

**Name:** Takuya Sakasai

**Research field:** Topology

**Key words:** mapping class groups of surfaces, characteristic classes of bundles, 3-dimensional manifolds, homology cobordisms, graph homology.

**Present research:**

The mapping class group of a surface is defined as the group of isotopy classes of self-diffeomorphisms of the surface. This group appears in various fields of mathematics such as topology, geometry, algebra, complex analysis and mathematical physics and plays an important role there. My central research interest is the mapping class group from a view point of topology. More specifically, I am recently studying the following topics:

1. The cohomology rings of the mapping class group and its subgroups can be regarded as the set of characteristic classes of surface bundles. They also give topological information on the moduli space of Riemann surfaces. By using structures of these groups, I would like to describe those cohomology rings in terms of representation theory. Recently I am investigating closely related infinite dimensional Lie algebras by theoretical consideration and computer experiments.
2. We might expect that the mapping class group and its enlargement called the homology cobordism group provide a method for classifying 3-dimensional manifolds in a systematic way. As for the latter group, the structure is not so well understood. I intend to construct new invariants of knots and 3-dimensional manifolds from structures of these groups and noncommutative algebras arising from fundamental groups of 3-dimensional manifolds.

**Notice for the students:**

The basic knowledge of manifolds and homology theory is required. It is good if you know the fundamentals of homotopy groups, characteristic classes and representation theory.