

第二十四届全国代数表示论研讨会 会议手册

安徽大学数学科学学院
合肥工业大学数学学院
中国科学技术大学数学科学学院
安徽 合肥


2025年6月25日-29日





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会议服务指南

 **注册时间:** 2025 年 6 月 25 日 13:00 开始

 **注册地点:** 合肥丰大国际大酒店 (繁华大道 10555 号)

 **住宿地点:** 合肥丰大国际大酒店


 **会议地点:** 合肥丰大国际大酒店

 **交通信息:** 前往酒店建议

合肥南站到酒店车程约 20 分钟 (57 路公交约 40 分钟)

合肥站到酒店车程约 30 分钟 (226 路公交约 70 分钟)

新桥机场到酒店车程约 45 分钟 (机场巴士 2 号线约 90 分钟)

 **就餐安排:**

	就餐时间	就餐主要地点
早餐	07:00 – 09:30	四楼自助餐厅
午餐	11:30 – 13:30	四楼自助餐厅
晚餐	18:00 – 20:00	四楼自助餐厅

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日程安排

报到: 06月25日(星期三) 地点: 合肥丰大国际大酒店一层大厅			
18:00 – 20:30	晚餐(地点: 四楼自助餐厅)		
06月26日上午(地点: 三楼国际B厅)			
08:20 – 08:50	开幕式(合影)		
专题报告			
时间	主持人	报告人	报告题目
08:50 – 09:35	肖杰	张金币	专题 I-1. An introduction to completion
09:50 – 10:35		刘玉明	专题 II-1. Covering of quiver with relations
茶歇			
10:55 – 11:40	朱彬	吴焱林	专题 III-1. Quivers with potential and Ginzburg dg algebras
11:40 – 13:40	午餐(地点: 四楼自助餐厅)		
06月26日下午(地点: 三楼国际B厅)			
时间	主持人	报告人	报告题目
14:30 – 15:15	林亚南	陈学庆	专题 IV-1. Introduction to Hall Algebras
15:30 – 16:15		孙永亮	专题 I-2. Good extensions and more examples
茶歇			
16:35 – 17:20	王顶国	邢博涵	专题 II-2. Push-down and pull-up
18:00 – 20:00	晚餐(地点: 四楼自助餐厅)		

06月27日上午(地点: 三楼国际B厅)			
时间	主持人	报告人	报告题目
08:30 – 09:15	章 璞	乐 博	专题 III-2. Torsion pairs
09:30 – 10:15		徐 帆	专题 IV-2. Motivation to introduce CoHAs
茶歇			
10:35 – 11:20	吴志祥	张耀华	专题 I-3. Approximable triangulated categories
11:30 – 13:30	午餐(地点: 四楼自助餐厅)		
06月27日下午			
自由讨论			
18:00 – 20:30	晚餐(地点: 三楼国际B厅)		
06月28日上午(地点: 二楼北京B厅)			
时间	主持人	报告人	报告题目
08:30 – 09:15	彭联刚	李能群	专题 II-3. Galois coverings of representation-infinite algebras
09:30 – 10:15		沈 超	专题 III-3. Stability scattering diagrams
茶歇			
10:35 – 11:20	韩 阳	高林溥	专题 IV-3. Definition of CoHAs and examples
11:30 – 13:30	午餐(地点: 四楼自助餐厅)		
06月28日下午(地点: 二楼北京B厅)			
时间	主持人	报告人	报告题目
14:30 – 15:15	张跃辉	陈晓虎	专题 I-4. Recent progress and applications
15:30 – 16:15		陈鹏云	专题 II-4. A covering technique for derived equivalences
茶歇			
16:35 – 17:20	徐运阁	覃 帆	专题 III-4. Cluster characters
18:00 – 20:00	晚餐(地点: 四楼自助餐厅)		

