

Research Plan

1. Tilting theory of deformed preprojective algebras and its derived category

Deformed preprojective algebras were introduced by Crawley-Boevey and Holland in order to study deformation of simple singularities. Preprojective algebras and deformed preprojective algebras are 2-Calabi-Yau algebras.

$$\{ \text{Preprojective} \} \subset \{ \text{Deformed preprojective} \} \subset \{ \text{2-Calabi-Yau} \}$$

In my research in the future, I study what results of preprojective algebras can be generalized to deformed preprojective algebras or 2-Calabi-Yau algebras. I recently provided a construction of silting modules of 2-Calabi-Yau algebras in joint work with Crawley-Boevey (Bielefeld University). I will try to construct and classify tilting objects of the derived categories of 2-Calabi-Yau algebras.

2. Wide subcategories and t -structures of Noetherian algebras

A wide subcategory is an extension closed abelian subcategory of a category of modules over a ring. It is known that wide subcategories of modules over an Artinian algebra correspond bijectively to semi-bricks, which are generalization of semi-simple modules. On the other hand, thick subcategories and t -structures of the derived category of a ring are important to understand the category and the ring. In the case where Artinian algebras, roughly speaking, thick subcategories correspond to wide subcategories, and t -structures correspond to torsion classes.

$$\begin{array}{ccc} \{ \text{semi-brick} \} & \longleftrightarrow & \{ \text{wide subcategory} \} \longleftrightarrow \{ \text{thick subcategory} \} \\ \{ \text{silting module} \} & \longleftrightarrow & \{ \text{torsion class} \} \longleftrightarrow \{ t\text{-structure} \} \end{array}$$

There are some result on the lower correspondences. However such results deal with infinitely generated modules and it is hard to calculate concretely. It seems that there is no results about the upper correspondences in the case where the algebra is Noetherian. In my research in the future, I study these correspondences for Noetherian algebras. Some examples indicate that the methods in my joint work with Iyama are very useful for this problems.