

Hao Zhuang

Curriculum Vitae

Department of Mathematics
Washington University in St. Louis
✉ hzhuang@wustl.edu

🌐 sites.google.com/view/hao-zhuang/home

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 Szegő 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.