06月29日上午(地点:二楼北京B厅)			
时间	主持人	报告人	报告题目
08:30 – 09:15	黄兆泳	高林溥	专题 IV-4. Applications of CoHAs
研究生论坛			
09:25 – 09:45	陈小伍	陈明发	Exchange graphs and Ext-quivers of hearts of tube categories
09:45 – 10:05		梁展阔	Pseudo grading on cluster automorphism group with application to cluster algebras of rank 3
10:05 – 10:25		陆雪松	Homotopy categories and fibrant model structures
茶歇			
10:45 – 11:05	邓邦明	翁伟康	ACM tilting bundles on a Geigle-Lenzing projective plane of type $(2, 2, 2, p)$
11:05 – 11:25		熊仪睿	Invariant stability conditions on local \mathbb{F}_0
11:25 – 11:45		张弛恒	Gorenstein derived equivalence and stable functors of Gorenstein projective modules
11:45 – 13:30	午餐(地点:四楼自助餐厅)		
06月29日下午			
自由讨论			

专题 I Completion of triangulated categories and its applications

负责人：陈红星 (首都师范大学)

专题简介： Triangulated category is one of the most important objects/tools in algebra, geometry, topology and so on. A fundamental question is how to construct triangulated categories in a systematic manner. In recent years, Amnon Neeman has introduced a novel approach to produce new triangulated categories from existing ones through completion with respect to good metrics. This kind of completion is especially well-suited within the framework of approximable triangulated categories, a new concept introduced and developed also by Neeman. The combination of completion and approximability has proved to be very useful in settling several conjectures and generalizing some classical theorems, such as Bondal-Van den Bergh's conjecture on strong generation, Antieau-Gepner-Heller's conjecture on the existence of bounded t-structures, Rickard's derived Morita theorem and Serre's GAGA theorem.

Throughout this lecture series, we will explore the key definitions and theorems in the theory of completion of triangulated categories and approximable triangulated categories. Additionally, the lectures will be enriched with diverse examples and insightful applications.

专题目录：

- I-1. An introduction to completion (张金币, 安徽大学)
- I-2. Good extensions and more examples (孙永亮, 盐城工学院)
- I-3. Approximable triangulated categories (张耀华, 湖北大学)
- I-4. Recent progress and applications (陈晓虎, 首都师范大学)

参考文献：

- [1] R. Biswas, H. Chen, K. M. Rahul, C. J. Parker, and J. Zheng, *Bounded t-structures, finitistic dimensions, and singularity categories of triangulated categories*, preprint, arXiv:2401.00130, 2024.
- [2] A. Canonaco, C. Haesemeyer, A. Neeman, and P. Stellari, *The passage among the subcategories of weakly approximable triangulated categories*, preprint, arXiv:2402.04605, 2024.

- [3] A. Neeman, *The categories \mathcal{T}^c and \mathcal{T}_c^b determine each other*, preprint, arXiv:1806.06471, 2018.
- [4] A. Neeman, *The category $[\mathcal{T}^c]^{\text{op}}$ as functors on \mathcal{T}_c^b* , preprint, arXiv:1806.05777, 2018.
- [5] A. Neeman, *Triangulated categories with a single compact generator and a Brown representability theorem*, preprint, arXiv:1804.02240v4, 2018.
- [6] A. Neeman, *Metrics on triangulated categories*, J. Pure Appl. Algebra **224** (2020), no. 4, Art. ID 106206.
- [7] A. Neeman, *Approximable triangulated categories*, in: *Representations of algebras, geometry and physics, Maurice Auslander distinguished lectures and international conference, Woods Hole Oceanographic Institute, Woods Hole, MA, USA, April 25–30, 2018*, pp. 111–155, Providence, RI: American Mathematical Society (AMS), 2021.
- [8] A. Neeman, *Strong generators in $\mathcal{D}^{\text{perf}}(X)$ and $\mathcal{D}_{\text{coh}}^b(X)$* , Ann. Math. (2) **193** (2021), no. 3, 689–732.
- [9] A. Neeman, *Finite approximations as a tool for studying triangulated categories*, in: *International Congress of Mathematicians 2022, ICM 2022, Helsinki, Finland, virtual, July 6–14, 2022. Volume 3. Sections 1–4*, pp. 1636–1658, Berlin: European Mathematical Society (EMS), 2023.
- [10] A. Neeman, *Bounded t -structures on the category of perfect complexes*, Acta Math. **233** (2024), no. 2, 239–284.

