する数理的研究について

Masakazu Akiyama (Meiji Univ.) A mathematical study on the left-right asymmetry of living organisms

概要 I have been interested in the patterns and morphogenesis of living organisms and have continued my research. Especially recent 5 years, in some research projects, I am trying to explore the essence of phenomena while building mathematical models in collaboration with experimental researchers. This time, I will introduce a mathematical study on the left-right asymmetry of living organisms.

Like humans, flies have asymmetrical organ arrangements. In particular, some intestinal organs, called the hindgut, are known to form left-right asymmetry faster than any other organ, but the essential mechanism is unknown.

We constructed a 3D model of the hindgut with cells as the smallest unit. Then, the calculation simulation suggested that the twisting of cells may induce left-right asymmetry. In the talk, I would like to talk about the above details.

9月17日(金) 第VIII会場

10:30~12:00

- 26 國府寛司 (京大理)^Z 力学系のリザーバー計算: ロジスティック写像の場合 15
原 誠人 (京大理)

Hiroshi Kokubu (Kyoto Univ.) Learning dynamics by reservoir computing: Case of the logistic maps
Masato Hara (Kyoto Univ.)

概要 Reservoir computing is a kind of machine learning using recurrent neural networks. The learning of the reservoir computing is done only with the output weight vector, and hence the learning is very easy and cheap. In this talk we study the learning of the reservoir computing with a specific target dynamical system, namely the logistic maps, and exhibit several numerical results that suggest a mathematical mechanism for the success of the learning.

- 27 國府寛司 (京大理)^Z 力学系のリザーバー計算: ある数学的枠組み 15
原 誠人 (京大理)

Hiroshi Kokubu (Kyoto Univ.) Learning dynamics by reservoir computing: A mathematical framework
Masato Hara (Kyoto Univ.)

概要 Reservoir computing is a kind of machine learning using recurrent neural networks. The learning of the reservoir computing is done only with the output weight vector, and hence the learning is very easy and cheap. In this talk, following the previous talk, we propose a mathematical framework that describes a mechanism explaining why the reservoir computing works well for learning dynamics, under some nice assumptions including the invertibility of the target dynamical system.

- 28 岩崎 悟 (阪大情報)^Z 2頂点を持つメトリックグラフ上の反応拡散方程式のフロント定在波 .. 15
神保 秀一 (北大理)
森田 善久 (龍谷大先端理工)

Satoru Iwasaki (Osaka Univ.) Standing waves of reaction-diffusion equations on an infinite graph with
Shuichi Jimbo (Hokkaido Univ.) two vertices
Yoshihisa Morita (Ryukoku Univ.)

概要 We study standing waves of reaction-diffusion equations on an infinite graph with two vertices. In particular, we reveal a relation between a number of standing waves and a length of one of edges. Furthermore, their stabilities are also studied by spectral analysis of linearized operators and comparison principles.

- 29 渡辺 雅二 (岡山 大*)^Z 合成ポリマー生分解プロセスに関する数理的考察 15
 河合 富佐子 (岡山 大*)
 木村 幸敬 (岡山大環境生命)
 Masaji Watanabe (Okayama Univ.*) Mathematical study on biodegradation of synthetic polymer
 Fusako Kawai (Okayama Univ.*)
 Yukitaka Kimura (Okayama Univ.)

概要 This presentation focuses on mathematical study of biodegradation of synthetic polymers. Its outline includes description of mathematical model, illustration of numerical techniques, and presentation of numerical results.

- 30 長山 雅晴 (北大電子研)^Z 自己駆動液滴の集合現象に対する数理モデリング 15
 Minsoo Kim (北大 理)
 小林 康明 (北大電子研)
 中田 聡 (広島大理)
 田中 晋平 (広島大理)
 Masaharu Nagayama (Hokkaido Univ.) Mathematical modeling for the clustering phenomenon of self-propelled
 Minsoo Kim (Hokkaido Univ.) oil-droplets
 Yasuaki Kobayashi (Hokkaido Univ.)
 Satoshi Nakata (Hiroshima Univ.)
 Shi-npei Tanaka (Hiroshima Univ.)

概要 We experimentally and numerically investigate collective behaviors of oil droplets floating on a surfactant solution in a narrow circular channel. In a closed environment where a glass cover is placed on the channel, it is shown that ethyl salicylate droplets on the surface of sodium dodecyl sulfate solution exhibit transient oscillatory dynamics, which leads to the formation of a single cluster via the merging of sub-clusters. To understand these experimental findings, we introduce a mathematical model that combines equations of motion for droplets with a reaction-diffusion system, where droplet dynamics and the chemical reactions are considered on the one-dimensional surface, and the diffusion of chemicals in the air phase and the water phase is treated in the two-dimensional region. We argue that the attractive long-range interaction due to the global concentration profile of the solution suffices for cluster formation.

午後

- 31 渡部 善隆 Kolmogorov 問題の対称性破壊分岐点に対する計算機援用証明 *
- (九大情報基盤研究開発センター)
 蔡 姝婷 (福建江夏学院)
 Yoshitaka Watanabe (Kyushu Univ.) Computer-assisted proofs of a symmetry-breaking bifurcation point for
 Shuting Cai (Fujian Jiangxia Univ.) the Kolmogorov problem

概要 We propose a computer-assisted method to prove the existence of a symmetry-breaking bifurcation point for the Kolmogorov problem. First, we numerically show that a symmetry-breaking bifurcation point exists. Then, according to the symmetric property, we define a symmetric operator. Using this operator, we divide the space into a symmetric space and an antisymmetric space. Then, considering the Reynolds number as a variable, we construct an extended system. We confirm the existence of the symmetry-breaking bifurcation point by computer-assisted proofs of the extended system that satisfies both conditions of a bifurcation theorem.

- 32 榎原航也 (岡山理大理・理化学研) 基本解近似解法を用いた磁性流体の Hele-Shaw 問題に対する数値計算 . . . *
 下地優作 (明大理工)
 矢崎成俊 (明大理工)
 Koya Sakakibara Numerical computations for magnetic Hele-Shaw problems by the method
 (Okayama Univ. of Sci./RIKEN) of fundamental solutions
 Yusaku Shimoji (Meiji Univ.)
 Shigetoshi Yazaki (Meiji Univ.)

