

Mini-Workshop on Gorenstein Homological Algebra

May 25-26, 2013, USTC

1. Program

May 25			May 26			
9:00-9:50	10:00-10:50	11:10-12:00	8:30-9:20	9:25-10:15	10:30-11:20	11:25-12:15
N. Ding	F. Kong	X. Zhang	P. Zhang	A. Iacob	L. Yao	C.M. Ringel
14:30-15:20	15:30-16:20	16:40-17:30				
Z. Huang	B. Xiong	S. Estrada				

Chair of May 25 Morning Session: Professor Pu Zhang (SJTU)

Chair of May 25 Afternoon Session: Professor Yu Ye (USTC)

Chair of May 26 Morning Session: Professor Zhaoyong Huang (NU)

All lectures are at Room 1611 in Guanli Keyan building (管理科研楼), which is at the very northeast corner of the east campus and very close to Guesthouse (专家楼). The conference dinner is on May 25, after the last talk we walk together to Shiweixian (食为先) restaurant (at the cross of Huangshan Road and Feixi Road).

2. Abstract

Nanqing Ding (Nanjing Univ.), Gorenstein right derived functors of $- \otimes -$ with respect to semidualizing modules.

Abstract: We study Gorenstein right derived functors of $- \otimes -$ with respect to semidualizing modules. As applications, some new criteria for a semidualizing module to be dualizing are given provided that R is a ring with a dualizing complex. This talk is a report on joint work with J. Hu and D. Zhang.

Sergio Estrada (Univ. de Murcia), Gorenstein homological algebra in categories of sheaves.

Abstract: We will introduce the notion of Gorenstein category as the convenient setup for doing Gorenstein Homological Algebra in categories of sheaves, or in general in categories without enough projective objects. We will illustrate this notion by showing that the category of $\text{Qcoh}(X)$ of quasi-coherent sheaves on a locally Gorenstein projective scheme fits into this setup. Then we will focus on the category $\text{Qcoh}(\text{cal } X)$ of quasi-coherent sheaves on certain Artin stacks and see that it is also possible to develop a version of Gorenstein homological algebra on it. We shall investigate on the structure of Gorenstein injective quasi-coherent sheaves and leave some open questions. The author is supported from the project DGI MTM2010-20940-C02-02 and FEDER funds.

Zhaoyong Huang (Nanjing Univ.), Homological dimensions relative to preresolving subcategories.

Abstract: We introduce relative preresolving subcategories and precoresolving subcategories of an abelian category and define homological dimensions and codimensions relative to these subcategories respectively. We study the properties of these homological dimensions and codimensions and unify some important properties possessed by some known homological dimensions. Then we apply the obtained properties to special subcategories and in particular to module categories. Finally we propose some open questions and conjectures, which are closely related to the generalized Nakayama conjecture and the strong Nakayama conjecture.

Alina Iacob (Georgia Southern Univ.), Gorenstein injective envelopes and covers.

Abstract: We prove if R is a commutative noetherian ring such that the character modules of Gorenstein injective modules are Gorenstein at, then the class of Gorenstein injective modules is covering. We also prove that over such a ring the class of Gorenstein injective modules is enveloping. In particular this shows the existence of the Gorenstein injective envelopes over commutative noetherian rings with dualizing complexes. This is joint work with Edgar Enochs.

Fan Kong (Shanghai Jiaotong Univ.), Decomposition of torsion pairs on module categories.

Abstract: We generalize the concept of torsion pair to $n+1$ -torsion tuples and study its structure which is helpful to study the structure of torsion pairs. Then, as a trial of obtaining all torsion pairs, we decompose torsion pairs by projective modules and injective modules, and find a one to one correspondence between torsion pairs and $n+1$ -torsion tuples. Then we calculate torsion pairs on the quiver algebra kA_n and tube categories, and give them a characterization by the above correspondence. We also study the structure of torsion pairs on the module categories of finite-dimensional hereditary algebras of Euclid type. This is joint with Keyan Song and Pu Zhang.

Claus Michael Ringel (Univ. Bielefeld), The Gorenstein projective modules for the Nakayama algebras.

Abstract: We are going to outline the structure of the category of the Gorenstein projective modules for a Nakayama algebra A . As a main tool we introduce the resolution quiver of A , it provides a fast algorithm in order to obtain the Gorenstein projective modules and to decide whether A is a Gorenstein algebra or not, and whether it is CM-free or not. It seems to be of interest that the resolution quiver of a connected Nakayama algebra either has no loops or else all cycles are loops.

Baolin Xiong (Beijing Univ. of Chemical Technology), Finite-dimensional algebras with few Gorenstein-projective modules.

Abstract: Let Λ be obtained from a finite-dimensional algebra with finite global dimension by creating some nodes. We show that such an algebra has only a finite number of isomorphism classes of indecomposable Gorenstein-projective modules and that the stable category of Gorenstein-projective modules is semisimple. This is joint with Claus Michael Ringel.

Lingling Yao (Southeast Univ.), The torsionless modules over cluster-tilted algebras of type A_n .

Abstract: We consider the torsionless modules over cluster-tilted algebras of type A_n . For this type of algebras we deduce some properties and characterizations of the torsionless modules. Moreover, it is showed that M is an indecomposable torsionless module if and only if M is an indecomposable projective module or $M = L(\alpha)$, where $\alpha: x \rightarrow y$ is a cyclic arrow and $P(y) \stackrel{\text{rel}}{\sim} P(\alpha) \rightarrow P(x) \rightarrow L(\alpha) \rightarrow 0$. The Auslander-Reiten structure is also investigated.

Pu Zhang (Shanghai Jiaotong Univ.), From CM-finite to CM-free.

Abstract: We prove that the relative Auslander algebra of a CM-finite algebra is CM-free. Thus, the category of the Gorenstein-projective modules over a CM-finite algebra turns out to be the category of the projective modules over a CM-free algebra. We also prove that the Gorenstein defect category of a CM-finite algebra is triangle-equivalent to the singularity category of its relative Auslander algebra. Thus, the Gorenstein defect category of a CM-finite algebra is uniquely determined by the category of its Gorenstein-projective modules. This is joint work with Fan Kong.

Xiaojin Zhang (Nanjing Univ. of Information Science and Technology), On Gorenstein projective conjecture.

Abstract: In this talk, we will show that the Gorenstein projective conjecture is left-right symmetric and its cohomology condition can not be reduced in general. Moreover, we will also show that the Gorenstein projective conjecture is true for CM-finite algebras.