专题 II Covering theory in representation theory of algebras

负责人：刘玉明 (北京师范大学)

专题简介： Covering theory is an important technique in representation theory of algebras, however, the results and the proofs are scattered in the literature. We give an introduction to covering theory at a level as elementary as possible, as well as an outline of some recent results on covering theory of fractional Brauer configuration algebras.

专题目录：

II-1. Covering of quiver with relations (刘玉明, 北京师范大学)

- II-1.1. Quotes from P. Dowbor and A. Skowroński
- II-1.2. Covering of quiver with relations
- II-1.3. Galois covering
- II-1.4. Universal cover
- II-1.5. Standardness
- II-1.6. Some recent results on covering theory

II-2. Push-down and pull-up (邢博涵, 北京师范大学)

- II-2.1. Definitions of push-down and pull-up
- II-2.2. Properties of push-down and pull-up
- II-2.3. Applications on determining the wildness

II-3. Galois coverings of representation-infinite algebras (李能群, 北京师范大学)

- II-3.1. Basic definitions and notations
- II-3.2. Modules of the second kind
- II-3.3. Examples and applications

II-4. A covering technique for derived equivalences (陈鹏云, 北京师范大学)

- II-4.1. Definitions of tilting spectroid
- II-4.2. Coverings of spectroids of homotopy categories
- II-4.3. Push-Down of a tilting spectroid

参考文献：

- [1] H. Asashiba, *A covering technique for derived equivalence*, *J. Algebra* **191** (1997), 382–415.
- [2] R. Bautista and S. Liu, *Covering theory for linear categories with application to derived categories*, *J. Algebra* **406** (2014), 173–225.
- [3] K. Bongartz and P. Gabriel, *Covering spaces in representation theory*, *Invent. Math.* **65** (1982), 331–378.

- [4] P. Dowbor and A. Skowroński, *On Galois coverings of tame algebras*, Arch. Math. **44** (1985), 522–529.
- [5] P. Dowbor and A. Skowroński, *Galois coverings of representation-infinite algebras*, Comment. Math. Helv. **62** (1987), 311–337.
- [6] K. Erdmann, *Blocks of tame representation type and related algebras*, LNM **1428** (Springer, 1990).
- [7] P. Gabriel, *The universal cover of a representation-finite algebra*, LNM **903** (Springer, 1981) 68-105.
- [8] E. L. Green, *Group-graded algebras and the zero relation problem*, LNM **903** (Springer, 1981) 106-115.
- [9] N. Li and Y. Liu, *Fractional Brauer configuration algebras II: covering theory* arXiv: 2412.13445 (2024), 1–45.
- [10] R. Martínez-Villa and J. A. De La Peña, *The universal cover of a quiver with relations*, J. Pure Appl. Algebra **30** (1983), 277–292.
- [11] Ch. Riedtmann, *Algebren, Darstellungsköcher, Überlagerungen und zurück*, Comment. Math. Helv. **55** (1980), no. 2, 199–224.
- [12] Ch. Riedtmann, *Representation-finite self-injective algebras of class A_n* , LNM **832** (Springer, 1980) 449-520.
- [13] Ch. Riedtmann, *Representation-finite self-injective algebras of class D_n* , Compos. Math. **49** (1983), 231–282.

专题 III Torsion theory, stability scattering diagrams, and cluster algebras

负责人：覃帆 (北京师范大学)

专题简介： In the first part of this lecture series, we review the foundations of Ginzburg dg algebras, focusing on quivers with potentials and the associated 3-Calabi–Yau (3CY) triangulated categories. We discuss mutations and explain the corresponding derived equivalences. Then, we provide a detailed introduction to torsion pairs in abelian categories, explaining the associated t-structures in derived categories and their relationship to cluster tilting objects.

