Workshop on Algebras and Representation Theory

December 30, 2023 - January 2, 2024, USTC, Hefei

December 30 (Saturday)

Time	Chair	Talk
14:00-18:00		Arrival
18:00-19:30		Dinner （专家楼）

December 31 (Sunday)

Time	Chair	Talk
9:00-9:50	Bernhard Keller	Hongxing Chen 陈红星（首都师范大学）
9:55-10:45		Haicheng Zhang 张海诚（南京师范大学）
10:45-11:10		Tea Break + Group Photo
11:10-12:00		Nan Gao 高楠（上海大学）
12:00-14:00		Lunch Break
14:00-14:50	Yu Ye	Xiaojin Zhang 张孝金（江苏师范大学）
14:55-15:45		Zhiwei Li 李志伟（江苏师范大学）
15:45-16:10		Tea Break
16:10-17:00		Jiangsheng Hu 胡江胜（杭州师范大学）
17:05-17:55		Yu Zhou 周宇（清华大学）
18:00-20:00		Dinner （专家楼）

January 1 (Monday)

Time	Chair	Talk
9:00-9:50		Zhe Han 韩喆 （河南大学）
9:55-10:45		Junyang Liu 刘钧旸 （清华大学）
10:45-11:10	Yanhong Bao	Tea Break
11:10-12:00		Guodong Zhou 周国栋（华东师范大学）
12:00-14:00		Lunch Break
14:00-16:00		Problem Session
16:05-17:00		Free Discussion

Lecture Room: 第五教学楼 5101

组织者：陈小伍，Bernhard Keller，乐珏，叶郁

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Abstracts

Bounded t-structures, finitistic dimensions and singularity categories of triangulated categories

Hongxing Chen (Capital Normal University)

Abstract: In this talk, we establish some very general results about the existence of bounded t-structures on (not necessarily algebraic or topological) triangulated categories and the invariance of triangulated categories under completion. Our general treatment, when specialised to the case of noetherian schemes, immediately gives us Neeman's theorem on regularity (a major generalization of a conjecture by Antieau, Gepner and Heller) as an application and significantly generalizes another remarkable theorem by Neeman about the equivalence of bounded t-structures on bounded derived categories of coherent sheaves. When specialised to other cases like (not necessarily commutative) rings, nonpositive DG-rings, connective ring spectra, triangulated categories without models, etc., we get many other applications. All of these results convey that the singularity category, in our sense, is an obstruction to the existence of bounded t-structures. This reports a recent joint work with Rudradip Biswas, Chris Parker, Kabeer Manali Rahul and Junhua Zheng.

The momomorphism category and representations in the stable category

Nan Gao (Shanghai University)

Abstract: We investigate the (separated) monomorphism category $\mathrm{mono}(Q, A)$ of a quiver over an Artin algebra A. We show that there exists a representation equivalence in the sense of Auslander from $\mathrm{mono}(Q, A)$ to $\mathrm{rep}(Q, \mathrm{mod}A)$. We apply these results to describe the indecomposables in the monomorphism category of a radical-square-zero Nakayama algebra, and to give a bijection between the indecomposables in the monomorphism category of two artinian uniserial rings of Loewy length 3 with the same residue field. This is a joint work with J.Kulshammer, S.Kvamme, and C.Psaroudakis.

Derived equivalence of hereditary artin algebras via HRS-tilting
Zhe Han (Henan University)

Abstract: Given a torsion pair in the module category of a hereditary artin algebra, there are different characterizations of the derived equivalence between the HRS-tilting with respect to the module category and the artin algebra. In this talk, I will try to show two quit different characterizations are equivalent. This is a joint work with He Ping.

Cotorsion pairs and homological conjectures
Jiangsheng Hu (Hangzhou Normal University)

Abstract: The notion of cotorsion pairs goes back to the 1970s when it was introduced by Salce in the case of abelian groups. Cotorsion pairs have been used to study covers and envelopes, particularly in the proof of the flat cover conjecture. They have also been used in homotopy theory and in tilting theory. In this talk, we present some homological properties of cotorsion pairs with a view to applications to the finitistic dimension conjecture, the Wakamatsu tilting conjecture, and the Auslander and Reiten conjecture. This talk is based on several joint works with L.W. Christensen, N.Q. Ding, S. Estrada, H.H. Li, Y.X. Li, P. Thompson and J. Wang.

