

Cotorsion pairs in categories of quiver representations and maximal equivalence between categories of complexes

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The talk is divided into two parts:

1) Completeness of the induced cotorsion pairs in categories of representations of a quiver. (arXiv:1711.00559)

The concept of representations of a quiver can be traced back to [Gab72]. Now, it is known that the theory of representations of a quiver plays a crucial role in several branches of mathematics, such as Lie Algebras, quantum groups, etc. In this talk, for a given quiver Q and an abelian category C we will be interested in certain (relative) homological aspects of the category $\text{Rep}(Q, C)$ of C -valued representations of Q . Namely, given a cotorsion pair (A, B) in an abelian category C , which satisfies certain mild conditions, there are several ways to lift that cotorsion pair to a cotorsion pair in $\text{Rep}(Q, C)$, see [HJ16]. In [Question 7.7, HJ16], the authors proposed the following question: Is it true that if the cotorsion pair (A, B) is complete, then so are these induced cotorsion pairs in $\text{Rep}(Q, C)$? In this talk, we show that the answer to this question is affirmative under certain conditions. In addition, we provide a quiver that does not satisfy these conditions, but gives an affirmative answer to the aforementioned question.

2) On maximal equivalence of subcategories of chain complexes.

The notion of adjoint functors is a weaker version of equivalence of categories. So when one has an adjoint functor based on an object, it is natural to come up with the question of determining objects in such a way that its associated adjoint functor turns out to be an equivalence of categories just like it happens in the so-called Morita equivalence. Having this phenomenon, an (right) R -module P is said to be $*$ -module if the representable functor $\text{Hom}_R(P, -)$ induces a maximal equivalence between $\text{Mod-}R$ and $\text{Mod-}A$, where $A := \text{End}_R(P)$, that is, an equivalence between the subcategory $\text{gen}(P)$ of P -generated R -modules and the subcategory $\text{cogen}(P^\wedge^*)$ of $P^\wedge^* := \text{Hom}_R(P, E)$ -cogenerated A -modules, where E is a cogenerator for $\text{Mod-}R$. Inspired from this, we introduce two notions of chain complexes, called $*$ -complex and modified $*$ -complex, each of which leads to a maximal equivalence between categories of chain complexes through the total hom complex and the modified hom-complex, respectively. In this talk, we will discuss their characterizations and their relations with (pre)silting complexes. This is a work in progress.

[Gab72] Gabriel, P. (1972). Unzerlegbare Darstellungen. I, *Manuscripta Math.* 6, 71-103.

[HJ16] Holm, H. & Jorgensen, P. (2016). Cotorsion pairs in categories of quiver representations. *Kyoto J. Math.* to appear.

[Oda17] Odabasi, S. (2017). Completeness of the induced cotorsion pairs in categories of quiver representations. Accepted in *Journal of Pure and Applied Mathematics*. arXiv: 1711.00559v1.