In the second part, we explore stability scattering diagrams arising from algebra representations, following Bridgeland’s construction. We explain their combinatorial structures defined by stability conditions and functions associated to motivic Hall algebras. Finally, we relate cluster algebras to torsion theory and stability scattering diagrams, following Nagao’s idea.

专题详情：

III-1 Quivers with potential and Ginzburg dg algebras (吴燚林, 中国科学技术大学)

In this talk, we will introduce the notion of quiver with potential and their mutations. We then present the construction of the associated Ginzburg dg algebra and show that mutations of quivers with potential yield equivalences of suitable 3-Calabi–Yau triangulated categories.

参考文献：

- [1] H. Derksen, J. Weyman, and A. Zelevinsky, *Quivers with potentials and their representations I: Mutations*, *Selecta Math.* **14** (2008), 59–119.
- [2] B. Keller and D. Yang, *Derived equivalences from mutations of quivers with potential*, *Adv. Math.* **226** (2011), no. 3, 2118–2168.
- [3] B. Keller, *Deformed Calabi-Yau completions*, with an appendix by M. Van den Bergh, *J. Reine Angew. Math.* **654** (2011), 125–180.

III-2 Torsion pairs (乐博, 清华大学)

We give a detailed introduction to torsion pairs in abelian categories and t-structures in triangulated categories. We then demonstrate how torsion pairs can be used to construct new t-structures in triangulated categories. We also recall how cluster tilting objects are associated with torsion classes.

参考文献：

- [1] T. Adachi, O. Iyama, and I. Reiten, *τ -tilting theory*, *Compos. Math.* **150** (2014), no. 3, 415–452.

- [2] D. Happel, I. Reiten, and S. O. Smalø, *Tilting in abelian categories and quasitilted algebras*, Mathematical Surveys and Monographs, vol. **575**, American Mathematical Society, 1996.

III-3 Stability scattering diagrams (沈超, 清华大学)

In this talk, we briefly introduce the stability scattering diagram associated with representations of algebras following Bridgeland. Its combinatorial part is constructed from the stability conditions, and its analysis part is constructed from motivic Hall algebras.

参考文献:

- [1] T. L. Gómez, *Algebraic stacks*, Proc. Math. Sci. **111** (1999), 1–31.
[2] T. Bridgeland, *An introduction to motivic Hall algebras*, Adv. Math. **229** (2012), no. 1, 102–138.
[3] M. Gross, P. Hacking, S. Keel, and M. Kontsevich, *Canonical bases for cluster algebras*, J. Amer. Math. Soc. **31** (2018), 497–608.

III-4 Cluster characters (覃帆, 北京师范大学)

In this talk, we briefly introduce the conceptual proof of Nagao: how the cluster characters for cluster monomials could be deduced from the torsion theory and the stability scattering diagrams.

参考文献:

- [1] B. Keller and D. Yang, *Derived equivalences from mutations of quivers with potential*, Adv. Math. **226** (2011), no. 3, 2118–2168.
[2] T. Bridgeland, *Scattering diagrams, Hall algebras and stability conditions*, Algebr. Geom. **4** (2017), no. 5, 523–561.
[3] K. Nagao, *Donaldson-Thomas theory and cluster algebras*, Duke Math. J. **7** (2013), 1313–1367.

专题 IV Introduction to cohomological Hall algebras

负责人：徐帆 (清华大学)

专题简介： This lecture series introduces the fundamental concepts of cohomological Hall algebras (CoHAs), a powerful tool in modern algebraic geometry and representation theory. We will explore the construction of CoHAs and their connections to various areas of mathematics and physics. The lecture is structured in four parts:

Part 1: Introduction to Hall Algebras: We review the theory of Hall algebras and variants, focusing on their construction from representations of quivers and finite-dimensional algebras. This provides the necessary foundation for understanding CoHAs.