The cyclotomic non-degenerate Hecke algebras of arbitrary Weyl groups
Zhiwei Li (Jiangsu Normal University)

Abstract: We show that certain weight extensions of non-degenerate affine Hecke algebras of arbitrary Weyl groups admit analogous Khovanov-Lauda-Rouquier generators after some localization. As an application, we obtain the Brundan-Kleshchev-Rouquier-type isomorphisms between direct sums of blocks of cyclotomic Hecke algebras of arbitrary Weyl groups and the cyclotomic quotients of some non-graded analogous KLR algebras.

On Amiot's Conjecture

Junyang Liu (Tsinghua University)

Abstract: In a survey paper in 2011, Amiot proposed a conjectural characterisation of the cluster categories which were conceived in the mid 2000s to lift the combinatorics of Fomin–Zelevinsky's cluster algebras to the categorical level. Our work is devoted to a proof of (a variant of) her conjecture. More generally, cluster categories admit higher dimensional and relative variants, the so-called Higgs categories recently introduced by Wu. We also prove higher-dimensional and relative variants of the conjecture.

Periodic derived Hall algebras of hereditary abelian categories

Haicheng Zhang (Nanjing Normal University)

Abstract: Let m be a positive integer and $\mathcal{D}_m(\mathcal{A})$ be the m-periodic derived category of a finitary hereditary abelian category $\mathcal{A}$. Applying the derived Hall numbers of the bounded derived category $\mathcal{D}^b(\mathcal{A})$, we define an m-periodic extended derived Hall algebra $\mathcal{D}\mathcal{H}_m^e(\mathcal{A})$ for $\mathcal{D}_m(\mathcal{A})$, and use it to give a global, unified and explicit characterization for the algebra structure of Bridgeland's Hall algebra (semi-derived Ringel-Hall algebra) of periodic complexes. In particular, the 2-periodic extended derived Hall algebra is proved to be isomorphic to the Drinfeld double Hall algebra of $\mathcal{A}$. Finally, for any odd positive integer m, we relate the Hall algebra $\mathcal{D}\mathcal{H}_m^e(\mathcal{A})$ with the odd periodic derived Hall algebra of $\mathcal{A}$ defined by Xu–Chen.

Applications of Gorenstein projective τ-rigid modules

Xiaojin Zhang (Jiangsu Normal University)

Abstract: In this talk, we first introduce the notion of CM-τ-tilting free algebras as the generalizations of CM-free algebras and show the homological properties of CM-τ-tilting free algebras. Then we give a bijection between Gorenstein projective τ-rigid modules and certain modules. Finally, we give a partial answer to Tachikawa's first conjecture by applying Gorenstein projective τ-rigid modules. This is ongoing joint work with Hui Liu.

Recent advances on Han's conjecture
Guodong Zhou (East China Normal University)

Abstract: This talk is about recent works on Han's conjecture which relates Hochschild homology and global dimension. We investigate this conjecture from a viewpoint of recollements of derived categories. We prove that for a recollement of unbounded derived categories of rings which extends downwards (or upwards) one step, Han's conjecture holds for the ring in the middle iff it holds for the two rings on the two sides and hence reduce Han's conjecture to derived 2-simple rings. Further, we apply our results to exact contexts and Morita contexts rings. A recent result of Cibils, Lanzilotta, Marcos and Solotar is generalized by combining previous results of H.X. Chen and C.-C. Xi. Bounded extensions are also investigated with a viewpoint to Han's conjecture.

Mutation graph of tau-tilting modules of surface rigid algebras
Yu Zhou (Tsinghua University)

Abstract: In this talk, we study a class of finite dimensional algebras, called surface rigid algebras, which arise from partial triangulations of punctured marked surfaces. We show that each indecompasable rigid module of a surface rigid algebra corresponds to a tagged arc on the surface, and there is an intersection-dimension formula. As an application, we show that the mutation graph of τ-tilting modules of a surface rigid algebra is connected, under a certain condition which are satisfied by any skew-gentle algebra. This is based on joint work with Ping He and Bin Zhu.