Topology Project

Topology and Geometry of Low-dimensional Manifolds

October 25 (Tue) - October 28 (Fri), 2016

Nara Women's University, Collaboration Center Z306

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Schedule

	25 (Tue)	26 (Wed)	27 (Thu)	28 (Fri)
10:00-11:00		Kasahara	Katayama	Los II
11:30-12:30		Los I	Porti I	Porti II
13:00-14:00	Pitsch		(Lunch)	
14:30-15:30	Kasuya		Yamaguchi	
16:00-17:00	Morita		Moussard	

Abstract

Yasushi Kasahara (Kochi University of Technology)

Title. On simple closed curves and a visualization of the linerarity for mapping class group of surface

Abstract. We consider the set of simple closed curves on a surface as a subset of its mapping class group and derive a condition equivalent to its linearity. We also apply our argument to show that an arbitrary homomorphism of the mapping class group is injective up to center if and only if it can detect the geometric intersection among the simple closed curves.

Naohiko Kasuya (Aoyama Gakuin University)

Title. Non-Kaehler complex structures on R^4

Abstract. We consider the following problem. "Is there any non-Kaehler complex structure on R^{2n}?" The answer is clearly negative for $n = 1$. On the other hand, there exist uncountably many non-Kaehler complex structures on R^{2n} for $n \geq 3$. It was proven by Calabi and Eckmann in 1953 by a simple application of the Calabi-Eckmann manifolds.

In this talk, I will give the affirmative answer to the case where $n = 2$. Namely, we construct uncountably many non-Kaehler complex structures on R^4. For the construction, it is important to understand the genus-one achiral Lefschetz fibration $S^4 \to S^2$ found by Yukio Matsumoto and Kenji Fukaya.

This is a joint work with Antonio Jose Di Scala (Politencnico di Torino) and Daniele Zuddas (KIAS).

Takuya Katayama (Hiroshima University)

Title. On two embedding theorems concerning right-angled Artin groups

Abstract. The right-angled Artin group (RAAG) on a finite graph Γ with the vertex set $V(\Gamma)$ and the edge set $E(\Gamma)$ is the group given by the following presentation, where we employ the convention opposite to the usual one:

$$G(\Gamma) = \langle \mathrm{V}(\Gamma) \mid [v_i, v_j] = 1 \text{ whenever } \{v_i, v_j\} \notin E(\Gamma) \rangle$$

The main purpose of this talk is to introduce some results closely related to the following embedding theorems.

(1) [Koberda, 2012] For each finite graph Γ, there exists an orientable surface such that $G(\Gamma)$ is embedded in the mapping class group on the surface.
(2) [Kim and Koberda, 2015] For each finite graph Γ, there exists a finite tree T such that $G(\Gamma)$ is quasi-isometrically embedded in $G(T)$.

In this talk, I first explain (i) an obstruction to the existence of embeddings between RAAGs and (ii) embeddings of RAAGs into RAAGs with underlying graphs of valencies at most 3. Then I explain refinements of (1) and (2) obtained by using (i) and (ii).

Jérôme Los (Aix-Marseille University)

Title I. Volume entropy for surface groups

Abstract. In the talk I will show how the growth function, called Volume entropy, for a class of presentations of surface group is obtained using a dynamical system approach.

Title II. A polynomial formula for the volume entropy of all classical surface groups presentations

Abstract. I will present a method for computing the volume entropy for all the classical presentations of surface groups. The result is a surprising explicit polynomial depending on the genus of the surface.

Shigeyuki Morita (The University of Tokyo)

Title. Characteristic classes of homological surface bundles and four-dimensional topology

Abstract. We define, in a systematic way, certain cohomology classes of the group of homology cobordisms of surfaces introduced by Garoufalidis and Levine. Then by using a theorem of Kontsevich, we show that any homology class of the outer automorphism group of a free group of any rank greater than one defines such a cohomology class. These classes serve as characteristic classes of homological surface bundles which generalize the usual notion of surface bundles. Finally we discuss a possible relation between non-triviality of one particular series of these classes, which corresponds to the Morita classes, and certain mysteries in low dimensional topology. This is based on a joint work with Takuya Sakasai and Masaaki Suzuki.

Delphine Moussard (RIMS, Kyoto University)

Title. Braid group orbits in Aff($\mathbb{C}$)-character varieties of the punctured sphere

Abstract. Joint work with Gaël Cousin The group $PB_n(S^2)$ of n-strands pure braids of the sphere acts naturally on the representations of the fundamental group of the n-punctured sphere. Gaël Cousin has shown that finite orbits of such actions provide interesting flat connections on vector bundles over projective ruled varieties. Motivated by this result, we consider the representations of the fundamental group of the n-punctured sphere in the complex affine group. I will describe the finite orbits of the action of the group $PB_n(S^2)$ on these representations.

Wolfgang Pitsch (Universitat Autonoma de Barcelona)

Title. Trivial cocycles, Casson invariant and a conjecture of Perron

Abstract. In 1993 S. Morita gave a new algebraic construction of the core of the Casson invariant, showing that purely cohomological methods could be used to construct interesting invariants of integral homology spheres. In this talk we will explain how we generalized Morita's work so as to possibly encompass any invariant of homology spheres. We will in particular discuss the role of the Rohlin invariant in dealing with $\mathbb{Z}/2\mathbb{Z}$-valued invariants. We will then show how to further generalize this construction to get a hold on invariants for $\mathbb{Z}/p\mathbb{Z}$-spheres and to construct a new invariant of $\mathbb{Z}/p\mathbb{Z}$-spheres conjectured by B. Perron. This last part is joint work with my PhD student R. Riba.

Joan Porti (Universitat Autonoma de Barcelona)

Title I. Reidemeister torsion for closed hyperbolic three manifolds

Abstract. In this talk I review first the definition of Reidemeister torsion, and then I study a specific torsion for hyperbolic three manifolds. In particular I describe its behaviour for sequences of hyperbolic three manifolds.

Title II. Reidemeister torsion on the variety of characters

Abstract. Let M be a hyperbolic three manifold of finite volume with cusps. Reidemeister torsion defines a rational function on the (distinguished component) of the character variety of M. The goal of this talk is to study and describe those functions.

Yoshikazu Yamaguchi (Akita University)

Title. On the asymptotic behavior of the Reidemeister torsion for toroidal surgeries along twist knots

Abstract. We will discuss the asymptotic behavior of the Reidemeister torsion for the manifolds obtained by exceptional surgeries along twist knots. It is known that 4-surgery along every twist knot yields a graph manifold. We mainly observe the representation space and the Reidemeister torsion for the resulting graph manifold by 4-surgery. Then we will also see the relation between the asymptotic behavior of the Reidemeister torsion for our graph manifold and those for the Seifert pieces in the graph manifold.

This is a joint work with Anh T. Tran (The University of Texas at Dallas).