Part 2: Motivation to introduce CoHAs: This part introduces three factorization characterizing moduli spaces of quiver representations. These factorization formulas is related to Donaldson-Thomas invariants and the wall-crossing formula. This provides a motivation to introduce CoHAs, i.e., categorifying the above three factorization.

Part 3 and Part 4: Definition, Construction and Examples of Cohomological Hall Algebras: We introduce the definition of CoHAs, emphasizing the role of cohomology in place of counting points. This two parts will discuss the construction of CoHAs and explore examples of CoHAs.

专题目录：

IV-1. Introduction to Hall Algebras (陈学庆, University of Wisconsin-Whitewater)

IV-2. Motivation to introduce CoHAs (徐帆, 清华大学)

IV-3. Definition of CoHAs and examples (高林溥, 清华大学)

IV-4. Applications of CoHAs (高林溥, 清华大学)

参考文献：

- [1] B. Davison and S. Meinhardt, *Cohomological Donaldson-Thomas theory of a quiver with potential and quantum enveloping algebras*, *Invent. Math.* **221** (2020), no. 3, 777–871.
- [2] H. Franzen and M. Reineke, *On the cohomological Hall algebra of the Kronecker quiver*, in: *Representation theory and beyond*, *Contemp. Math.* **758**, Amer. Math. Soc., Providence, RI, 2020, pp. 213–225.
- [3] S. Gautam and V. Toledano Laredo, *Yangians and quantum loop algebras*, *Sel. Math. New Ser.* **19** (2013), 271–336.
- [4] M. Kontsevich and Y. Soibelman, *Cohomological Hall algebra, exponential Hodge structures and motivic Donaldson-Thomas invariants*, *Commun. Number Theory Phys.* **5** (2011), no. 2, 231–352.

- [5] M. Reineke, *The Harder-Narasimhan system in quantum groups and cohomology of quiver moduli*, *Invent. Math.* **152** (2003), no. 2, 349–368.
- [6] M. Reineke, *Moduli of representations of quivers*, in: *Trends in representation theory of algebras and related topics*, EMS Ser. Congr. Rep., Eur. Math. Soc., Zürich, 2008, pp. 589–637.
- [7] M. Reineke, *Cohomological Hall algebras and motivic invariants for quivers*, Lecture series, 2021.
- [8] Y. Yang and G. Zhao, *The cohomological Hall algebra of a preprojective algebra*, *Proc. Lond. Math. Soc. (3)* **116** (2018), no. 5, 1029–1074.

Exchange graphs and Ext-quivers of hearts of tube categories

陈明发 (清华大学)

In this report we introduce the notion of pre-simple-minded collection (pre-SMC) of type \mathbb{A} in the bounded derived categories $\mathcal{D}^b(\mathbf{T}_p)$ of tube categories \mathbf{T}_p of rank p . This provides a direct way to classify the hearts in $\mathcal{D}^b(\mathbf{T}_p)$. This classification of hearts is applied to prove the exchange graph of hearts in $\mathcal{D}^b(\mathbf{T}_p)$ is connected. Furthermore, the Ext-quivers of hearts in $\mathcal{D}^b(\mathbf{T}_p)$ are explicitly described. This provides a construction of extended nilpotent representation categories associated with hearts. As a by-product, we show that the space of Bridgeland stability conditions on $\mathcal{D}^b(\mathbf{T}_p)$ is connected and contractible.

Pseudo grading on cluster automorphism group with application to cluster algebras of rank 3

梁展阔 (四川大学)

We introduce a pseudo \mathbb{N} -grading on the cluster automorphism group $\text{Aut}(\mathcal{A})$ with respect to an initial seed of \mathcal{A} , which consists of a family of subsets $\{G_i\}_{i \in \mathbb{N}}$ of $\text{Aut}(\mathcal{A})$ such that $\text{Aut}(\mathcal{A}) = \bigcup_{i \in \mathbb{N}} G_i$ and $G_k \cdot G_l \subset \bigcup_{i=0}^{k+l} G_i$. We prove that $\text{Aut}(\mathcal{A})$ is generated by $G_0 \cup G_1$, leading to an elementary approach for calculating cluster automorphism groups of certain cluster algebras. As an application, we completely determined the cluster automorphism groups of cluster algebras of rank 3 with indecomposable exchange matrices.

