Short Research Description

by Corina Ciobotaru

I am a fourth year Ph.D student under the supervision of Pierre-Emmanuel Caprace, at the Université catholique de Louvain, Belgium. My research concerns primary the **Howe–Moore's property** of a non-compact, locally compact group; namely vanishing at infinity of all matrix coefficients of its unitary representations without non-zero invariant vectors. This property is well known to hold for non-compact, simple real and p-adic Lie groups as well as for closed, non-compact groups with further properties and acting by automorphisms on d-regular trees. In the first year of my thesis, we were able to give a unified proof, recovering all those groups and adding to the list further examples. Consequently, we obtain two families of Howe–Moore groups: connected, non-compact, simple real Lie groups and their totally disconnected analogs, namely closed, non-compact, simple groups acting by type-preserving automorphisms and **strongly transitively** on a locally finite thick Euclidean building. Furthermore, for the particular case of d-regular trees we conjecture that all known examples are the only ones having Howe–Moore's property.

Still the conjecture is 'classified' as work in progress. But digging towards a solution, we introduced the notion of a **strongly regular hyperbolic automorphism** of a locally finite thick Euclidean building. This allowed us to fully characterize groups, acting by automorphisms on a locally finite thick Euclidean building, to admit a **Gelfand pair**. Without giving the definition, we recall that Gelfand pairs are useful tools for studying irreducible unitary representations of a locally compact group. Furthermore, all known examples are again the two families of Howe–Moore groups presented above. We do not know to what extend Howe–Moore and Gelfand pairs groups are related, but we strongly believe that our partial unpublished results on Burger–Mozes universal groups, combined with our result and well known properties of Gelfand pairs, will allow us to conclude, at some point, the conjecture in the mere case of d-regular trees.

Additional to the purposes mentioned in the above paragraph, strongly regular hyperbolic automorphisms of a locally finite thick Euclidean building appear to have other interesting applications. Implementing their CAT(0) and their peculiar dynamical properties, recently we were able to construct abelian and free subgroups inside (non necessarily discrete) groups acting co-compactly, by type-preserving automorphisms on a locally finite thick (general) building.