概要 Magnetic fluids in Hele-Shaw cells create intriguing patterns. We propose a simple numerical method for Hele-Shaw type problems by the method of fundamental solutions and apply the method for magnetic Hele-Shaw problems. The method of fundamental solutions is one of the mesh-free numerical solvers for potential problems, which provides a highly accurate approximate solution despite its simplicity. Moreover, combining with the asymptotic uniform distribution method, the numerical method satisfies the volume-preserving property. We use Amano's method to arrange the singular points in the method of fundamental solutions. We show several numerical results to exemplify the effectiveness of our numerical scheme.

- 33 小山大介 (電通大) 重調和問題に対する内部ペナルティ法で生ずる行列の条件数の評価 *
 Daisuke Koyama Estimates of the condition number of matrices arising in an interior
 (Univ. of Electro-Comm.) penalty method for the biharmonic problem

概要 An interior penalty (IP) method for the biharmonic problem is studied. In the method, the displacement and the stress are approximated by polynomials of degree less than or equal to k and $k - 1$, respectively. In the case when $k = 1$, an a priori error estimate for the stress of the IP method which is the same as that of the Herrmann–Johnson method is obtained by taking a penalty parameter of $O(1/h)$, where h is the mesh size parameter. Huang–Huang [J. Sci. Comput., **69** (2016), 1251–1278] insisted that the penalty parameter should be taken of $O(1/h^2)$ to get the error estimate as above. An estimate for the condition number of a matrix arising in the IP method is established. It implies that the condition number approaches to infinity as the penalty parameter approaches to infinity.

- 34 土屋拓也 (八戸工大) 有限要素法による双曲型偏微分方程式の構造保存数値計算 *
 Takuya Tsuchiya Structure preserving numerical calculation of hyperbolic partial differ-
 (Hachinohe Inst. of Tech.) ential equations with finite element method

概要 We perform numerical calculations of the hyperbolic partial differential equations. In addition, the discretized equations are created by the finite element method with structural preservation, and high-precision numerical simulations are performed. In this talk, we show the method of making discretization with structure preserving finite element method for the advection equations and the wave equations. Additionally, we will talk about the simulations of the Klein–Gordon equation using the structure preserving finite element method.

- 35 小林俊介 (京大理・理化学研) 膨張する円周上で定義された Kuramoto–Sivashinsky 方程式に対する Crank–
 矢崎成俊 (明大理工) Nicolson スキームの存在性・一意性・収束性 *
 Shunsuke Kobayashi On the existence, uniqueness, and convergence of a Crank–Nicolson
 (Kyoto Univ./RIKEN) scheme for the Kuramoto–Sivashinsky equation defined on an expanding
 Shigetoshi Yazaki (Meiji Univ.) circle

概要 This talk will present a finite difference method with the Crank–Nicolson scheme of the Kuramoto–Sivashinsky equation defined on an expanding circle, and the existence, uniqueness, and second-order error estimate of the scheme. The equation can be obtained as a perturbation equation from the circle solution to an interface equation and can provide a guideline for understanding the wavenumber selection of solutions to the interface equation. Our proposed numerical scheme can help such a mathematical analysis.

- 36 本多泰理 (東洋大情報連携) On partial differential equation-based neural network with additional parameters *
- Hirota Honda (Toyo Univ.) On partial differential equation-based neural network with additional parameters

概要 In a recent paper, we presented a neural network that is based on an initial-boundary value problem of partial differential equation. In this talk, we will present an extended version of our method that has additional parameters to be optimized. More concretely, we regard the diffusion coefficient and the terminal time as parameters as well. By considering the multi-class classification task, we shall reveal the explicit form of the Frechet derivative, that will be useful to find an updating algorithm of all parameters.

- 37 市田 優 (明大理工) 負冪の非線形性を持つ消散双曲 MEMS 型偏微分方程式における特異性を有する進行波 *
- Yu Ichida (Meiji Univ.) Traveling waves with singularities in a damped hyperbolic MEMS type equation in the presence of negative powers nonlinearity

概要 In this talk, we investigate how the existence of the traveling waves, their shapes, and asymptotic behavior change with the presence or absence of an inertial term in a damped hyperbolic MEMS type equation in the presence of negative powers nonlinearity. These are studied by applying the framework that combines Poincaré compactification, classical dynamical systems theory, and geometric methods for desingularization of vector fields. These allow us to classify all traveling waves and their properties since we know all the solution trajectories of the equations they satisfy, including those to infinity. We report that the presence of this term causes the shapes to change significantly for sufficiently large wave speed.

- 38 長瀬 准平 (芝浦工大理工) 包除積分ニューラルネットのパーセプトロンによる構成について *
- 本田 あおい (九工大情報工)
- 石渡 哲哉 (芝浦工大システム理工)
- Jumpei Nagase (Shibaura Inst. of Tech.) Constructing inclusion-exclusion integral neural networks with perceptrons
- Aoi Honda (Kyushu Inst. of Tech.)
- Tetsuya Ishiwata (Shibaura Inst. of Tech.)

概要 In this research, we consider the correspondence between Möbius-type inclusion-exclusion integrals and neural networks. The inclusion-exclusion integral proposed by Honda et al. is a generalized integral for non-additive measures. It is known that the inclusion-exclusion integral can be interpreted as a kind of neural network, which has been actively applied in recent years, and its implementation has been discussed. In this research, we clarify the correspondence between the Schoke-type inclusion-exclusion integral and the ReLU perceptron, which has not been addressed in previous research.

