Research interests

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The main topic of my thesis is the study of characteristic classes of surface bundles, as defined by Morita (see [2]). In particular, Morita asked whether these classes are bounded, or in other words, if they can be represented by cocycles which are uniformly bounded. This is known to hold for the classes in degree $2(k+1)$ since these are pullbacks of primary classes on the symplectic group, which are bounded by a result of Gromov. The question for the remaining classes in degree $2k$ is open from degree 4 already.

One advantage of the theory of bounded cohomology, initiated by Gromov in the beginning of the 80's [1], is that good bounds for norms of cohomology classes naturally give rise to Milnor-Wood inequalities. One aspect of my work is thus to try to compute the norms of the characteristic classes of surface bundles, with as aim to produce new inequalities between classical invariants of surface bundles.

An important object in my research is the mapping class group of surfaces. In fact, characteristic classes of surface bundles are, in the universal case, cohomology classes of the mapping class group.

I am also interested in learning more about the Teichmüller space of surfaces. Indeed, it encodes much information on the configuration of the curves in a surface and it could help finding a geometric interpretation for representatives of cohomology classes of the mapping class group of the surface.

References

[1] M. Gromov, *Volume and bounded cohomology*, Inst. Hautes Études Sci. Publ. Math. No. 56, (1982), 5–99 (1983).

[2] S. Morita, *The Geometry of Characteristic Classes*, American Mathematical Society, 2001.