



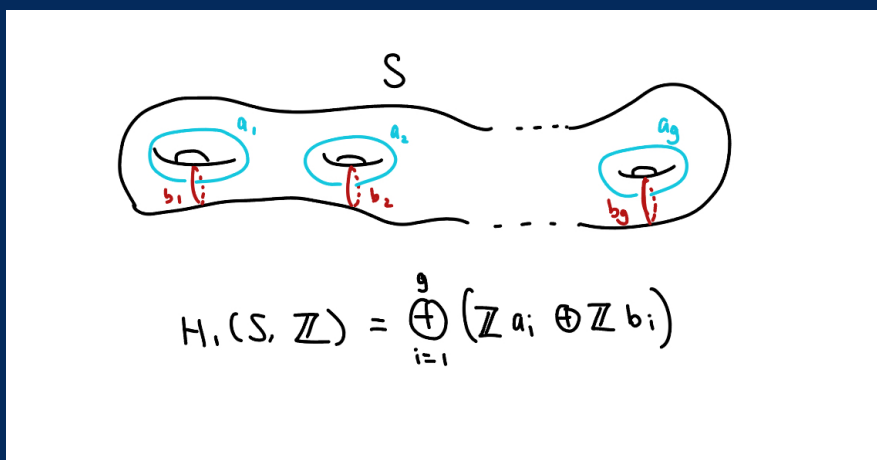
Departmental PhD Thesis Exam

Tuesday, June 24th, 2025 at 2:00 p.m. (sharp)
via Zoom /63 St. George Street, Room 111

PhD Candidate : Simon Shuofeng Xu

Supervisor : Daniel Litt

Thesis title : On topological and Hodge theoretic invariants of curves and families of curves



Abstract

In this thesis, we study topological and Hodge theoretic invariants associated to smooth complex algebraic varieties with particular focuses on algebraic curves and smooth projective families of curves. The central question we would like to understand is to what extent these invariants capture morphisms between the corresponding varieties.

More precisely, inspired by Grothendieck's section conjecture in anabelian geometry, we formulated and studied a topological and a Hodge theoretic section question for smooth projective family of curves and made progress towards answering those questions. In the topological setting, many of our results are analogous to existing results in anabelian geometry. In the Hodge setting, much less is known, and so we also studied the connection between the Hodge theoretic section question and classical results in non-abelian Hodge theory. In a different direction, motivated by the famous theorem of Torelli, we studied if the Torelli's theorem can be made functorial. We construct interesting examples of morphisms of Hodge structures which do not arise from morphism between curves, and connect our construction to the study of isotrivial isogeny factors in family of curves.