- 39 山岸 義和 (龍谷大先端理工) アルキメデス螺旋格子上のポロノイ領域の面積の収束 *
- 須志田 隆道 (サレジオ工高専)
- J.-F. Sadoc (Univ. Paris-Sud)
- Yoshikazu Yamagishi (Ryukoku Univ.) Area convergence of Voronoi cells on spiral lattices
- Takamichi Sushida (Salesian Polytech.)
- Jean-François Sadoc (Univ. Paris-Sud)

概要 An Archimedean spiral lattice with a radial distance exponent α , is locally approximated by linear lattices. If the angle parameter is badly approximable, the area of the Voronoi cell converges if it is properly normalized with α .

トポロジー

9月14日(火) 第IX会場

9:30~12:00

- 1 野崎雄太 (広島大先進理工)^Z On the kernel of the surgery map restricted to the 1-loop part 15
佐藤正寿 (東京電機大未来)
鈴木正明 (明大総合数理)
Yuta Nozaki (Hiroshima Univ.) On the kernel of the surgery map restricted to the 1-loop part
Masatoshi Sato (Tokyo Denki Univ.)
Masaaki Suzuki (Meiji Univ.)

概要 Every homology cylinder is obtained from Jacobi diagrams by clasper surgery. The surgery map $\mathfrak{s}: \mathcal{A}_n^c \rightarrow Y_n \mathcal{IC}_{g,1} / Y_{n+1}$ is surjective for $n \geq 2$, and its kernel is closely related to the symmetry of Jacobi diagrams. We determine the kernel of \mathfrak{s} restricted to the 1-loop part after taking a certain quotient of the target. Also, we introduce refined versions of the AS and STU relations among clasplers and study the abelian group $Y_n \mathcal{IC}_{g,1} / Y_{n+2}$ for $n \geq 2$.

- 2 門田直之 (岡山大理)^Z On minimal generating sets for the mapping class group of a punctured surface 15
Naoyuki Monden (Okayama Univ.) On minimal generating sets for the mapping class group of a punctured surface

概要 Let $\Sigma_{g,p}$ be an oriented surface of genus g with p marked points and no boundary components. We denote by $\mathcal{M}_{g,p}$ and $\mathcal{M}_{g,p}^\pm$ the mapping class group and the extended mapping class group of $\Sigma_{g,p}$, respectively. We show that $\mathcal{M}_{g,p}$ and $\mathcal{M}_{g,p}^\pm$ are generated by two elements for $g \geq 3$ and $p \geq 7$.

- 3 久野恵理香 (阪大理)^Z 向き付け二重被覆に誘導される写像類群間の単射準同型の擬等長埋め込み
片山拓弥 (学習院大理) み性 (1) 10
Erika Kuno (Osaka Univ.) The mapping class group of a nonorientable surface is quasi-isometrically
Takuya Katayama (Gakushuin Univ.) embedded in the mapping class group of the orientation double cover I

概要 Let N be a connected nonorientable surface with or without punctures, and $j: S \rightarrow N$ the orientation double covering. It has previously been proved that the orientation double covering j induces an injective homomorphism $\iota: \text{Mod}(N) \hookrightarrow \text{Mod}(S)$. We prove that this injective homomorphism ι is a quasi-isometric embedding. The key idea of our proof is the semihyperbolicity of the extended mapping class group $\text{Mod}^\pm(S)$, which has already been established.

- 4 片山拓弥 (学習院大理)^Z 向き付け二重被覆に誘導される写像類群間の単射準同型の擬等長埋め込み
久野恵理香 (阪大理) み性 (2) 15
Takuya Katayama (Gakushuin Univ.) The mapping class group of a nonorientable surface is quasi-isometrically
Erika Kuno (Osaka Univ.) embedded in the mapping class group of the orientation double cover II

概要 Paris–Rolfsen and Stukow proved that, for any admissible subsurface F' of a compact surface F such that every component of $F - F'$ has negative Euler characteristic, the natural homomorphism between the mapping class groups is injective. In this talk, we prove that the injective homomorphism is a quasi-isometric embedding. This is a joint work with Erika Kuno.

- 5 片山拓弥 (学習院大理)^Z 直角アルティン群と向き付け不可能曲面の曲線グラフ (1) 15
久野恵理香 (阪大理)
Takuya Katayama (Gakushuin Univ.) Right-angled Artin groups and curve graphs of nonorientable surfaces I
Erika Kuno (Osaka Univ.)

概要 Koberda proved in 2012 that sufficiently high powers of Dehn twists about essential simple closed curves in an orientable surface generate a right-angled Artin group in the mapping class group of the surface. In this talk, we prove that the same holds for the mapping class groups of nonorientable surfaces. This is a joint work with Erika Kuno.

- 6 久野恵理香 (阪大理)^Z 直角アルティン群と向き付け不可能曲面の曲線グラフ (2) 10
片山拓弥 (学習院大理)
Erika Kuno (Osaka Univ.) Right-angled Artin groups and curve graphs of nonorientable surfaces II
Takuya Katayama (Gakushuin Univ.)

概要 Let N be a closed nonorientable surface with or without marked points. We prove that, for every finite full subgraph Γ of $\mathcal{C}^{\text{two}}(N)$, the right-angled Artin group on Γ can be embedded in the mapping class group of N . Here, $\mathcal{C}^{\text{two}}(N)$ is the subgraph, induced by essential two-sided simple closed curves in N , of the ordinal curve graph $\mathcal{C}(N)$. In addition, we show that there exists a finite graph Γ which is not a full subgraph of $\mathcal{C}^{\text{two}}(N)$ for some N , but the right-angled Artin group on Γ can be embedded in the mapping class group of N . In this talk, we focus on the proof of the the latter result.

- 7 丸山修平 (名大多元数理)^Z On the spaces of bounded characteristic classes and non-descendable
川崎盛通 (青学大理工) quasimorphisms 15
Shuhei Maruyama (Nagoya Univ.) On the spaces of bounded characteristic classes and non-descendable
Morimichi Kawasaki quasimorphisms
(Ooyama Gakuin Univ.)

概要 Let G be a connected topological group and \tilde{G} the universal covering group. In this talk, we give an isomorphism between the spaces of bounded (universal) characteristic classes of foliated G -bundles and non-trivial homogeneous quasimorphisms on \tilde{G} which do not descend to G . As a corollary, we clarify the boundedness and unboundedness of specific characteristic classes of foliated symplectic and contact fibrations.

