MAT993V: PSEUDO-ANOSOV MAPS

Instructor: Chi Cheuk Tsang, PK-5220, tsang.chi_cheuk@uqam.ca

Meeting time: Wednesdays 9am-12nn, room PK-5675

Course webpage: https://sites.google.com/view/chicheuktsang/teaching/uqam-winter-2024

Course description: Pseudo-Anosov maps are a family of surface homeomorphisms that play a central role in the Nielsen-Thurston classification of surface mapping classes. These maps have provided a rich source of research directions in topology and dynamical systems since the 80s. This class is an introduction to the subject and is aimed at equipping the audience with sufficient background to then explore the literature in areas that they find interesting. Topics that we plan to cover include: train tracks, basic Teichmüller theory, a proof of Nielsen-Thurston classification, Thurston-Fried fibered face theory, and veering triangulations. The prerequisites for this class are basic differential topology (manifolds, metrics, flows) and basic algebraic topology (fundamental group, homology, cohomology).

Assessment: 50% active participation + 50% presentation

References: I will be following my own notes, which are uploaded to the course webpage. Some general references for the subject are:

- 'Travaux de Thurston sur les surfaces' by Albert Fathi, François Laudenbach, and Valentin Poénaru.
  (English translation: 'Thurston's work on surfaces' by Djun M. Kim and Dan Margalit.)
- 'An Introduction to Geometric Topology' by Bruno Martelli.
- 'Combinatorics of Train Tracks' by Robert Penner and John Harer.
- 'A Primer on Mapping Class Groups' by Benson Farb and Dan Margalit.

Presentation: Each enrolled student will be asked to choose a paper on a topic related to pseudo-Anosov maps and give a 1 hour presentation on it in the last two weeks of class. A list of recommended papers can be found in a separate document uploaded to the course webpage. You must notify me beforehand which paper you choose. You can also present a paper that is not on the list if you have my approval. Each student must present a distinct paper; choices are first-come-first-serve.

Tentative schedule:

Week	Date	Topics
1	10 Jan	Definitions and basic properties
2	17 Jan	Train tracks
3	24 Jan	Splitting sequences
4	31 Jan	Teichmüller theory
5	7 Feb	Geodesic currents
6	14 Feb	Proof of Nielsen-Thurston classification
7	21 Feb	Buffer
Reading week		
8	6 Mar	Minimum dilatation problems
9	13 Mar	Clique polynomials
10	20 Mar	Thurston fibered faces
11	27 Mar	Teichmüller polynomial
12	3 Apr	Veering triangulations
13	10 Apr	Universal finiteness theorem
14	17 Apr	Student presentations
15	24 Apr	Student presentations