

Spring Workshop 2014

on Low-Dimensional Topology and its Ramifications

The conference will take place at Meijo University satellite campus (MSAT). Talks will take place at Conference Room, 13th Floor, MSAT from 2pm on Feb. 28. We will have a party on Saturday night at “Nanafuku”. The conference is partially supported by

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program & abstracts

Feb. 28 (Fri.)

- 14:00-14:05 Opening
- 14:10-14:50 Nao Imoto (M2, Nara Women’s University)
On Alexander invariant of rational homology fibered knot
- 15:20-15:50 Sukuse Abe (D1, Saitama University)
Definition of finite type invariants of connected oriented compact 3-manifolds, and Qundle homotopy (cocycle) invariants
- 16:20-16:50 Kodai Wada (M1, Tokyo Gakugei University)
[a joint work with Natsuka Kobayashi (M1, Tokyo Gakugei University)]
Covering linkage invariants of Brunnian links and their Milnor invariants

Mar. 1 (Sat.)

- 10:30-12:00 Sachiko Ohtani (National Defense Academy of Japan)
Arithmetic topology for moduli of Galois representations
- lunch (poster session)
Yuki Temma (M1, Nihon University)
Non-left-orderable surgeries and presentations of knot groups
- 15:00-16:30 Shinya Okazaki (OCAMI, Osaka City University)
Bridge genus and braid genus for 3-manifolds
- 16:30-17:30 free discussion (tea time)
- 18:00- party at “Nanafuku”

Mar. 2 (Sun.)

- 10:30-12:00 Hideo Takioka (D2, Osaka City University)
The Γ -polynomial of a knot and its applications

- 14:00-16:30 Jean-Baptiste Meilhan (Institut Fourier, Universite Grenoble I)
Homotopy classification of welded and ribbon 2-string links
- 16:30-16:35 Closing

Conference Organizers :

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abstract

Feb. 28 (Fri.)

- 14:05-14:50 Nao Imoto (M2, Nara Women's University)

On Alexander invariant of rational homology fibered knot

In this talk, we define a class of knots which is called rational homology fibered knot by using rational homology, and study Alexander invariants of them. We further define the monodromies of rational homology fiber surfaces, and see how they are related to the Alexander invariants. We also see that there is a decomposition of monodromy corresponding to mutually disjoint, rational homology fiber surfaces for a knot. We show some examples of such decomposition of monodromy.

- 15:20-15:50 Sukuse Abe (D1, Saitama University)

Definition of finite type invariants of connected oriented compact 3-manifolds, and Qundle homotopy (cocycle) invariants

We obtain a finite type invariant of connected oriented compact 3-manifolds. The domain of 3-manifolds is larger than the integral homology 3-spheres of LMO invariant. However, this invariant induces the homology of 3-manifold, and we give a filtration to the domain of mapping class groups.

- 16:20-16:50 Kodai Wada (M1, Tokyo Gakugei University)

Covering linkage invariants of Brunnian links and their Milnor invariants

[a joint work with Natsuka Kobayashi (M1, Tokyo Gakugei University)]

Let L be an $(n + 1)$ -component Brunnian link in 3-sphere S^3 and K a component of L . Then the double branched cover of S^3 branched over K is still S^3 . In particular each lift of $L \setminus K$ is an n -component Brunnian link. We show that the Milnor invariants of length $n + 1$ for the link L is modulo-2 congruent to a sum of Milnor invariants of length n for lifts of $L \setminus K$.

Mar. 1 (Sat.)

- 10:30-12:00 Sachiko Ohtani (National Defense Academy of Japan)

Arithmetic topology for moduli of Galois representations

Arithmetic topology is a study that views 3-dimensional topology and algebraic number theory as analogies from the viewpoint of group theory and Galois theory, which have appeared recently in the classification of mathematics. That fundamental concept is based on analogies between knots and prime numbers. In this talk, we discuss an analogy between moduli of representations of knot groups and Galois groups.

- lunch (poster session)

Yuki Temma (M1, Nihon University)

Non-left-orderable surgeries and presentations of knot groups

I will talk about non-left-orderable surgeries on knots. A Dehn surgery is called a non-left-orderable surgery if it yields a closed 3-manifold with non-left-orderable fundamental group. I found presentations of knot groups which make possible to have a non-left-orderable surgery for a given knot in the 3-sphere. This result gives an extension of Nakae's result.

- 15:00-16:30 Shinya Okazaki (OCAMI, Osaka City University)

Bridge genus and braid genus for 3-manifolds

The bridge genus and the braid genus are invariants of a closed connected orientable 3-manifold M which are introduced by A. Kawauchi. The bridge genus $g_{\text{bridge}}(M)$ (resp. the braid genus $g_{\text{braid}}(M)$) of M is the minimal number of bridge(L) (resp. braid(L)) for any L such that M is obtained by the 0-surgery of S^3 along a link L . In this talk, we calculate the bridge genus and braid genus for some 3-manifolds.

Mar. 2 (Sun.)

- 10:30-12:00 Hideo Takioka (D2, Osaka City University)

The Γ -polynomial of a knot and its applications

The Γ -polynomial is an invariant of an oriented link in the 3-sphere, which is contained in both the HOMFLYPT and Kauffman polynomials as their common zeroth coefficient polynomial. As applications of the Γ -polynomial, I will talk about the following topics:

- (1) On the arc index of cable knots (joint with Hwa Jeong Lee, KAIST)
- (2) On the braid index of Kanenobu knots
- (3) On the arc index of Kanenobu knots (joint with Hwa Jeong Lee, KAIST)
- (4) On the cable Γ -polynomials of mutant knots

- 14:00-16:30 Jean-Baptiste Meilhan (Institut Fourier, Universite Grenoble I)

Homotopy classification of welded and ribbon 2-string links

“Ribbon 2-knotted surfaces” are locally flat embeddings of surfaces in 4-space which bound immersed 3-manifolds with only ribbon singularities. These objects also appear as topological realizations of “welded knotted objects”, which is a natural quotient of virtual knot theory.

In this talk, we consider ribbon tubes, which are knotted annuli bounding ribbon 3-balls. We will see how ribbon tubes naturally act on the reduced free group, and that this action classifies ribbon tubes up to homotopy, that is, when allowing each tube component to cross itself. At the combinatorial level, this provides a classification of welded string links up to self-virtualization, and the above-mentioned action on the reduced free group can be seen as the “virtual extension” of Milnor invariants. This generalizes a result of Habegger and Lin on string links.

This talk is based on a joint work with B. Audoux, P. Bellingeri and E. Wagner. It is addressed to non-specialists, and will in particular review all the background notions for the results.