BOYU ZHANG

ADDRESS Kirwan Hall 4418
4176 Campus Dr, College Park, MD 20742
EMAIL bzh@umd.edu
WEBSITE https://www.math.umd.edu/~bzh/

ACADEMIC APPOINTMENT

2022- : Assistant Professor (tenure-track), University of Maryland at College Park, Maryland

2021-2022: Assistant Professor, Princeton University, New Jersey

2018-2021: Instructor of Mathematics, Princeton University, New Jersey

EDUCATION

2013-2018: Harvard University, Massachusetts
Ph.D. in Mathematics
Advisor: Clifford Taubes
Thesis: Several compactness results in gauge theory and low dimensional topology

2009-2013: Peking University, Beijing, China.
B.S. in Mathematics

RESEARCH INTEREST

I am interested in gauge theory, Floer homology, and their interactions with geometric structures on 3 and 4-dimensional manifolds such as knots and links, foliations, contact structures, and symplectic structures.

PUBLICATIONS AND PREPRINTS

1. Ring structures in singular instanton homology (with Yi Xie), arXiv 2307.08845.
2. A deformation of Asaeda-Przytycki-Sikora homology (with Zhenkun Li and Yi Xie), arXiv 2302.11109.
3. Instanton homology and knot detection on thickened surfaces (with Zhenkun Li and Yi Xie), Selecta Mathematica, 29, Article number: 84 (2023)
4. A note on the existence of U-cyclic elements in periodic Floer homology (with Dan Cristofaro-Gardiner, Daniel Pomerleano, Rohil Prasad), arxiv 2110.13844, accepted by Proc. Amer. Math. Soc.
5. The smooth closing lemma for area-preserving surface diffeomorphisms (with Dan Cristofaro-Gardiner and Rohil Prasad), arxiv 2110.02925
6. On Floer minimal knots in sutured manifolds (with Zhenkun Li and Yi Xie), Trans. Amer. Math. Soc. Ser. B 9 (2022), 499-516
7. On meridian-traceless SU(2)–representations of link groups (with Yi Xie), Adv. Math. 418 (2023).
8. Equivariant Cerf theory and perturbative $SU(n)$ Casson invariants (with Shaoyun Bai), arXiv 2009.01118.
9. Instantons and Khovanov skein homology on $I \times T^2$ (with Yi Xie), arXiv 2005.12863, accepted by Quantum Topology.

10. Two detection results of Khovanov homology on links (with Zhenkun Li and Yi Xie), Trans. Amer. Math. Soc. 374 (2021), 6649-6664.
11. On links with Khovanov homology of small ranks (with Yi Xie), Math. Res. Lett. Volume 29 (2022), 1261 – 1277.
12. Classification of links with Khovanov homology of minimal rank (with Yi Xie), arXiv 1909.10032, J. Eur. Math. Soc. (2023)
13. Instanton Floer homology for sutured manifolds with tangles (with Yi Xie), arXiv 1907.00547.
14. On the compactness problem for a family of generalized Seiberg-Witten equations in dimension three (with Thomas Walpuski), Duke Math. J. 170(17): 3891-3934.
15. Rectifiability and Minkowski bounds for the zero loci of $\mathbb{Z}/2$ harmonic spinors in dimension 4, Commun. Anal. Geom. Volume 30 (2022) Number 7: 1633 – 1681
16. Modulo 2 counting of Klein-bottle leaves in smooth taut foliations, Algebr. Geom. Topol., 2018 Aug 22; 18(5): 2701-2727.
17. Monopoles and foliations without holonomy-invariant transverse measure, J. Symplectic Geom., Volume 20, Number 1, 191–258, 2022.

INTERDISCIPLINARY COLLABORATIONS

1. Yue Wang, Boyu Zhang, Jérémie Kropp, Nadya Morozova: *Inference on tissue transplantation experiments*, Journal of Theoretical Biology, Volume 520.
2. Hui Zhao, Kehua Su, Chenchen Li, Boyu Zhang, Lei Yang, Na Lei, Xiaoling Wang, Steven J. Gortler, Xianfeng Gu: *Mesh Parametrization Driven by Unit Normal Flow*, Computer Graphics Forum, Volume 39, Issue 1.

TEACHING

MATH 734: Algebraic Topology (Spring 2024)
MATH 410: Advanced Calculus (Spring 2023)
MATH 432: Introduction to Topology (Fall 2022 and Fall 2023)
MAT 204: Advanced Linear Algebra with Applications (Spring 2022, Princeton)
MAT 215: Single Variable Analysis with an Introduction to Proofs (Fall 2021, Princeton)
MSRI graduate summer school: Gauge Theory in Geometry and Topology (Summer 2021)
MAT 92: Topics in Gauge Theory (Spring 2021, Princeton)
MAT 175: Mathematics for Economics and Life Sciences (Fall 2020 and Spring 2021, Princeton)
MAT 567: Topics in Low Dimensional Topology (Spring 2020, Princeton)
MAT 92: Morse Theory (Fall 2019, Princeton)
MAT 175: Mathematics for Economics and Life Sciences (Fall 2019, Princeton)
MAT 104: Calculus II (Fall 2018, Spring 2019, Princeton)

Math 1b: Calculus, Series, and Differential Equations. (Spring 2017, Harvard)
Undergraduate Tutorial: Morse Theory (Spring 2016, Harvard)
Qualifying Exam Tutorial (Summer 2015, Harvard)
Summer Tutorial: Knots and Links (Summer 2015, Harvard)
Math 1b: Calculus, Series, and Differential Equations. (Spring 2015, Harvard)
Qualifying Exam Tutorial (Summer 2014, Harvard)

