

Curriculum Vitæ

Irving Dai
ifdai@stanford.edu

EDUCATION AND EMPLOYMENT

Stanford University

September 2021 – Present

NSF Postdoctoral Fellow/Postdoctoral Scholar
Postdoctoral Sponsor: Ciprian Manolescu

Massachusetts Institute of Technology

September 2019 – June 2021

NSF Postdoctoral Fellow/Instructor in Pure Mathematics
Postdoctoral Sponsor: Tomasz Mrowka

Princeton University

September 2014 – June 2019

Ph.D. in Mathematics
Thesis: Involutive Heegaard Floer homology and homology cobordism
Advisor: Zoltán Szabó

Harvard College

September 2010 – May 2014

A.B. in Mathematics and Physics with Highest Honors, *summa cum laude*
Honors Thesis: Foliation theory and the classification of overtwisted contact structures
Advisor: Clifford Taubes

PREPRINTS AND PUBLICATIONS

1. Equivariant knots and knot Floer homology
with A. Mallick and M. Stoffregen.
Preprint, [arXiv:2201.01875](#) (2022).
2. Homology concordance and knot Floer homology
with J. Hom, M. Stoffregen, and L. Truong.
Preprint, [arXiv:2110.14803](#) (2021).
3. Instanton Floer homology of almost-rational plumbings
with A. Alfieri, J. Baldwin, and S. Sivek.
To appear in *Geometry & Topology* (2020).
4. Corks, involutions, and Heegaard Floer homology
with M. Hedden and A. Mallick.
To appear in *Journal of the European Mathematical Society* (2020).
5. The 0-concordance monoid is infinitely generated
with M. Miller.
To appear in *Proceedings of the American Mathematical Society* (2019).
6. More concordance homomorphisms from knot Floer homology
with J. Hom, M. Stoffregen, and L. Truong.
Geometry & Topology, **25**(1) (2021), 275–338.
7. An infinite-rank summand of the homology cobordism group
with J. Hom, M. Stoffregen, and L. Truong.
Submitted, [arXiv:1810.06145](#) (2018).

8. Connected Heegaard Floer homology of sums of Seifert fibrations
Algebraic & Geometric Topology, **19**(5) (2019), 2535–2574.
9. On homology cobordism and local equivalence between plumbed manifolds
with M. Stoffregen.
Geometry & Topology, **23**(2) (2019), 865–924.
10. Involutive Heegaard Floer homology and plumbed three-manifolds
with C. Manolescu.
Journal of the Institute of Mathematics of Jussieu, **18**(6) (2019), 1115–1155.
11. On the Pin(2)-equivariant monopole Floer homology of plumbed 3-manifolds
The Michigan Mathematical Journal, **67**(2) (2018), 423–447.
12. Diameter bounds and recursive properties of Full-Flag Johnson graphs
Discrete Mathematics, **341**(7) (2018), 1932–1944.
13. Combinatorial properties of Full-Flag Johnson graphs
Combinatorial Algorithms, IWOCA 2015, pp. 112–123
in *Lecture Notes in Computer Science* (9538), Springer (2016).
14. On rationally ergodic and rationally weakly mixing rank-one transformations
with X. Garcia, T. Pădurariu, and C. E. Silva.
Ergodic Theory and Dynamical Systems, **35**(4) (2015), 1141–1164.

SELECTED HONORS

National Science Foundation, Mathematical Sciences Postdoctoral Fellowship (2019)
 National Science Foundation, Graduate Research Fellowship (2015)
 Princeton University, Centennial Fellowship (2014)
 Barry M. Goldwater Scholar (2013)
 Phi Beta Kappa Academic Honor Society, Junior 24 (2013)

TEACHING

Course instructor, Stanford University: Fall 2021.
 Taught *Calculus* (MATH 20). Led a team of two teaching assistants and was responsible for the entire course (about 130 students). Composed all homework and exams, gave lectures, and coordinated the junior staff.

Course assistant, MIT: Spring 2021.
 Served as a mentor/assistant for *Mathematics Project Laboratory* (18.821). This is a special mathematical communication/writing course designed to introduce students to research in mathematics. Students form groups and work on small projects over the course of the semester.

Course instructor, MIT: Fall 2020.
 Taught *Introduction to Topology* (18.901).

Course instructor, Princeton University: Spring 2018.
 Taught *Linear Algebra with Applications* (MAT 202).

