

QIUYU REN

PERSONAL INFORMATION

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Languages: Chinese, English, French

RESEARCH INTERESTS

Low-dimensional topology, with a focus on 3-manifolds, 4-manifolds, and knot theory, using tools from contact and symplectic geometry, hyperbolic geometry, Khovanov homology, and Floer homology.

EDUCATION

University of California, Berkeley Ph.D. in Mathematics (expected May 2026) Advisor: Ian Agol	August 2021 - Present
Massachusetts Institute of Technology (MIT) B.S. in Mathematics GPA: 5.0/5.0	August 2018 - June 2021
Peking University Major in Mathematics	September 2017 - July 2018

RESEARCH PAPERS

Submitted

- [11] Intrinsic Khovanov homology in \mathbb{RP}^3 , with Hongjian Yang, arXiv:2510.00109.
- [10] Adjunction inequality for spatially refined s -invariants, arXiv:2502.20728.
- [9] Khovanov homology and exotic 4-manifolds, with Michael Willis, arXiv:2402.10452.

Published & accepted

- [8] Cosmetic surgery on satellite knots, *Bull. Lond. Math. Soc.* (2025).
- [7] Toroidal Hitomezashi patterns, with Shengtong Zhang, *Discrete Math.* **348** (2025), no. 1, 114231.
- [6] Slice genus bound in DTS^2 from s -invariant, *Algebr. Geom. Topol.* **24** (2024) 4115–4125.
- [5] Lee filtration structure of torus links, *Geom. Topol.* **28** (2024) 3935–3960.
- [4] A succinct proof to Defant and Kravitz’s theorem on the length of Hitomezashi loops, with Shengtong Zhang, *Ann. Comb.* **29** (2025) 117–122.
- [3] Spectral asymptotics for kinetic Brownian motion on Riemannian manifolds, with Zhongkai Tao, *Math. Ann.* (2025).

Preprints

- [2] Khovanov skein lasagna modules with 1-dimensional inputs, with Ian Sullivan, Paul Wedrich, Michael Willis, and Melissa Zhang, arXiv:2510.05273.
- [1] Spectral asymptotics for kinetic Brownian motion on locally symmetric spaces, with Zhongkai Tao, arXiv:2208.13111.

INVITED TALKS

- (Upcoming) Virginia Topology Conference 2025: New Developments in 4-Manifold Topology, December 2025.
- (Upcoming) Ohio State University geometric topology seminar, December 2025.
- (Upcoming) Online quantum topology seminar organized by L. Kauffman, December 2025.
- (Upcoming) UC Berkeley informal String-Math seminar ($\times 2$), November 2025.
- Knots, groups, and manifolds, Centre de Recherches Mathématiques (CRM), August 2025.
- New perspectives on skein modules, Centre International de Rencontres Mathématiques (CIRM), July 2025.
- Max Planck Institute for Mathematics (MPIM) in Bonn low-dimensional topology seminar, July 2025.
- Humboldt University of Berlin geometric topology seminar, July 2025.
- Research seminar on quantum topology and categorification (QTCat), University of Hamburg, June 2025.
- Modern Developments in Low-Dimensional Topology, International Centre for Theoretical Physics (ICTP), Italy, June 2025.
- AMS 2025 Spring Western Sectional Meeting, California Polytechnic, May 2025.
- Knots, Quivers & Beyond (online), Indian Institute of Technology Bombay, February 2025.
- University of Oregon topology seminar, February 2025.
- First International Online Knot Theorem Congress, February 2025.
- Sungkyunkwan University topology seminar, December 2024.
- UCSB topology seminar, December 2024.
- University of Georgia research topology seminar, October 2024.
- Moscow State University knots and representation theory seminar (online), September 2024.
- Columbia University geometric topology seminar, September 2024.
- AMS 2024 Fall Central Sectional Meeting, University of Texas, San Antonio, September 2024.
- (Lecture series) Conference on quantum topology at Belalp, Switzerland, September 2024.
- New structures in low-dimensional topology, Erdős Center, Alfréd Rényi Institute, July 2024.
- Knot Online Seminar (K-OS), June 2024.
- Research seminar on quantum topology and categorification (QTCat), University of Hamburg, June 2024.
- University of South Florida geometry and topology seminar, April 2024.
- Simons Collaboration satellite conference: Floer homology, low-dimensional topology, and algebra, Princeton University, March 2024.
- UC Davis geometry and topology seminar, March 2024.
- Texas A&M University topology seminar, October 2023.
- Caltech geometry and topology seminar, September 2023.

- Stanford University topology seminar, September 2023.
- MIT geometry and topology seminar, September 2023.

AWARDS AND GRANTS

Mathematics Summer Grant Award, UC Berkeley	2024
Mathematics Summer Grant Award, UC Berkeley	2022
Jon A. Bucsela Prize, MIT	2021
Rank 7.5, 78 th William Lowell Putnam Mathematical Competition, USA	2019
The Hartley Rogers Jr. Prize (SPUR), MIT	2019
Freshmen Scholarship, Peking University	2017
Gold Medal, 58 th International Mathematical Olympiad (IMO), Brazil	2017

SERVICES AND MISCELLANY

Professional Services

- Referee for *Algebraic & Geometric Topology*, *Journal of Topology*.
- Reviewer for zbMATH Open.
- Will be a co-mentor in the 2nd Scottish Talbot on Algebra and Topology workshop: skein lasagna modules, Crianlarich, Scotland, January 2026.
- Led exercise sessions in the Summer School on Modern Developments in Low-Dimensional Topology, International Centre for Theoretical Physics (ICTP), Italy, June 2025.
- Co-organizing the student low-dimensional topology seminar with Audrey Rosevear, UC Berkeley, Fall 2024 – Present.
- Co-organized the student 3-manifold seminar with Ethan Dlugie, UC Berkeley, Fall 2023 – Spring 2024.
- Co-organized a reading group on Kobayashi-Hitchin correspondence (Donaldson-Uhlenbeck-Yau theorem) with Yueqing Feng, UC Berkeley, Fall 2022.
- Organized an online reading group on Donaldson's theory for 4-manifolds, Summer 2021.

Mentoring

- Supervised an independent reading for a UC Berkeley undergraduate student, Fall 2023.
- Mentor at the Peer Mentor Program for new math PhD students at UC Berkeley, Fall 2023.
- Tutor at MIT Math Learning Center, Fall 2020.

Teaching

- UC Berkeley

- TA for MATH 202B: Introduction to Topology and Analysis, Spring 2025.
- TA for MATH 128A: Numerical Analysis, Spring 2024.
- TA for MATH 55: Discrete Mathematics, Fall 2023.
- TA for MATH 16A: Analytic Geometry and Calculus, Spring 2023.
- TA for MATH 16A: Analytic Geometry and Calculus, Fall 2022.

- TA for MATH 16A: Analytic Geometry and Calculus, Spring 2022.
- TA for MATH 54: Linear Algebra and Differential Equations, Fall 2021.

AI Benchmarks

- Contributed to GAUSS, a benchmark for evaluating the multi-dimensional mathematical abilities of AI.
- Contributed to Humanity's last exam, a difficult cross-domain benchmark for AI.
- Contributed to FrontierMath, a benchmark for evaluating advanced mathematical reasoning in AI.

Running

- Third place in the 2021 Berkeley Half Marathon (20–29 age group).
- Third place in the 2019 Baystate Marathon (20–29 age group).
- First place in the 2018 Baystate Half Marathon (under 20 age group).