

Schedule and Abstracts

63rd Cascade Topology Seminar

All talks will be held in Lecture Theatre 118 in St John's College. Registration, lunch, and coffee breaks will be in the foyer outside the room.

Saturday 14th September

9:00am - Registration

9:30am - Bena Tshishiku (Brown University)

Title: Surface bundles, monodromy, and arithmetic groups

Abstract: In the 1960s Atiyah and Kodaira constructed surface bundles over surfaces with many interesting properties. The topology of such a bundle is completely encoded by its monodromy representation (a homomorphism to a mapping class group), and it is a fundamental problem to understand precisely how the topology of the bundle is reflected in algebraic properties of the monodromy. The main result of this talk is that the Atiyah-Kodaira bundles have arithmetic monodromy groups. A corollary of this result is that Atiyah-Kodaira bundles fiber in exactly two ways. This is joint work with Nick Salter.

10:30am - Coffee break!

11:00am - Gabriel Islambouli (University of Waterloo)

Title: Smooth 4-manifolds and the pants complex

Abstract: We show that every smooth, orientable, closed 4-manifold can be represented by a loop in the pants complex. As an application, we give an intuitive, combinatorial proof that the cobordism group of such manifolds is isomorphic to the integers. We also discuss some insights into the structure of the pants complex that this correspondence gives us.

12:00pm - Catered lunch

1:30pm - Marissa Loving (Georgia Tech)

Title: Spectral Rigidity of q -differential Metrics

Abstract: When geometric structures on surfaces are determined by the lengths of curves, it is natural to ask which curves' lengths do we really need to know? It is a classical result of Fricke that a hyperbolic metric on a surface is determined by its marked simple length spectrum. More recently, Duchin-Leininger-Rafi proved that a flat metric induced by a unit-norm quadratic differential is also determined by its marked simple length spectrum. In this talk, I will describe a generalization of the notion of simple curves to that of q -simple curves, for any positive integer q , and show that the lengths of q -simple curves suffice to determine a non-positively curved Euclidean cone metric induced by a q -differential metric.

2:30pm - More caffeine!

3:00pm - Ilya Gekhtman (University of Toronto)

Title: Growth rates of invariant random subgroups of hyperbolic groups and rank 1 Lie groups

Abstract: Invariant random subgroups (IRS) are conjugacy invariant probability measures on the space of subgroups of a given group G . They arise naturally as point stabilizers of probability measure preserving actions. The space of invariant random subgroups of $SL_2 \mathbb{R}$ can be regarded as a natural compactification of the moduli space of Riemann surfaces, related to the Deligne-Mumford compactification. Invariant random subgroups can be regarded as a generalization both of normal

subgroups and of lattices in topological groups. As such, it is interesting to extend results from the theories of normal subgroups and of lattices to the IRS setting.

Jointly with Arie Levit, we prove such a result: the critical exponent (exponential growth rate) of an infinite IRS in an isometry group of a Gromov hyperbolic space (such as a rank 1 Lie group, or a hyperbolic group) is almost surely greater than half the Hausdorff dimension of the boundary. This generalizes an analogous result of Matsuzaki-Yabuki-Jaerisch for normal subgroups. As a corollary, we obtain that if Γ is a typical subgroup and X a rank 1 symmetric space then $\lambda_0(X/\Gamma) < \lambda_0(X)$ where λ_0 is the bottom of the spectrum of the Laplacian. The proof uses ergodic theorems for actions of hyperbolic groups.

I will also talk about results about growth rates of normal subgroups of hyperbolic groups that inspired this work.

4:00pm - Break

4:30pm - Jonah Gaster (McGill University)

Title: Coloring curves on surfaces

Abstract: In the context of proving that the mapping class group has finite asymptotic dimension, Bestvina-Bromberg-Fujiwara exhibited a finite coloring of the curve graph, i.e. a map from the vertices to a finite set so that vertices of distance one have distinct images. In joint work with Josh Greene and Nicholas Vlamis we give more attention to the minimum number of colors needed. We show: The separating curve graph has chromatic number coarsely equal to $g \log(g)$, and the subgraph spanned by vertices in a fixed non-zero homology class is uniquely $(g-1)$ -colorable. Time permitting, we discuss related questions, including an intriguing relationship with the Johnson homomorphism of the Torelli group.

5:30pm - Nothing at all

7:00pm - Saturday night festivities (Ivory Restaurant and The Forks, see your registration pack or the website for more details).

Sunday 15th September

9:30am - Thomas Koberda (University of Virginia)

Title: Commensurations of thin groups

Abstract: I will discuss a recent result joint with M. Mj, which shows that the commensurator of an infinite index normal subgroup of an arithmetic lattice in a simple Lie group is discrete in most cases.

10:30am - Caffeine break

11:00am - Christopher Leininger (University of Illinois at Urbana-Champaign)

Title: Weil-Petersson translation length and manifolds with many fibered fillings

Abstract: In this talk, I will discuss joint work with Minsky, Souto, and Taylor in which we prove that any mapping torus of a pseudo-Anosov mapping class with bounded normalized Weil-Petersson (WP) translation length contains a finite set of vertical and horizontal closed curves, and drilling out this set of curves results in one of a finite number of cusped hyperbolic 3-manifolds (depending only on the normalized WP length bound). This echoes an earlier result, joint with Farb and Margalit, for the Teichmüller metric. We also prove new estimates for the WP translation length of compositions of pseudo-Anosov mapping classes and arbitrary powers of a Dehn twist.