

Kohno Lab Intensive Seminar 2018

河野研集中セミナー 2018

Sat, Sep 15 – Tue, Sep 18

目次

1	Sat, Sep 15 / 9月15日(土)	1
1.1	10:15 – 11:45, Sergei BURKIN / セルゲイ ブルキン	1
1.2	14:00 – 15:30, SATO Genki / 佐藤 玄基	2
1.3	16:00 – 17:30, LIN Dexie / 林	2
2	Sun, Sep 16 / 9月16日(日)	2
2.1	10:15 – 11:45, KITAMURA Takuma / 北村 拓真	2
2.2	14:00 – 15:30, TANAKA Toshiki / 田中 俊輝	2
2.3	16:00 – 17:30, Oleksii LEONTIEV / アレックス レオンチエフ	3
3	Mon, Sep 17 / 9月17日(月)	3
3.1	10:15 – 11:45, KIM Minkyu / キム ミンギョ	3
3.2	14:00 – 15:30, KAKU Soichiro / 加来 宗一郎	3
3.3	16:00 – 17:30, YOSHIDA Jun / 吉田 純	3
4	Tue, Sep 18 / 9月18日(火)	4
4.1	10:15 – 11:45, KATO Hiroki / 加藤大輝	4
4.2	14:00 – 15:30, KAWASHIMA Yumehito / 川島 夢人	4

1 Sat, Sep 15 / 9月15日(土)

1.1 10:15 – 11:45, Sergei BURKIN / セルゲイ ブルキン

Title Learning from hierarchy via persistence forests, with applications to graph learning

Abstract We introduce persistence forests, a generalization of persistent homology and of single linkage hierarchical clustering, whose summary can serve as an interface between “spaces” and machine learning. While persistent homology is a (quiver) representation of the real line, persistence forest is a representation of the merge forest. The latter is more sensitive, but still stable, topological

summary. We show that persistence forests improve the performance of a modern graph learning algorithm (DGCNN) on several common datasets, and describe how to use persistent forests to find weaknesses in such algorithms.

1.2 14:00 – 15:30, SATO Genki / 佐藤 玄基

Title Geometric realization of semisimplicial sets in homotopy type theory

Abstract Homotopy type theory is a homotopy-coherent theory of homotopy types, invented by many researchers including Voevodsky and Awodey-Warren. In order to make it truly homotopy-coherent, we formulate it as a completely different formal theory from ZFC or first-order logic. In this talk, I will give a short introduction to homotopy type theory, and talk about the description of my construction of geometric realization of semisimplicial sets in homotopy type theory.

1.3 16:00 – 17:30, LIN Dexie / 林

Title Superconnection and relative Chern character

2 Sun, Sep 16 / 9月16日(日)

2.1 10:15 – 11:45, KITAMURA Takuma / 北村 拓真

Title Grothendieck-Teichmüller Group and its action on knots

Abstract Grothendieck-Teichmüller Group(以下 GT Group) は Drinfeld が考案したもので、量子群といった準三角準ホップ代数の変形を記述するために導入され、また絶対ガロア群の表現と関係している。さらに、GT Group の結び目のなす空間への作用が考えられ、それを通して絶対ガロア群の結び目への作用が得られる。セミナーではこれらの事実について解説する予定である。

2.2 14:00 – 15:30, TANAKA Toshiki / 田中 俊輝

タイトル Weyl 加群の Chari-Pressley-Loktev 基底の安定性予想について

アブストラクト Weyl 加群 $W(\lambda)$ は current 代数 $\mathfrak{g}[t](:= \mathfrak{g} \otimes \mathbb{C}[t])$ 上の有限次元表現である。これは対応する有限次元リー環 \mathfrak{g} の支配的ウェイト $\lambda \in P^+$ で添え字づけられている。Chari-Pressley-Loktev 基底はその線形空間としての基底であり、この基底は安定性と呼ばれる性質を持つことが Ravinder 氏により予想されている。これは Weyl 加群の間の標準的な包含関係と、Chari-Pressley-Loktev 基底の添え字の包含関係がある意味で整合的であることを主張している。今回の発表では安定性予想の主張の内容と、一部の扱いやすい場合に計算した私の結果を紹介する予定である。