Homotopy categories and fibrant model structures

陆雪松 (上海交通大学)

The homotopy category of a model structure on a weakly idempotent complete additive category is proved to be the additive quotient of the category of cofibrant-fibrant objects with respect to the subcategory of cofibrant-fibrant-trivial objects. A model structure on pointed category is fibrant, if every object is a fibrant object. Fibrant model structures is characterized by trivial cofibrations, and also by fibrations. Fibrantly weak factorization systems are introduced, fibrant model structures are constructed via fibrantly weak factorization systems, and a one-one correspondence between fibrantly weak factorization systems and fibrant model structures is obtained. Applications are given to rediscover the ω -model structures and the \mathcal{W} -model structures, and their relations with exact model structures are discussed.

ACM tilting bundles on a Geigle-Lenzing projective plane of type $(2, 2, 2, p)$

翁伟康 (厦门大学)

Let \mathbb{X} be a Geigle-Lenzing projective plane of type $(2, 2, 2, p)$ and $\text{coh}\mathbb{X}$ the category of coherent sheaves on \mathbb{X} . The aim of this talk is to investigate ACM tilting bundles over \mathbb{X} , that is, tilting objects in the derived category $D^b(\text{coh}\mathbb{X})$ that are also ACM bundles. We show that a tilting bundle consisting of line bundles is the 2-canonical tilting bundle up to degree shift. We also provide a program to construct ACM tilting bundles, which give a rich source of (almost) 2-representation infinite algebras. As an application, we give a classification result of ACM tilting bundles.

Invariant stability conditions on local \mathbb{F}_0

熊仪睿 (西南石油大学)

Let X denote the total space of canonical bundle of Hirzbruch surface \mathbb{F}_0 , the aim of this talk is to describe a class of invariant stability conditions on the derived category of X supported on the zero section. We give a complete characterization of the stable objects for a chamber of such invariant stability conditions. Our work is a mathematical interpretation of physicists Fabrizio Del Monte and Pietro Longhi, Quiver Symmetries and Wall-Crossing Invariance. Commun. Math. Phys. 398, 89–132 (2023).

Gorenstein derived equivalence and stable functors of Gorenstein projective modules

张弛恒 (上海大学)

Gorenstein derived categories and Gorenstein derived equivalences were introduced by Gao and Zhang have some advantages in the study of Gorenstein homological algebras. A Gorenstein derived equivalence is a triangle equivalence between the Gorenstein derived categories over Artin algebras. For Gorenstein derived equivalent Artin algebras, it is hard to directly compare the modules over them, since a Gorenstein derived equivalence typically takes modules of one algebra to complexes over the other algebra. It is a well-known result of Rickard which says that a derived equivalence between two selfinjective algebras always induces a stable equivalence of Morita type. Hu and Pan proved that a derived equivalence induces a stable equivalence of Gorenstein projective objects.

In this speech, we mainly connect the Gorenstein derived equivalence and stable functors of Gorenstein projective modules. Specially, we prove that a Gorenstein derived equivalence between CM-finite algebras A and B can induce a stable functor between the factor categories $A - \text{mod}/A - \text{Gproj}$ and $B - \text{mod}/B - \text{Gproj}$. Furthermore, the above stable functor is an equivalence when A and B are Gorenstein.

专题负责人：

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刘玉明 北京师范大学
覃 帆 北京师范大学
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徐 帆 清华大学
邢博涵 北京师范大学
张金币 安徽大学
张耀华 湖北大学

研究生论坛报告人：

陈明发 清华大学
陆雪松 上海交通大学
梁展阔 四川大学
翁伟康 厦门大学
熊仪睿 西南石油大学
张弛恒 上海大学