- 8 山崎晃司 (東工大理工)^Z Fibration structure for Gromov h-principle 15
Koji Yamazaki (Tokyo Tech) Fibration structure for Gromov h-principle

概要 H-principle (or homotopy principle) is the property that some solutions to a partial differential equation/inequality can be obtained as a deformed of a formal solution by a homotopy. Gromov defines the *sheaf theoretic h-principle* in his book and shows the existence of h-principle from a very abstract setting. We clarify a categorical structure behind Gromov h-principle. The main result is that a *flexible sheaf* can be understood as a fibrant object in some categories.

14:25~15:25 特別講演

粕谷直彦(北大理)^Z 強擬凹複素曲面の境界に現れる接触構造

Naohiko Kasuya (Hokkaido Univ.) Contact structure on the boundary of a strongly pseudoconcave complex surface

概要 A. J. Di Scala, D. Zuddas and I constructed the first examples of non-Kähler complex structures on the 4-ball B^4 . For our complex structure, the boundary of B^4 can be made to be strongly pseudoconcave and a negative overtwisted contact structure is induced on the boundary 3-sphere. Then, a natural question arises. “Which contact 3-manifold can be realized as the boundary of a strongly pseudoconcave complex surface?” In order to answer this question, we establish the method of holomorphic handle attaching to the strongly pseudoconcave boundary of a complex surface, based on Eliashberg’s construction of Stein manifolds. As a consequence, we prove that every closed co-oriented contact 3-manifold can be filled as the boundary of a strongly pseudoconcave complex surface. This is a joint work with Daniele Zuddas.

15:50~16:45

9 岡島宏樹(高知大総合人間自然)^Z 球面の安定ホモトピー群のギリシャ文字元について …………… 10

Hiroki Okajima (Kochi Univ.) A note on the Greek letter elements in the stable homotopy groups of spheres

概要 The β -elements in the stable homotopy groups $\pi_*(S^0)$ of spheres are studied by many authors such as H. Toda, L. Smith and S. Oka. For the homotopy groups themselves, A. Yabe and K. Shimomura determined the stable homotopy groups of L_2 -local spheres. H. R. Miller, D. C. Ravenel, W. S. Wilson and K. Shimomura studied products of β -elements in $\pi_*(L_2S^0)$. Here, L_2 is the Bousfield localization functor with respect to the Johnson–Wilson spectrum $E(2)$. Ravenel defined a beta element, which is not determined uniquely. We study these elements and show that the number of beta elements of the same name is at most two. We further consider $\pi_*(L_2S^0)$ as well as $\pi_*(S^0)$, and obtain some results on products of these.

10 大島慶之(島根大自然)^Z 様々な連結性と一般化された逆極限 …………… 15

Yoshiyuki Oshima (Shimane Univ.) Various connectedness and generalized inverse limits

概要 In 1954, Capel showed that local connectedness is preserved under inverse limits with monotone bonding maps. And, in 2020, Espinoza and Matsushashi showed that *n-aposyndesis*, *semi-aposyndesis*, *continuum-chainability*, *Wilder, D, D**, and *co-local connectedness* are also preserved under inverse limits with monotone bonding maps. On the other hand, in 2017, Kelly generalized Capel’s theorem. In fact, he showed inverse limits with monotone set-valued bonding functions on $[0, 1]$ are locally connected. In this talk, I will talk whether the results above by Espinoza and Matsushashi are correct or not under inverse limits with monotone set-valued bonding functions.

11 南 範彦(名工大)^Z 有限群 G の分類空間 BG と. 低次有理性=高次線織性の観点からアップグレードした, 有限群 G の Noether 問題 …………… 15

Norihiko Minami (Nagoya Inst. of Tech.) Classifying space of finite group BG and the Noether’s program of finite group G , upgraded from the view point of lower rationality = higher ruledness

概要 I shall report how the group cohomology calculation, which is familiar to topologists, allow us to give counter examples of finite groups to the upgraded Noether’s program from the view point of lower rationality = higher ruledness

9月15日(水) 第IX会場

10:10~10:20 2021年度日本数学会幾何学賞受賞者紹介

10:35~11:35 2021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)

河澄 響 矢 (東大数理)^Z 写像類群のリー代数を求めて

久野 雄介 (津田塾大学芸)

Nariya Kawazumi (Univ. of Tokyo) In search of the Lie algebra of the mapping class group

Yusuke Kuno (Tsuda Coll.)

概要 Given an oriented surface, one can consider the associated graded Lie algebra of the filtration of its mapping class group that is defined by the lower central series of the fundamental group of the surface. The Johnson homomorphism is an injective graded Lie homomorphism from this Lie algebra to the Lie algebra of symplectic derivations. In this talk, we explain a geometric approach to the Johnson homomorphism using the Goldman–Turaev Lie bialgebra of the surface. In particular, we show that the Kashiwara–Vergne problem, which originates in Lie theory, is equivalent to the problem of finding Magnus expansions of the fundamental group of the surface which are compatible with the structure of the Goldman–Turaev Lie bialgebra. We will also mention several infinitesimal approaches to topology of the mapping class group.

13:15~14:15 2021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)

村上 順 (早大理工)^Z ジョーンズ多項式とその応用

Jun Murakami (Waseda Univ.) The Jones polynomial and its applications

概要 The Jones polynomial is the foundation of the quantum topology of low-dimensional manifolds. The Jones polynomial is related to the quantum group $\mathcal{U}_q(\mathfrak{sl}_2)$, and is extended to the colored Jones polynomial and the Witten–Reshetikhin–Turaev invariant of three manifolds, and various quantum invariants. Based on Kashaev’s observation that certain quantum invariant of knots relates to the hyperbolic volume of the knot complement, the volume conjecture is proposed. This conjecture predicts a relation between the colored Jones polynomial of a knot and the volume of the knot complement. On the other hand, the Jones algebra is generalized to the Kauffman bracket skein algebra, which is expected to be a good tool to quantize some classical geometric theory.

