

RTG Log Cabin Seminar 2024: Own Research

Jointly organised by Arthur Limoge, João Lobo Fernandes,
Tom Stalljohann, Carl Zürcher

2 - 5 September 2024

This year's log cabin seminar of the RTG will take place from 2 to 5 September 2024. The location will be the Naturfreundehaus Neckarmühlbach in the village of Neckarmühlbach at the Neckar, east of Heidelberg. The goal of the seminar is for the participants to communicate among one another what research projects the different people within the RTG work on. To this end participants will give talks about their research, about the broader fields that they work in or about topics which they find interesting and related to their work. There will be 13 talks, each lasting 45 minutes.

List of talks

Day 1

- 1. Introduction: Asymptotics of the Cheeger constant in selected moduli spaces of translation surfaces** (Maurice Reichert)
- 2. Asymptotics of the Cheeger constant in selected moduli spaces of translation surfaces** (Maurice Reichert)
We are exploring the behavior of a topological variant of the Cheeger constant on principal strata $(\mathcal{H}(1^{2g-2}))_g$ of translation surfaces as genus g approaches infinity. Through our analysis, we demonstrate that the expected value of the topological variant of the Cheeger constant has an upper growth rate like g^3 for large genus g . Depending on the time and preparations :), we will also discuss the case for the minimal stratum.
- 3. Proving Existence of Periodic Orbits for Inverse Magnetic Billiards** (Tom Stalljohann)
Consider a vector field orthogonal to the plane with constant magnetic strength. We turn off the magnetic strength on an arbitrary convex domain in the plane (in a non-continuous manner!). Electrons moving according to the Lorentz Force Rule now move on trajectories that are straight lines in the domain and circular arcs outside the domain. Are there always such trajectories that are periodic?

Day 2

4. **Finiteness properties of TDLC groups** (Laura Bonn)

I will give a short introduction to the finiteness properties of tdlc groups and show a way how we can construct tdlc groups. Then we will see that we can transfer finiteness properties of discrete groups along such a construction of a tdlc group. At the end I will give a few examples of these constructions.

5. **Uncountably many groups of type FP and their homological Dehn functions** (Jannis Weis)

I will give an introduction to (homological) finiteness conditions and Dehn functions as well as some classical results in this area by Bestvina-Brady and Brown.

6. **TBA** (Johannes Kunz)

TBA

Day 3

7. **Introduction to Abstract Harmonic Analysis** (Carl Zürcher)

8. **Kirillov's orbit method** (Alexander Blatz)

The unitary dual of a nilpotent Lie group G can be determined algebraically using Kirillov's orbit method - just compute the space of coadjoint orbits of G ! One also obtains a natural fibration over the center of G via the central character. We give an efficient description of its fibers using cohomology, and visualize examples in dimension strictly less than 6.

9. **Boundary representations of right-angled Artin groups** (Carl Zürcher)

By Glimm's Lemma discrete groups are type I if and only if they are virtually abelian. One problem for such groups is the construction of large classes of irreducible unitary representations. This talk will be about so-called boundary representations of non-type I groups which have been proven to be irreducible for Gromov-hyperbolic groups and which have been studied by the speaker for right-angled Artin groups.

10. **Bounding sphere packing densities** (Maximilian Wackenhuth)

We use harmonic analysis on symmetric spaces of noncompact type and on the Heisenberg group to bound packing densities of sphere packings.

11. **Hyperuniformity of point processes in the Euclidean group** (Daniel

Roca González)

TBA

Day 4

12. **Homotopy noninvariance of configuration spaces** (Nicolas Pimenidis)

I will elaborate on the celebrated proof by Salvatore and Longoni which was part of my master's thesis. If time permits, I could also talk about homotopy invariance of loop spaces of configuration spaces as proven by Levitt.

13. **Configuration spaces of manifolds** (João Lobo Fernandes)

In this talk, I will introduce and motivate the study of configuration spaces. I will provide examples and philosophical applications to the study of spaces of knots on a manifold, of dimension 4 or higher. The main motivating question I will try to answer is: what can the configuration space of a manifold say about the homeomorphism type of the manifold.

	Day 1 - Monday	Day 2 - Tuesday	Day 3 - Wednesday	Day 4 - Thursday
07:30		Breakfast 07:30 - 09:00	Breakfast 07:30 - 09:00	Breakfast 07:30 - 09:00
09:00		Jannis 09:00 - 10:00	Carl: Introductory Talk 09:00 - 09:30	Nicolas 09:00 - 09:30
			Break	Break
10:00		Break	Carl 10:00 - 10:30	João 09:45 - 10:45
		Laura 10:30 - 11:30	Break	Clean-up 10:45 - 13:00
11:00		Break	Alexander 11:00 - 12:00	
		Johannes 11:45 - 12:15	Lunch 12:00 - 14:00	
12:00	Arrival	Lunch 12:15 - 14:00		
13:00				Departure
14:00	Maurice: Introductory Talk 14:00 - 14:30	Free afternoon	Max 14:00 - 15:00	
	Break			
	Maurice 14:45 - 15:45		Break	
15:00				Daniel 15:30 - 16:00
	Break			Informal discussions 16:00 - 19:30
16:00	Tom 16:15 - 17:15			
	Informal discussions 17:15 - 19:30			
17:00				
17:30				
19:30	Dinner 19:30 -	Dinner 19:30 -	Dinner 19:30 -	