Andreas Leiser – Short description of my research.

In my PhD project I mainly investigate the heat flow on graphs and its possible applications to cryptography and information theory according to a suggestion of Hungerbühler and Struwe ([2]).

One very interesting setting is to consider the case of Cayley graphs as suggested by Boillat ([1]) in an internal note and which is based on a well-known theorem (Theorem 8.2.1) in [3]. We then ask how the groups and generating sets which determine Cayley graphs are related (together with other parameters) to the computational complexity of the inverse problem of the heat flow on such structures.

Apart of the beauty of geometric group theory itself, I am therefore particularly interested, e.g., in

- the results and methods that GGT provides to my questions in the more general case of infinite groups,
- the insights attained by approaching questions geometrically (I initially started from a rather pure algebraic / combinatoric perspective of Cayley graphs on finite groups),
- the transition of the heat flow on finite, infinite and continuous structures,
- and in particular in some of the problems studied typically in GGT such as the word problem, the conjugacy problem, maybe also groups of exponential growth etc. which are per se interesting in computational complexity and theoretical informatics.

I therefore believe that GGT – and in the study of the transition of the discrete to the continuous case, analytic GT – are one of the essential areas which my research is based on.

References

[1] J. E. Boillat. Cryptography and Discrete Heat Equation in Cayley Graphs. Personal Comm., 2003.

[2] N. Hungerbühler and M. Struwe. A one-way function from thermodynamics and applications to cryptography. *Elem. Math.*, 58:1–16, 2003.

[3] A. Lubotzky. *Discrete Group, Expanding Graphs and Invariant Measures.* Birkhäuser, 2009. Origin. published 1994.