Jiaheng Zhao

Curriculum Vitae

Education

2021–2025 **Masters of Mathematics**, *Academy of Mathematics and System Sciences, Chinese Academy of Sciences*.

Core Courses Algebraic Topology, Differential Topology, Algebra I: Galois Theory and Representation Theory, Riemann Surfaces, Lie Groups, Basic Lie Theory

2017–2021 **Bachelor of Physics**, *The University of Chinese Academy of Sciences*.

Core Courses Linear Algebra, Mathematical Analysis, Abstract Algebra, Complex Analysis, Theoretical Mechanics, Statistical Mechanics, Quantum Mechanics, Electrodynamic, Group Theory, Quantum Field Theory, Algebraic Geometry, Algebraic Topology, Algebra II: Homological Algebra, Algebra III: Commutative Algebra, Solid State Physics

Bachelor's Thesis

Title *Condensation theory in 3d toric code*

Supervisors Professor Chen Fang & Professor Liang Kong

Abstract We study the condensation theory and gapped boundaries of the 3+1D (space-times dimension) toric code model.

Master's Thesis

Title *An introduction to the theory of factorisation homology*

Supervisors Professor Yang Su

Abstract We give an introduction to the theory of factorisation homology, both on smooth manifolds and stratified manifolds. Besides the fundamental theory, we introduce some applications, including cobordism hypothesis.

Research Interests

- Higher category and higher algebra. For example, representation theory of $\mathbb{E}_n$-algebras, enriched higher categories, ∞-operads...
- Application of higher algebra in various fields. For example, TQFT and factorisation homology, mathematical physics,stable homotopy theory, algebraic K-theory, topological order and tensor categories...

Talks and Presentations

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- 2022 June, SUSTech-Nagoya workshop on Quantum Science 2022
  Title: Generalized Eilenberg-Watts Calculus and 1d condensation theory
- 2023 July, The First International Congress of Basic Science, Poster Session
  Title: Geometric theory of anyon condensation
- 2023 August, SUSTech-Nagoya workshop on Quantum Science 2023
  Title: Center functors and condensation theory
- 2024 January, "Advances in Quantum Algebra" workshop, BIMSA
  Title: Lagrangian algebras in braided fusion 2-categories

Seminars

2020–2023 **Regular TQFT Group Meeting**, Held by Liang Kong.
This is group meeting held by Professor Liang Kong from 2020 spring to 2023 spring. Topics in this seminar varies from higher algebra to condensed matter physics, and even art and literature.

2021 Autumn **Seminar on Classical Category Theory**, Held by Jiaheng Zhao.
This seminar focuses on basic notions and constructions in 1-category theory.

2022 Autumn **Seminar on ∞-categories**, Held by Jiaheng Zhao.
This seminar focuses on basic notions and constructions in ∞-category theory. We discussed many topics including Joyal's lifting theorem, straightening-unstraightening equivalence, limits and colimits in ∞-categories and ∞-operads.

2024 Autumn **Seminar on continuous K-theory**, Held by Chirs Brav and Guozhen Wang.
The goal of this seminar is to give an introduction to Efimov K-theory. We review the categorical language of stable ∞-categories and presentable ∞-categories. After a review of connective and non-connective K-theory we enter the world of continuous K-theory.

Publications

[1] *String Condensations in 3+1D and Lagrangian Algebras*, with Jia-Qi Lou, Zhi-Hao Zhang, Liang Kong and Yin Tian.
Advances in Theoretical and Mathematical Physics, Volume 27, October 12, 2023

Preprints

[1] *Higher condensation theory*, with Liang Kong, Zhi-Hao Zhang and Hao Zheng.
https://arxiv.org/abs/2403.07813