In this talk, I would like to explain the representation theoretical aspect of the Jones polynomial, the volume conjecture and its application, and an application of the skein algebra to the $SL(2, \mathbb{C})$ character variety of a knot.

9月16日(木) 第IX会場

9:30~12:00

12 北澤 直樹 (九大IMI)^Z Special generic 写像と多様体の Massey 積について …………… 15

Naoki Kitazawa (Kyushu Univ.) On special generic maps and Massey products of manifolds

概要 Special generic maps are higher dimensional variants of Morse functions with exactly two singular points on homotopy spheres, playing important roles in so-called Reeb’s theorem. This class has been attractive, posing restrictions on the topologies and the differentiable structures of the manifolds. This talk concerns new restrictions: restrictions on triple Massey products of manifolds admitting such maps.

- 13 佐治健太郎 (神戸大理)^Z D_4 関数の分岐集合の幾何 10
 S. P. Santos
 (São Paulo State Univ.)
Kentaro Saji (Kobe Univ.) Geometry of bifurcation sets of generic unfoldings of corank two func-
 Samuel Paulino Santos tions
 (São Paulo State Univ.)

概要 In this talk, we deal with the bifurcation sets of generic unfoldings of corank two functions. Taking blow-ups, we show each of the bifurcation sets of such functions admits a parametrization as a surface in the Euclidean three space. Using this parametrization, the behavior of the Gaussian curvature and the principal curvatures and their zero sets will be presented.

- 14 石井一平 ^Z Positive flow-spines and contact 3-manifolds 15
 石川昌治 (慶大経済)
 古宇田悠哉 (広島大理)
直江央寛 (中大理工)
 Ippei Ishii Positive flow-spines and contact 3-manifolds
 Masaharu Ishikawa (Keio Univ.)
 Yuya Koda (Hiroshima Univ.)
Hironobu Naoe (Chuo Univ.)

概要 We study a relationship between flow-spines and contact structures. A contact structure ξ on a 3-manifold is said to be supported by a flow-spine P if ξ has a contact form whose Reeb flow is a flow of P . In this talk, we introduce the positivity of flow-spines and define a map from the set of positive flow-spines to the set of contact 3-manifolds by associating to a positive flow-spine P a contact structure supported by P . More specifically, we show that (i) any positive flow-spine supports a contact structure, (ii) two contact structures supported by the same positive flow-spine are contactomorphic, and (iii) any contact structure is supported by a positive flow-spine.

- 15 バラルリホラモン ^Z Inverse symbolic coding of geodesics in hyperbolic surfaces 15
 (立命館大総合科学技術研究機構)
 野沢 啓 (立命館大理工)
Ramón Barral Lijó (Ritsumeikan Univ.) Inverse symbolic coding of geodesics in hyperbolic surfaces
 Hiraku Nozawa (Ritsumeikan Univ.)

概要 The cut-and-project method has been a fruitful tool to obtain interesting examples of aperiodic tilings and Delone sets (e.g., the Fibonacci tiling). This technique can be adapted to the hyperbolic setting in order to obtain examples that exhibit chaotic behaviour. We show how this can be regarded as a sort of inverse symbolic coding of the geodesic flow in a hyperbolic surface. We also present a computation of some numerical dynamical invariants.

- 16 バラルリホラモン ^Z Chaos in the universal space of pointed colored graphs 15
 (立命館大総合科学技術研究機構)
 野沢 啓 (立命館大理工)
Ramón Barral Lijó (Ritsumeikan Univ.) Chaos in the universal space of pointed colored graphs
 Hiraku Nozawa (Ritsumeikan Univ.)

概要 In this talk we will adapt Devaney's definition of chaos to the Gromov space of isomorphism classes of pointed colored graphs. This setting can be regarded as a generalization of both symbolic dynamics and laminations by graphs. Finally, we prove that being chaotic is a generic conditions in several subspaces of the Gromov space.

- 17 安部 哲哉 (立命館大理工)^Z アニュラスツイストを用いたスライス結び目と amphicheiral 結び目の構成 15

Tetsuya Abe (Ritsumeikan Univ.) The construction of slice knots and amphicheiral knots via annulus twists

概要 We will introduce the construction of slice knots and amphicheiral knots via annulus twists.

- 18 鈴木 龍正 (東工大理工)^Z ポシェット手術による 4 次元ホモトピー球面の構成 10

Tatsumasa Suzuki (Tokyo Tech) Constructions of homotopy 4-spheres by pochette surgery

概要 The boundary sum of the product of a circle with a 3-ball and the product of a disk with a 2-sphere is called a pochette. For a pochette P embedded in a 4-manifold M , a pochette surgery on M is the operation of removing the interior of P and gluing in P by a diffeomorphism of the boundary of P . Pochette surgery is a generalization of the well-known Gluck surgery. In this talk, we construct various homotopy 4-spheres by applying pochette surgeries on the 4-sphere, and prove that some of them are diffeomorphic to the 4-sphere by Kirby calculus.

- 19 菅原 朔見 (北大理工)^Z Divides with cusps and Kirby diagrams for line arrangements 15
吉永 正彦 (北大理工)

Sakumi Sugawara (Hokkaido Univ.) Divides with cusps and Kirby diagrams for line arrangements
Masahiko Yoshinaga (Hokkaido Univ.)

概要 A divide is the image of a generic immersions of a finite number of closed interval and circles into unit disk which is introduced by A'Campo. In this talk, we introduce the notion of the divide with cusps which is a generalization of the divide. We also discuss that the link obtained from the divide with cusps is used to describe the Kirby diagram of the complement of a complexified real line arrangement.

