Research Description – Francesca Diana

Geometric and Analytic Group theory – Ventotene 9-14 September 2013

I am working on uniformly finite homology, a coarse homology theory introduced by Block and Weinberger [2] to study the large-scale structure of non-compact metric spaces with bounded geometry. It is a coarse homology theory in the sense that two quasi-isometric spaces have the same uniformly finite homology. The uniformly finite chains are the ones considered by Roe for coarse homology [3] with an additional boundedness condition on the coefficients.

Block and Weinberger give a characterization of amenability using uniformly finite homology, in particular they prove that a metric space with bounded geometry is non-amenable if and only if its zero degree uniformly finite homology group is trivial [2]. Uniformly finite homology in degree zero has been used for a number of different applications: Whyte has used this to study rigidity problems for discrete metric spaces having bounded geometry [4]; vanishing classes in zero degree uniformly finite homology in the non-amenable case have been used to construct aperiodic tilings for some manifolds.

I am interested in further applications of uniformly finite homology and I am studying uniformly finite homology in higher degrees since this is still not very well understood. More generally I investigate the geometric information contained in higher degree uniformly finite homology.

Recently Matthias Blank and I have shown that uniformly finite homology of finitely generated amenable groups is infinite dimensional in most cases [1]. See also Matthias Blank's research description.

References

[1] M. Blank, F. Diana, *Uniformly finite homology of amenable groups* Preprint Arxiv coming soon.

[2] J. Block, S. Weinberger, *Aperiodic tilings, positive scalar curvature and amenability of spaces*, J. Amer. Math. Soc., 5 (1992), no. 4, 907-918.

[3] J. Roe, *Lectures on coarse geometry*,University Lecture Series, 31. American Mathematical Society, Providence, RI, 2003.

[4] K. Whyte, *Amenability, bi-Lipschitz equivalence, and the von Naumann conjecture*, Duke Math. J. 99 (1999), no. 1, 93-112.