2.3 16:00 – 17:30, Oleksii LEONTIEV / アレックス レオンチエフ

Title Symmetry breaking operators for the restriction of representations of indefinite orthogonal groups $O(p, q)$

Abstract In this talk I will give an overview of my joint work with Professor Toshiyuki Kobayashi. For the pair of indefinite orthogonal groups $(G, G') = (O(p+1, q+1), O(p, q+1))$, we construct and completely classify all symmetry breaking operators from the certain class of standard representations of G to the standard representations of G' . The problem of construction and classification of symmetry breaking operators (SBOs, for short) was first proposed by T. Kobayashi and B. Speh in [Memoirs of Amer. Math. Soc. 2015] in the general setting, where they also gave a complete answer to this question for the Lorentz group. In this course of our work, we generalized the results to the setting where (G, G') are of higher real rank. I will cover the construction and classification of SBOs and various relations between them, including residue formulæ and functional identities. If time permits, I will explain how these results relate to Zuckerman derived functor modules. Our results give an answer to Stage C of the ABC program of branching laws, proposed by the T. Kobayashi in [Progr. Math. 2015] which provides us with a deeper understanding of the branching problems.

3 Mon, Sep 17 / 9月17日(月)

Title Extension of quandle cocycle invariant as a pseudofunctor

3.1 10:15 – 11:45, KIM Minkyu / キム ミンギョ

Title Dijkgraaf-Witten theory

Abstract Let n be a natural number. Dijkgraaf-Witten invariant for closed oriented n -manifolds is defined using a singular cocycle of the classifying space associated with a finite group. (n -dimensional) Dijkgraaf-Witten theory is an n -TQFT which recovers the Dijkgraaf-Witten invariant. In this talk, we explain a generalization of Dijkgraaf-Witten theory obtained by considering ‘KK-cycles of the classifying space’ instead of singular cocycles. If time allows, we explain a construction of Dijkgraaf-Witten theory using a representative of a class in generalized (co)homology groups.

3.2 14:00 – 15:30, KAKU Soichiro / 加来 宗一郎

3.3 16:00 – 17:30, YOSHIDA Jun / 吉田 純

Title An operadic approach to involutions and the dihedral homology

Abstract Loday pointed out that one can define the “dihedral homology” on algebras equipped with involutions. Unfortunately, involutions are “contravariant” and hard to describe in purely operadic

ways. We attempt this problem in this talk. We will discuss an extension of the notion of group operads so that variables can have parities. As a result, we obtain a coherent description for the dihedral homology.

4 Tue, Sep 18 / 9月18日(火)

4.1 10:15 – 11:45, KATO Hiroki / 加藤大輝

Title On ℓ -independence of trace of monodromy

Abstract I will discuss ℓ -independence problems, which are problems on ℓ -adic étale cohomology in arithmetic geometry. Grothendieck and his school established the theory of ℓ -adic étale cohomology, which is an algebraic analogue of usual singular cohomology and is defined even for varieties of positive characteristic. Here ℓ is a prime number distinct from the characteristic of the base field. Philosophically, ℓ -adic étale cohomology theories for various ℓ have essentially the same information. For example, the trace of various actions is or is expected to be a rational number independent of ℓ . I will mainly explain the case of Galois action.

4.2 14:00 – 15:30, KAWASHIMA Yumehito / 川島 夢人

Title A family of representations of mapping class group

Abstract Recently I reveal a new relationship between the dilatation of pseudo-Anosov braids on surfaces with boundary and fixed point theory by showing a formula for the dilatation of pseudo-Anosov braids by means of the representations of braid groups on surface. In this talk I construct a family of representations of mapping class groups on surface extending the representation above.