- 20 小川 将輝 (埼玉大理工)^Z 3次元多様体の多重分岐ハンドル体分解の安定同値性について 10

Masaki Ogawa (Saitama Univ.) A stably equivalence of a multibranching handlebody decomposition of a 3-manifold

概要 A multibranching handlebody decomposition is a decomposition of a 3-manifolds with some handlebodies so that the union of the intersections of handlebodies is a multibranching surface. Heegaard splitting admits an operation called stabilization and it is unique up to stabilization and isotopy for any 3-manifolds. We consider the case of multibranching handlebody decomposition. We introduce some stabilizations and a move of multibranching handlebody decomposition and show the stably equivalence of a multibranching handlebody decomposition.

- 21 北澤 直樹 (九大 I M I) 単連結閉多様体のカップ積と special generic 写像を許容するユークリッド空間の次元 *

Naoki Kitazawa (Kyushu Univ.) Cup products of closed and simply-connected manifolds and dimensions of Euclidean spaces into which these manifolds admit special generic maps

概要 Special generic maps are higher dimensional variants of Morse functions with exactly two singular points on homotopy spheres, playing important roles in so-called Reeb's theorem. This class has been attractive, posing restrictions on the topologies and the differentiable structures of the manifolds. This talk concerns applications of known restrictions to know dimensions of Euclidean spaces into which closed and simply-connected manifolds of suitable classes admit.

- 22 安田 智之 (奈良工高専) 2次元リボン結び目のもろ手型 *
- Tomoyuki Yasuda Amphicheirality of ribbon 2-knots.
(Nara Nat. Coll. of Tech.)

概要 For any classical knot k^1 , we can construct a ribbon 2-knot $spun(k^1)$ by spinning an arc removed a small segment from k^1 about \mathbf{R}^2 in \mathbf{R}^4 . A ribbon 2-knot is an embedded 2-sphere in \mathbf{R}^4 . $Spun(k^1)$ is the 2-knot called a ribbon 2-knot. If k^1 has an n -crossing presentation, by spinning this, we can naturally construct a ribbon presentation with n ribbon crossings for $spun(k^1)$. Thus, we can define naturally a notion on ribbon 2-knots corresponding to the crossing number on classical knots. It is called the ribbon crossing number. On classical knots, it was a long-standing conjecture that any odd crossing classical knot is not amphicheiral. We show that for any odd integer n there exists an amphicheiral ribbon 2-knot with the ribbon crossing number n .

14:25~15:25 特別講演

- 山下 靖 (奈良女大理)^Z Computer experiments on Möbius transformations and random Kleinian groups
Yasushi Yamashita Computer experiments on Möbius transformations and random Kleinian groups
(Nara Women's Univ.)

概要 Computer experiment has been an important method in studying hyperbolic 3-manifolds. The set of all Möbius transformations form a group called the Möbius group. It is isomorphic to the group of orientation-preserving isometries of hyperbolic 3-space. A Kleinian group is a discrete subgroup of the Möbius group. If a Kleinian group has no nontrivial torsion elements, it is the fundamental group of a hyperbolic 3-manifold.

In this talk, we describe some basic computational methods to study the Möbius group. As an application, we consider geometrically natural probability measures on the Möbius group, and study “random” subgroups of Möbius groups. By computational investigation, we give estimates of the probability that a group generated by a pair of random parabolic transformations is discrete.

A part of this talk is joint work with G. Martin and G. O’Brien.

15:50~16:50

- 23 S. Mahmoudi (東北大大理)^Z Study of weaves using weaving diagrams 15
Sonia Mahmoudi (Tohoku Univ.) Study of weaves using weaving diagrams

概要 The author presents a new way of defining and studying Euclidean and hyperbolic periodic weaving diagrams, from the point of view of low dimensional topology. A systematic method of constructing weaving diagrams from polygonal tessellations will be introduced. Then, since the number of crossings in particular is a suitable concept for studying and classifying such entangled structures, we can use knot theory to better understand their topology. Therefore, the Tait First and Second conjectures are extended to reduced alternating weaving diagrams of minimal size, embedded on higher genus surfaces.

- 24 佐野 岳人 (東大数理)^Z Bar-Natan ホモトピー型の構成 15
Taketo Sano (Univ. of Tokyo) A Bar-Natan homotopy type

概要 Following Lipshitz–Sarkar’s construction of Khovanov homotopy type, we construct for any link diagram L a CW spectrum $\mathcal{X}_{BN}(L)$ whose reduced cellular cochain complex gives the Bar-Natan complex of L . We prove that $\mathcal{X}_{BN}(L)$ is stably homotopy equivalent to the wedge sum of its canonical cells.

- 25 野坂 武史 (東工大理)^Z Meta-nilpotent knot invariants and symplectic automorphism groups of free nilpotent groups 15

Takefumi Nosaka (Tokyo Tech) Meta-nilpotent knot invariants and symplectic automorphism groups of free nilpotent groups

概要 We develop nilpotently p -localization of knot groups in terms of (symplectic) automorphism groups of free nilpotent groups. We show that any map from the set of conjugacy classes of the outer automorphism groups yields a knot invariant. We also investigate the automorphism groups and compute the resulting knot invariants.

- 26 市原 一裕 (日大文理) Knots in homology lens spaces determined by their complements *

斎藤 敏夫 (上越教育大)
Kazuhiro Ichihara (Nihon Univ.) Knots in homology lens spaces determined by their complements
Toshio Saito (Joetsu Univ. of Edu.)

概要 A knot K in an oriented closed 3-manifold M is said to be *determined by its complement* if the complement $M - K$ is not orientation-preservingly homeomorphic to the complement of any knot in M unless it is orientation-preservingly equivalent to K . The *Oriented Knot Complement Conjecture* states that any knot in an oriented closed 3-manifold would be determined by its complement. We give supporting evidence to the conjecture when M is a homology lens space and K is not null-homologous in M with additional conditions.

- 27 丹下 稜斗 (早大教育) Liminal representations and odd cyclic branched coverings of the figure-eight knot *

Ryoto Tange (Waseda Univ.) Liminal representations and odd cyclic branched coverings of the figure-eight knot

概要 We see a relation between liminal representations and odd cyclic branched coverings of the figure-eight knot.