COMMUNITY SERVICE/OUTREACH

MIT Program for Research in Math, Engineering and Science (PRIMES): Winter 2020 – Winter 2021
 Directed a team of three high school students doing a research project in low-dimensional topology. The project involved computing homology cobordism invariants for different families of Seifert fibered manifolds. My students have written their own paper, which they are preparing for submission to a research journal. (See Seetharaman, Yue, and Zhu, *Patterns in the lattice homology*

of Seifert homology spheres, [arXiv:2110.13405](https://arxiv.org/abs/2110.13405).) We met weekly to explore problems and discuss mathematics; I also provided advice on giving presentations, writing papers, and mathematical communication.

MIT Undergraduate Research Opportunities Program (UROP): Fall 2020 – Summer 2021

Supervised reading projects for three different undergraduates wanting to explore low-dimensional topology. Topics included the Casson invariant, Kirby calculus, and Heegaard Floer homology.

Reading Mentor (Casson invariant and Kirby calculus), Summer 2021

Reading Mentor (Heegaard Floer homology), Winter 2020

Reading Mentor (Casson invariant and Kirby calculus), Fall 2020

American Mathematical Society, Graduate Student Blog: Academic Years 2015 – 2017

Served as an editor for an AMS blog featuring articles written by and for graduate students in mathematics.

MIT Educational Studies Program (ESP): Summer 2013

Held weekend summer classes in mathematics/physics for local high school students.

MIT Program for Research in Mathematics, Engineering and Science (PRIMES): Spring 2013

Ran a semester-long reading course in abstract algebra for high school students.

Program in Mathematics for Young Scientists (PROMYS): Summer 2011

Served as a counselor/course assistant for a six-week mathematics camp in number theory for high school students.

PROFESSIONAL SERVICE

Served as a reviewer for various mathematics journals:

Journal of Topology, Geometry & Topology, Indiana University Mathematics Journal, Annales de l'Institut Fourier, Selecta Mathematica, Proceedings of the London Mathematical Society, Proceedings of the Georgia International Topology Conference, Algebraic & Geometric Topology

Nearly Carbon Neutral Geometric Topology Conference (NCNGT): Summer 2021

NCNGT is an online conference divided into several different sessions. I co-organized a session on recent techniques in Floer and Khovanov homology.

MIT Geometry and Topology Seminar: Fall 2020 – Spring 2021

Organized the MIT Geometry and Topology Seminar.

MIT Mathematics Department: Spring 2020 – Spring 2021

Served as a secondary advisor for undergraduates pursuing a joint major in mathematics.

PCMI Graduate Summer School: Summer 2019

Served as a course assistant for a one-week introductory summer course (by Jennifer Hom) on Heegaard Floer homology.

Princeton Summer School in Low-Dimensional Topology and Symplectic Geometry: Summer 2018

Served as a course assistant for a three-week summer school aimed at advanced undergraduates/first-year graduate students interested in low-dimensional topology.

RESEARCH TALKS AND PRESENTATIONS

AMS-MAA Joint Mathematics Meetings; January 2022 (scheduled)

UGA Topology Seminar; November 2021

UCSD Topology Seminar; April 2021

Michigan State University Geometry and Topology Seminar; February 2021

Geometry and Topology Workshop Turkey; November 2020

Stanford Topology Seminar; April 2020

Winter Braids X (Contributed); February 2020

UCLA Geometry and Topology Workshop; January 2020

Boston Graduate Topology Seminar; October 2019

Brandeis Topology Seminar; October 2019
AMS Sectional Meeting/Special Session; September 2019
Floer Homotopy Theory and Low-Dimensional Topology; August 2019
PCMI Research Program (Contributed); July 2019
Virginia Topology Conference (Contributed); December 2018
University of Chicago Topology Seminar; November 2018
Stony Brook Seminar in Topology and Symplectic Geometry; October 2018
MIT Geometry and Topology Seminar; October 2018
Princeton Summer School in Low-Dimensional Topology and Symplectic Geometry; June 2018
Columbia Symplectic Geometry, Gauge Theory, and Categorification Seminar; March 2018
UCLA Topology Seminar; November 2017
Caltech Geometry and Topology Seminar; November 2017
International Workshop on Combinatorial Algorithms; October 2015
AMS-MAA Joint Mathematics Meetings; January 2013