SELECTED SERVICES AND OUTREACH

Member of the organizational committee for the University of Maryland High School Math Competition
Co-organizer of the DC Jail College Bridge Math program by Petey-Greene in 2023
Co-organizer of the Geometry and Topology seminar at the University of Maryland at College Park
Co-organizer of the Brin Mathematics Research Center workshop on *Low-dimensional topology and homeomorphism groups* in 2022
Co-organizer of the MSRI graduate summer school on *Gauge Theory in Geometry and Topology* in 2021
Co-organizer of Princeton Topology Seminar from 2018 to 2022

AWARDS AND FELLOWSHIPS

1. 2023-2028: Simons Foundation Travel Support for Mathematicians
2. 2017: Harvard University, Graduate School of Arts and Sciences, Merit Fellowship
3. 2013: Peking University, School of Mathematical Sciences, Xiao-Song Lin award
4. 2011,2012: S-T. Yau College Students Mathematics Contests, 4 gold medals and 2 silver medals

LANGUAGES

Native speaker of Chinese, fluent in English.
Passed the French and German reading exams at Harvard.

RESEARCH TALKS

Dec 2023 *Knots in Washington conference*, George Washington University
Oct and Dec 2023 *Gauge theory seminar*, Rutgers University at New Brunswick
Oct 2023 *Geometry seminar*, University of Virginia
Sep 2023 *Geometry and Topology seminar*, University of Washington at St. Louis
Sep 2023 *AMS Sectional meeting*, University of Buffalo
Aug 2023 *Hua Luogeng Youth Forum*, Chinese Academy of Sciences
Jul 2023 Plenary talk at *Graduate Student Topology and Geometry Conference*, Harvard University
Apr 2023 *Conference on Gauge Theory and Low Dimensional Topology*, University of Miami
Apr 2023 *AMS sectional meeting*

Nov 2022 *Gauge Theory and Topology Seminar*, Harvard University
Sep 2022 *Symplectic Geometry Seminar*, Stony Brook University and Simons Center
Jun 2022 *Workshop on Geometric Analysis and Calibrated Geometries*, ETH Zurich
Mar 2022 *Colloquium*, Rutgers University at Newark
Feb 2022 *Southeast China Topology Workshop*
Jan 2022 *Interdisciplinary Science Seminar*, Harvard University
Nov 2021 *Geometry Seminar*, University of Kansas
Oct 2021 *Geometry Seminar*, University of Virginia
Jun 2021 *Knot Theory Seminar*, University of Warsaw
May 2021 *Geometric Analysis Conference*, Rutgers University
May 2021 *Topology Seminar*, UCSD
Mar 2021 *AMS sectional meeting*
Feb 2021 *Geometry and Topology Seminar*, University of Waterloo
Nov 2020 *Geometric analysis seminar*, Rutgers University
Nov 2020 *Geometry, Topology and Dynamics seminar*, Boston College
Nov 2020 *Topology Seminar*, Stanford University
Oct 2020 *Geometry and Topology Seminar*, Caltech
Oct 2020 *AMS sectional meeting*
Sep 2020 *Trends in low-dimensional topology seminar*
Jun 2020 *Regensburg low-dimensional geometry and topology seminar*
Feb 2020 *Topology Seminar*, Princeton University
Feb 2020 *Symplectic Topology Seminar*, IAS
Jan 2020 *Symplectic Geometry, Gauge Theory, and Categorification Seminar*, Columbia University
Jan 2020 *Topology seminar*, UCSD
Dec 2019 *Topology seminar*, Chinese Academy of Sciences
Dec 2019 *Workshop on gauge theory and Floer homology*, Peking University
Dec 2019 *SIAM Conference on Analysis of Partial Differential Equations*, La Quinta, California
Dec 2019 *AMS sectional meeting*, University of Florida
Oct 2019 *Geometry and Topology Seminar*, Michigan State University
Oct 2019 *Topology seminar*, MIT
Jul 2019 Short talk at the *IAS/IPAM summer program*, Park City
May 2019 *Georgia Topology Conference*, University of Georgia
Jan 2019 Plenary talk at *the 14^{th} East Asian Conference on Geometric Topology*, Peking University
Nov 2018 *Topology Seminar*, Rutgers University
Oct 2018 *Geometry and Topology Seminar*, Stony Brook University
Mar 2018 *Analysis and PDE Seminar*, Stanford University
Feb 2018 *Topology Seminar*, Princeton University
Feb 2018 *Geometry and Topology Seminar* Michigan State University
Dec 2017 *Embedding questions in symplectic topology: Dusa McDuff*, workshop at Tsinghua Sanya International Mathematics Forum

Apr 2017 *Floer homologies and topology of 4-manifolds*, University of Massachusetts, Amherst
Jan 2017 *Geometry and Topology Seminar*, Peking University
Dec 2016 *Topology Seminar*, Princeton University
Oct 2016 *Geometry and Topology Seminar*, California Institute of Technology
Sep 2016 *Geometry Seminar*, University of Virginia
Sep 2016 *Geometry and Topology Seminar*, Massachusetts Institute of Technology
Sep 2016 *S-T. Yau's Student seminar*, Harvard University

Last updated: February 1, 2024