無限可積分系

9月14日(火) 第I会場

10:00~12:00

- 1 笹本智弘(東工大理)^Z q -Whittaker 関数と有限温度自由フェルミオン 15
 今村卓史(千葉大理)
 M. Mucciconi (Univ. Warwick)
 Tomohiro Sasamoto (Tokyo Tech) q -Whittaker function and free fermion at finite temperature
 Takashi Imamura (Chiba Univ.)
 Matteo Mucciconi (Univ. Warwick)

概要 It is known that Cauchy sums for the q -Whittaker and the skew Schur polynomials produce the same factorized expressions modulo a q -Pochhammer symbol. We consider the sums with restrictions on the length of the first rows for both polynomials and prove an identity which relates them. The sum for the q -Whittaker side is related to the models in the Kardar–Parisi–Zhang(KPZ) class while the sum for the skew Schur side is related to a free fermion at finite temperature. We will give a bijective proof of the identity. This gives a direct connection between KPZ models and a free fermion at finite temperature.

- 2 渋川元樹(神戸大理)^Z An explicit formula of powers of 2×2 quantum matrices 15
 Genki Shibukawa (Kobe Univ.) An explicit formula of powers of 2×2 quantum matrices

概要 We derive an explicit formula for the n -th power of a 2 by 2 quantum matrix in terms of the Chebyshev polynomials of the second kind. As an application, we give another proof of some relations of entries of powers for 2 by 2 quantum matrices.

- 3 米山瑛仁(東大総合文化)^Z 3D reflection maps from tetrahedron maps 15
 Akihito Yoneyama (Univ. of Tokyo) 3D reflection maps from tetrahedron maps

概要 In this talk, we present a method for obtaining set-theoretical solutions to the 3D reflection equation by using known ones to the Zamolodchikov tetrahedron equation, where the former equation was proposed by Isaev and Kulish as a boundary analog of the latter. By applying our method to Sergeev's electrical solution and a two-component solution associated with the discrete modified KP equation, we obtain new solutions to the 3D reflection equation. Our approach is closely related to a relation between the transition maps of Lusztig's parametrizations of the totally positive part of SL_3 and SO_5 , which is obtained via folding the Dynkin diagram of A_3 into one of B_2 .

- 4 小島武夫(山形理工)^Z Quadratic relations of the deformed W -superalgebra $\mathcal{W}_{q,t}(A(M, N))$ · 15
 Takeo Kojima (Yamagata Univ.) Quadratic relations of the deformed W -superalgebra $\mathcal{W}_{q,t}(A(M, N))$

概要 We find the free field construction of the basic W -current and screening currents for the deformed W -superalgebra $\mathcal{W}_{q,t}(A(M, N))$ associated with Lie superalgebra of type $A(M, N)$. Using this free field construction, we introduce the higher W -currents and obtain a closed set of quadratic relations among them. These relations are independent of the choice of Dynkin diagrams for the Lie superalgebra $A(M, N)$, though the screening currents are not. This allows us to define $\mathcal{W}_{q,t}(A(M, N))$ by generators and relations.

- 5 山根宏之(富山大理)^Z 一般化された量子群のワイル亜群のケイリーグラフのハミルトン閉路 .. 15
 Hiroyuki Yamane (Univ. of Toyama) Hamiltonian circuits of Cayley graphs of Weyl groupoids of generalized quantum groups

概要 We show an existence of Hamiltonian circuits of Cayley graphs of Weyl groupoids of generalized quantum groups. We exactly draw them for rank three and four cases.

- 6 大久保勇輔 (第一薬大)^Z B型 q -戸田関数の明示公式 15
 白石潤一 (東大数理)
 星野 歩 (広島工大工)
 Yusuke Ohkubo Explicit formula for the q -Toda function of type B
 (Daiichi Univ. of Pharm.)
 Jun'ichi Shiraishi (Univ. of Tokyo)
 Ayumu Hoshino
 (Hiroshima Inst. of Tech.)

概要 The q -Toda system has been studied in the connection with representation theory of the quantum groups. In this talk, we give the explicit formula for the asymptotically free eigenfunctions of the q -Toda operator of type B. This formula can be regarded as a branching formula from the q -Toda function of type B restricted to the q -Toda functions of type A. The proof is given by a contiguous relation of the q -Toda functions of type A and a recursion relation of the branching coefficients.

- 7 菅原 優 (東北大理)^Z $A_3^{(1)}$ 型および $D_4^{(1)}$ 型アフィン量子展開代数の普遍 R 行列の積公式と量子二重対数の恒等式 15
 Masaru Sugawara (Tohoku Univ.) The product formulas for universal R -matrices of quantum affine enveloping algebras of type $A_3^{(1)}$, $D_4^{(1)}$ and quantum dilogarithm identities

概要 Dimofte, Gukov, Soibelman discovered remarkable identities for quantum dilogarithm on a non-commutative algebra as wall-crossing formulas in the physics context. On the other hand, K. Ito constructed the product formula for the universal R -matrix of affine quantum enveloping algebra $U_q(\mathfrak{g})$, which is associated with convex orders on affine root system. In our previous study, we showed that explicitly computing the appropriate product presentation of universal R -matrix of $U_q(\widehat{\mathfrak{sl}_3})$ yields one of the identity. In this talk, we report that investigating the higher rank case when \mathfrak{g} is of type $A_3^{(1)}$ and $D_4^{(1)}$ enables us to derive the other identities algebraically, for which no mathematical proofs were known.

- 8 加藤正輝 (富山高専) Sums of two-parameter deformations of multiple polylogarithms *
 Masaki Kato Sums of two-parameter deformations of multiple polylogarithms
 (Toyama Nat. Coll. of Tech.)

概要 In this talk, we introduce a generating function of sums of two-parameter deformations of multiple polylogarithms, denoted by $\Phi_2(a; p, q)$, and study a q -difference equation satisfied by it. We show that this q -difference equation can be solved by expanding $\Phi_2(a; p, q)$ into power series of the parameter p and then using the method of variation of constants. By letting $p \rightarrow 0$ in the main theorem, we find that the generating function of sums of q -interpolated multiple zeta values can be written in terms of the q -hypergeometric function ${}_3\phi_2$, which is due to Li-Wakabayashi.

