Hao Zhuang

Curriculum Vitae

Department of Mathematics
Washington University in St. Louis
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Position

2025-current **Postdoc** (beginning in Sept 2025), Beijing International Center for Mathematical Research, Peking University.

Education

2019-2025 **Ph.D. in Mathematics** (expected in May 2025), Washington University in St. Louis.

Academic Advisor: Prof. Xiang Tang.

Dissertation (May 08, 2025): The Witten Deformation and Proper Cocompact Lie Group Actions.

2014-2019 **B.S. in Information and Computing Science**, Fudan University.

2015-2019: Information and Computing Science, School of Mathematical Sciences.

2014-2015: Chemistry, Department of Chemistry.

Research interests

Geometry and topology.

Papers

Analytic and topological realizations of the invariant Thom-Smale complex. arXiv:2311.10417v4.

Kervaire semi-characteristics in KK-theory and an Atiyah type vanishing theorem. arXiv:2410.00794v2 (submitted).

To appear

Primitive cohomology groups and semi-characteristics of symplectic manifolds (one result has been announced in Gone Fishing 2025).

Ongoing projects

Double groupoids and Morse-Bott theory.

Thom-Smale theory, but noncommutative (joint with Jiachen Lu).

Mod 2 index formula under cocompact actions.

Talks

Spring 2025	Gone Fishing 2025 at WUSTL: Symplectic semi-characteristics.
	NCG Festival at CU Boulder: Kervaire semi-characteristics in KK-theory.
	Szegő Seminar at WUSTL: An introduction to Gromov-Witten invariants.
	Geometry and Topology Seminar at WUSTL: Invariant Thom-Smale-Witten theory.
Winter 2025	JMM 2025 in Seattle: Generalized mod 2 index in KK-theory and an Atiyah type vanishing theorem.
Fall 2024	UIUC-WUSTL Joint Symplectic Geometry Seminar at UIUC: Analytic Morse theory under Lie group actions.
	Geometry and Topology Seminar at WUSTL: Proper cocompact Kervaire semi-characteristics in KK-theory.
Spring 2024	Gone Fishing 2024 at Northwestern University: Invariant Morse-Bott-Smale cohomology and the Witten deformation.
	Graduate Seminar at Missouri S&T: Witten's insight: An analytic approach to Morse theory.
	Differential Geometry and Symplectic Topology Seminar at UMN Twin Cities: Invariant Morse-Bott-Smale chain complexes, the Witten deformation and the estimates of eigenvalues.
	Noncommutative Geometry Seminar at Texas A&M University: Invariant Morse-Bott-Smale chain complexes, the Witten deformation and Lie groupoid methods.
Fall 2023	Workshop on Noncommutative Geometry and Representation Theory at WUSTL: Invariant Morse-Bott-Smale cohomology and the Witten deformation.
Spring 2023	Geometry and Topology Seminar at WUSTL: Invariant Morse-Bott-Smale chain complex under the circle action.
Spring 2022	Szegö Seminar at WUSTL: Introduction to Morse theory.
Fall 2020	Geometry and Topology Seminar at WUSTL: An analytic proof of the Poincaré-Hopf index theorem.

Conferences

Summer 2024	Multivariable Operator Theory Conference at WUSTL.
Spring 2024	UIUC-WUSTL Joint Symplectic Geometry Seminar at UIUC.
Fall 2023	UIUC-WUSTL Joint Symplectic Geometry Seminar at WUSTL.
Summer 2023	Noncommutative Geometry Festival at WUSTL.
Spring 2023	UIUC-WUSTL Joint Symplectic Geometry Seminar at UIUC.
	The 28th Southern California Geometric Analysis Seminar at UC Irvine.
Fall 2022	Focused Research Group - Workshop on Hypoelliptic Operators at WUSTL.
Summer 2022	Great Plains Operator Theory Symposium at WUSTL.
Summer 2021	Great Plains Operator Theory Symposium (online).
2020-2023	Global Noncommutative Geometry Seminar (online).
Summer 2019	K-theory and Noncommutative Geometry at SCMS.

Teaching

Spring 2025	Math 131 Calculus I, teaching assistant.
Fall 2024	Math 233 Calculus III, teaching assistant.
	Math Circle high school session, instructor.
Fall 2022	Math 233 Calculus III, teaching assistant.
Summer 2022	Math 309 Matrix Algebra, instructor.
Spring 2022	Math 217 Differential Equations, teaching assistant.
Fall 2021	Math 233 Calculus III, teaching assistant.
Spring 2021	Math 217 Differential Equations, teaching assistant.
Fall 2020	Math 233 Calculus III, teaching assistant.

Honors

2020	Lo Fellowship.
2019-2024	McDonnell International Scholars Fellowship.