RESEARCH DESCRIPTION

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I have recently finished my master thesis at the University of Bologna under the supervision of Stefano Francaviglia and I am mainly interested in Geometric Group Theory for its applications to low dimensional geometry and topology.

The work of Thurston and Perelman has shown that the study of 3-dimensional manifolds can be reduced to the hyperbolic case, where Mostow's Rigidity Theorem is available. This theorem essentially says that the geometry of a hyperbolic manifold in dimension 3 (or higher) is completely determined by its fundamental group, so it makes perfectly sense to switch attention from the properties of the manifold to those of the group.

Through the recent work of Agol and Wise, some of the geometric properties of these groups (e.g. hyperbolicity) have turned out to be crucial in the solution of two long-standing problems in low dimensional topology (Virtually Haken and Virtually Fibering Conjectures) about the existence and structure of suitable surfaces in (a finite cover of) a hyperbolic 3-manifold.

One of the main ingredients in the proofs of the above conjectures has been the construction of a CAT(0) cube complex with the same fundamental group as the hyperbolic manifold and some additional properties about the intersection patterns of its hyperplanes (= codimension-1 subspaces), known as speciality conditions. These allow to get a virtual embedding of the fundamental group into a right-angled Artin group, from which it inherits some useful algebraic properties.