Simple objects in the heart of a t-structure

Historically, the study of modules over finite dimensional algebras has started with the study of the ones with finite dimension. This is sufficient when dealing with a finite dimensional algebra of finite representation type, where there are only finitely many indecomposable modules of finite length. Indecomposable modules of infinite length occur when dealing with algebras of infinite representation type and the study of pure-injective modules over a finite dimensional algebra is crucial for the problem of describing infinite dimensional modules. In this talk, we consider a specific class of finite dimensional algebras of infinite representation type, called "tubular algebras". Pure-injective modules over tubular algebra have been partially classified by Angeleri Hügel and Kussin, in 2016, and we want to give a contribution to the classification of the ones of "irrational slope". In this talk, first, via a derived equivalence, we move to a more geometrical framework, i.e. we work in the category of quasi-coherent sheaves over a tubular curve, and we approach our classification problem from the point of view of tilting/cotilting theory. More precisely, we consider specific torsion pairs cogenerated by infinite dimensional cotilting sheaves and we study the Happel-Reiten-Smalø heart of the corresponding t-structure in the derived category. These hearts are locally coherent Grothendieck categories and, in these categories, the pure-injective sheaves over the tubular curve become injective objects. In order to study injective objects in a Grothendieck category is fundamental the classification of the simple objects. In the seminar, we use some techniques coming from continued fractions and universal extensions to provide a method to construct an infinite dimensional sheaf of a prescribed irrational slope that becomes simple in the Grothendieck category given as the heart of a precise t-structure.

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