

# Groups, Buildings and Compactifications

Münster, August 9th - 11th 2017

This seminar is intended as a continuation of a joint seminar series of the math departments of Bielefeld, Karlsruhe, Münster and Regensburg.

This time, we study how buildings arise naturally as the boundary of semi-simple Lie groups. In general, we are interested in spaces with nice group actions (for certain classes of groups) and the construction of compactifications for those spaces.

Following the survey article [Ji], we consider the geodesic compactification of a symmetric space of non-compact type and identify its boundary with the Tits Building of a semi-simple Lie group.

Thereafter, we study Tits buildings associated to algebraic groups defined over  $\mathbb{Q}$  which arise in a similar fashion as in the Lie group case.

Then, we turn to duality groups and universal spaces (for proper actions). We consider the Borel-Serre compactification of locally symmetric spaces and apply this to construct universal spaces for non-uniform lattices  $\Gamma \subseteq G$  and obtain duality results for arithmetic subgroups of  $G(\mathbb{Q})$ .

At that point, we study how geometric properties of the group action on the boundary can be used to prove the Novikov Conjecture and verify these properties for arithmetic subgroups.

Finally, we study two examples which are generalisations of the arithmetic subgroup  $\mathrm{GL}(2, \mathbb{Z})$ , namely the Mapping Class Group  $\mathrm{Mod}^+(\Sigma_g)$  and the group of outer automorphisms of a free group  $\mathrm{Out}(F_n)$ . Here, the natural geometric objects of interest are the Teichmüller space for  $\mathrm{Mod}^+(\Sigma_g)$  and the so called Outer space for  $\mathrm{Out}(F_n)$ . Again, we study Borel-Serre like compactifications of these spaces and try to understand (the simplicial structure of) their boundaries and derive duality results.

The seminar is organised by Julia Heller, Annette Karrer, Nils Leder and Robin Loose and funded by the SFB 878 *Groups, Geometry and Actions* in Münster. If you are interested in participation or if you have any further questions, please contact us.

## References

- [Ji] L. Ji. From symmetric spaces to buildings, curve complexes and outer spaces. <http://www.math.lsa.umich.edu/~lji/belgium.pdf>.