

Report: Visit to the University of Amsterdam

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The visit

Initially, the visit was scheduled for March 2010 but due to passport problems, I was able to travel on 18 May 2010 and returned on 20 June 2010. Thanks to Prof B Löwe who accepted to postpone the training.

In Amsterdam, the Institute for Logic, Language and computation (ILLC) provided me with an office where I had unlimited internet access. It was indeed an excellent environment for research. The secretary helped me to find an accommodation with reasonable price.

During the whole month, I followed a training in Descriptive set theory. We had discussions with Prof B Löwe four times per week, for about two hours each session. The procedure was to read the study materials before the discussions. This was actually my first course in Descriptive set theory. I also followed a course by Prof B Löwe in Set theory with MSc students in Logics.

We discussed the basics of Descriptive set theory, effective descriptive set theory, infinite games and the axiom of determinacy. Of course, it was impossible to cover all the details of the theory in a month. Now I know, that descriptive set theory can help to grasp the structure of some classes of compact sets.

Research project

I am currently working on the problem of Salem sets which is related to the problem of sets of uniqueness (a compact subset of $[0, 1]$ of Hausdorff dimension α is a Salem set, if it supports a probability measure μ such that, its Fourier transform $\hat{\mu}$ satisfies $|u|^\beta |\hat{\mu}(u)|^2 < \infty$ for any $\beta < \alpha$ and u real).

As it is the case for other sets related to the problem of uniqueness, the structure of Salem sets is not known. Some examples have been constructed by different authors: Salem (who constructed the first example), Kahane (showed that the image of any compact subset of $[0, 1]$ by the Brownian motion and many other Gaussian processes is a Salem set), Kaufman (constructed the first nonrandom example), etc. But the structure of these sets is still not well understood.

Now, I am equipped to study the descriptive complexity of Salem sets in the class of compact sets, following the result line of Kechris, who studied the structure of the class of compact sets of uniqueness, in the class of compact subsets of $[0, 1]$.

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