- 9 井元隆史 (産業技術総合研) 捻り境界条件を用いた XXX スピン鎖の特異解の正則化 *
 出口哲生 (お茶の水女大理)
 Takashi Imoto Regularization of the singular solution for the XXX spin chain using
 (Nat. Inst. of Adv. Industrial Sci. and Tech.) twisted boundary condition
 Tetsuo Deguchi (Ochanomizu Univ.)

概要 Bethe ansatz is a method for obtaining all eigenstates of the XXX spin chain. It is known that in order to construction Bethe vectors to satisfy completeness under the periodic boundary condition, it is necessary to add a singular solution where both sides of Bethe ansatz equation diverge in addition to the general solution. The energy corresponding to a singular solution can be obtained by using regularization method. On the other hand, the existing regularization method have difficulty in calculating the norm and so on. In our talk, we propose a new method of regularization using twisted boundary conditions.

- 10 澁川陽一 (北大理) ホップ亜代数の FRT 構成法 *
- 乙戸勇大 (北大理)
- Youichi Shibukawa (Hokkaido Univ.) FRT construction of Hopf algebroids
- Yudai Otsuto (Hokkaido Univ.)

概要 For arbitrary algebras L , Hopf algebroids with base rings L are constructed by means of suitable elements of L .

14:25~15:25 特別講演

大矢浩徳 ^Z 捻り写像とその応用について
(芝浦工大システム理工)

Hironori Oya (Shibaura Inst. of Tech.) Twist maps and their applications

概要 In the mid-1990s, Berenstein, Fomin, and Zelevinsky introduced a specific biregular automorphism on a unipotent/double Bruhat cell for the study of totally positive elements. Their automorphism is called a twist automorphism, and it plays the essential role in the Chamber Ansatz formula, which leads to total positivity criteria.

Interestingly, the twist automorphism appears in various situations besides the study of total positivity. It might look a technical tool, but it is very useful in many places as a duality-like operation, and it is actually interpreted as a categorical operation via categorification. In this talk, I would like to explain several applications of the twist automorphism in our recent research. The topics include automorphisms on certain cluster varieties, Newton–Okounkov polytopes of Schubert varieties, and the representation theory of quantum loop algebras.

9月15日(水) 第I会場

10:00~11:00

- 11 鈴木貴雄 (近畿大理工)^Z 一般化 q -ガルニエ系のラックス形式 15
- Takao Suzuki (Kinki Univ.) A Lax formulation of a generalized q -Garnier system

概要 Recently, a birational representation of an extended affine Weyl group of type $A_{mn-1}^{(1)} \times A_{m-1}^{(1)} \times A_{m-1}^{(1)}$ was proposed with the aid of a cluster mutation. In this talk we formulate this representation in a framework of a system of q -difference equations with $mn \times mn$ matrices. This formulation is called a Lax form and is used to derive a generalization of the q -Garnier system.

- 12 重富尚太 (九大数理)^Z 捩率一定曲線および torsion angle 一定離散曲線の明示公式 15
- 梶原健司 (九大IMI)
- Shota Shigetomi (Kyushu Univ.) Explicit formulas of curves with constant torsion and discrete curves
- Kenji Kajiwara (Kyushu Univ.) with constant torsion angle

概要 We construct explicit formulas of curves with constant torsion and discrete curves with constant torsion angle in terms of elliptic theta function.

- 13 濱中真志 (名大多元数理)^Z 反自己双対ゲージ場の多重ソリトン散乱と quasideterminants 15
 Shan-Chi Huang (名大多元数理)
 Masashi Hamanaka (Nagoya Univ.) Multi-soliton dynamics of anti-self-dual gauge fields
 Shan-Chi Huang (Nagoya Univ.)

概要 We study dynamics of multi-soliton solutions of anti-self-dual Yang–Mills equations for $G=SL(2, \mathbb{C})$ in four dimensional real spaces with signatures of the Euclidean, the Minkowski, and the Ultrahyperbolic. The one-soliton solution has its principal peak of action density on a three-dimensional hyperplane in four dimensional space. We call it the soliton wall. We prove that in the asymptotic region, the n -soliton solution actually describes nonlinear superposition of n soliton walls with phase shifts. We calculate the phase shift factors explicitly and find that the action densities can be real-valued in the asymptotic region. Furthermore, we show that the gauge group can be $G=U(2)$ in the Ultrahyperbolic signature. It is remarkable that quasideterminants play important roles in calculations and proofs.

- 14 中園信孝 (東京農工大工) Special solutions to the multiplicative type discrete KdV equation *
 Nobutaka Nakazono Special solutions to the multiplicative type discrete KdV equation
 (Tokyo Univ. of Agri. and Tech.)

概要 In 1977, Hirota found the autonomous 2-dimensional difference-difference equation, which is a discrete analogue of the Korteweg–de Vries (KdV) equation. In this talk, we show that its multiplicative versions have special solutions expressed in terms of solutions of the discrete Painlevé equations of $A_3^{(1)}$ -, $A_4^{(1)}$ -, $A_5^{(1)}$ - and $A_6^{(1)}$ -type.

11:15～12:15 特別講演

- 辻本 諭 (京大情報)^Z The rational Heun operator and Wilson biorthogonal rational functions
 Satoshi Tsujimoto (Kyoto Univ.) The rational Heun operator and Wilson biorthogonal rational functions

概要 First, we introduce the bispectral property in classical orthogonal polynomials, and then show that various extensions of the Heun operator can be obtained from the polynomial degree-raising property. After that, we consider the rational Heun operator defined as the most general second-order q -difference operator which sends any rational function of type $[(n-1)/n]$ to a rational function of type $[n/(n+1)]$. Then the Wilson biorthogonal rational functions will be shown to be solutions to a generalized eigenvalue problem involving rational Heun operators of the “classical” kind. The correspondence with this operator and the one-dimensional degeneration of the Ruijsenaars–van Diejen Hamiltonians will also be discussed.