Curriculum Vitæ

Irving Dai
irving.dai@math.utexas.edu

EDUCATION AND EMPLOYMENT

The University of Texas at Austin (2023 – Present)
Assistant Professor

Stanford University (2021 – 2023)
NSF Postdoctoral Fellow/Postdoctoral Scholar
Postdoctoral Sponsor: Ciprian Manolescu

Massachusetts Institute of Technology (2019 – 2021)
NSF Postdoctoral Fellow/Instructor in Pure Mathematics
Postdoctoral Sponsor: Tomasz Mrowka

Princeton University (2014 – 2019)
Ph.D. in Mathematics
Thesis: Involutive Heegaard Floer homology and homology cobordism
Advisor: Zoltán Szabó

Harvard College (2010 – 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. $\mathbb{Z}$-disks in $\mathbb{C}P^2$
   with A. Conway and M. Miller.
   Preprint, `arXiv:2403.10080` (2024).

2. Gompf's cork and Heegaard Floer homology
   with A. Mallick and I. Zemke.
   Preprint, `arXiv:2309.02309` (2023).

3. Involutions and the Chern-Simons filtration in instanton Floer homology
   with A. Alfieri, A. Mallick, and M. Taniguchi.
   Preprint, `arXiv:2312.08258` (2023).

4. Lattice homology and Seiberg-Witten-Floer spectra
   with H. Sasahira, and M. Stoffregen.
   Preprint, `arXiv:2309.01253` (2023).

5. Rank-expanding satellites, Whitehead doubles, and Heegaard Floer homology
   with M. Hedden, A. Mallick, and M. Stoffregen.
   Preprint, `arXiv:2209.07512` (2022).

6. The $(2,1)$-cable of the figure-eight knot is not smoothly slice
   with S. Kang, A. Mallick, J. Park, and M. Stoffregen.
   Preprint, `arXiv:2207.14187` (2022).

7. Equivariant knots and knot Floer homology
   with A. Mallick and M. Stoffregen.
   Journal of Topology, **16**(3) (2023), 1167−1236.

8. Homology concordance and knot Floer homology
with J. Hom, M. Stoffregen, and L. Truong.
Preprint, `arXiv:2110.14803` (2021).

9. Instanton Floer homology of almost-rational plumbings
with A. Alfieri, J. Baldwin, and S. Sivek.
Geometry & Topology, **26**(5) (2022), 2237−2294.

10. Corks, involutions, and Heegaard Floer homology
with M. Hedden and A. Mallick.
Journal of the European Mathematical Society, **25**(6) (2023), 2319−2389.

11. The 0-concordance monoid admits an infinite linearly independent set
with M. Miller.
Proceedings of the American Mathematical Society, **151**(8) (2023), 3601−3609.

12. More concordance homomorphisms from knot Floer homology
with J. Hom, M. Stoffregen, and L. Truong.
Geometry & Topology, **25**(1) (2021), 275−338.

13. An infinite-rank summand of the homology cobordism group
with J. Hom, M. Stoffregen, and L. Truong.
Duke Mathematical Journal, **172**(12) (2023), 2356−2432.

14. Connected Heegaard Floer homology of sums of Seifert fibrations
Algebraic & Geometric Topology, **19**(5) (2019), 2535−2574.

15. On homology cobordism and local equivalence between plumbed manifolds
with M. Stoffregen.
Geometry & Topology, **23**(2) (2019), 865−924.

16. Involutive Heegaard Floer homology and plumbed three-manifolds
with C. Manolescu.
Journal of the Institute of Mathematics of Jussieu, **18**(6) (2019), 1115−1155.

17. On the Pin(2)-equivariant monopole Floer homology of plumbed 3-manifolds
The Michigan Mathematical Journal, **67**(2) (2018), 423−447.

18. Diameter bounds and recursive properties of Full-Flag Johnson graphs
Discrete Mathematics, **341**(7) (2018), 1932−1944.

19. Combinatorial properties of Full-Flag Johnson graphs
Combinatorial Algorithms, IWOCA 2015, pp. 112−123
in Lecture Notes in Computer Science (9538), Springer (2016).

20. 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, Research Grant (2023)
Hidden Symmetries: Internal and External Equivariance in Floer Homology
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

Introduction to Heegaard Floer Homology
Course instructor, The University of Texas at Austin (Spring 2024).

Functions of a Real Variable (MATH 115)
Course instructor, Stanford University (Spring 2023).

Introduction to Topology and Geometry (MATH 144)
Course instructor, Stanford University (Winter 2023).

Proofs and Modern Mathematics (MATH 56)
Course instructor, Stanford University (Winter 2023).

Calculus (MATH 20)
Course instructor, Stanford University (Fall 2021). Coordinated the junior staff and was responsible for both sections of an entire course (about 130 students).

Mathematics Project Laboratory (18.821)
Course mentor/assistant, MIT (Spring 2021). 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.

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

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

COMMUNITY SERVICE/OUTREACH

Stanford Undergraduate Reading Course: Academic Year 2022 – 2023
Supervised two reading projects in Floer theory and low-dimensional topology for an undergraduate interested in topology research. Topics included:
Knot Floer homology, Spring 2023
Donaldson's theorem and Freedman's theorem, Fall 2022

Stanford Undergraduate Research Institute in Mathematics (SURIM): Summer 2022
Supervised reading projects for two undergraduates wanting to explore low-dimensional topology. Topics included:
Involutive Heegaard Floer homology and homology cobordism, Summer 2022
Knot Floer homology and bordered Floer homology, Summer 2022

MIT Program for Research in Math, Engineering and Science (PRIMES): Winter 2020 – Winter 2021
Mentored a team of three high school students doing a research project in low-dimensional topology. Their project involved computing homology cobordism invariants for different families of Seifert fibered manifolds. The students wrote and submitted their own paper: *Patterns in the lattice homology of Seifert homology spheres*, `arXiv:2110.13405` (Seetharaman, Yue, and Zhu).

MIT Undergraduate Research Opportunities Program (UROP): Academic Year 2020 – 2021
Supervised reading projects for three undergraduates wanting to explore low-dimensional topology. Topics included:
Casson invariant and Kirby calculus, Summer 2021
Heegaard Floer homology, Winter 2020
4-manifolds 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.

PROFESSIONAL SERVICE

Served as a reviewer for various mathematics journals:

Journal of Symplectic Geometry, *Journal of Differential Geometry*, *Forum of Mathematics (Sigma)*, *Quantum Topology*, *Crelle's Journal*, *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*

Georgia Tech Topology Summer School: Summer 2023

Gave a one-week introductory summer course on Heegaard Floer homology and knot Floer homology aimed at graduate students.

Stanford Topology Seminar: Fall 2022 – Spring 2023

Helped organize the Stanford Topology Seminar.

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

Helped organize 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.