

# Algebra and Geometry Seminar

**Speaker:** Lleonard Rubio (University of Verona)

**Title:** Maximal tori in  $HH^1$  and the homotopy theory of bound quivers

**Abstract:** Hochschild cohomology is a fascinating invariant of an associative algebra which possesses a rich structure. In particular, the first Hochschild cohomology group  $HH^1(A)$  of an algebra  $A$  is a Lie algebra, which is a derived invariant and, among self-injective algebras, an invariant under stable equivalences of Morita type. This establishes a bridge between finite dimensional algebras and Lie algebras, however, aside from few exceptions, fine Lie theoretic properties of  $HH^1(A)$  are not often used.

In this talk, I will show some results in this direction. More precisely, I will explain how maximal tori of  $HH^1(A)$ , together with fundamental groups associated with presentations of  $A$ , can be used to deduce information about the shape of the Gabriel quiver of  $A$ . In particular, I will show that every maximal torus in  $HH^1(A)$  arises as the dual of some fundamental group of  $A$ . By combining this, with known invariance results for Hochschild cohomology, I will deduce that (in rough terms) the largest rank of a fundamental group of  $A$  is a derived invariant quantity, and among self-injective algebras, an invariant under stable equivalences of Morita type. Time permitting, I will also provide various applications to semimonomial and simply connected algebras.

This is joint work with Benjamin Briggs.