

Ayodeji Lindblad

Curriculum Vitae

Education

2023–2028 **Ph.D. in Mathematics**, Massachusetts Institute of Technology, Cambridge, MA.

Advised by Tomasz Mrowka

2019–2023 **B.S. in Mathematics**, Massachusetts Institute of Technology, Cambridge, MA.

Fellowships

2023–2028 **Dean of Science Fellowship**, Massachusetts Institute of Technology, Cambridge, MA.

Through a partnership with the School of Science, the Office of the Dean for Graduate Education and the science departments at MIT, the Dean of Science offers a fellowship to 20 graduate students each year.

Research papers

Designs related through Hopf and projective maps, *Discrete & Computational Geometry*, 2025.

We present infinite families of efficient constructions which build t -designs on spheres by placing t -designs on the Hopf and projective fibers associated to $\lfloor t/2 \rfloor$ -designs on quotient spheres or projective spaces.

Asymptotically optimal t -design curves on S^3 , *Preprint*, arXiv:2408.04044, 2024.

We prove existence of asymptotically optimal t -design curves on the 3-sphere, resolving a question of Ehler and Gröchenig.

Asymptotically small generalizations of t -design curves, *Preprint*, arXiv:2505.03056, 2025.

Proves existence of approximate and weighted t -design curves satisfying certain desirable properties which achieve the optimal asymptotic order of length of spherical t -design curves on the d -sphere for all odd d in the approximate setting and all d in the weighted setting. Explicit formulas for such weighted t -design curves on the 2-sphere and 3-sphere are given for all t .

Abelianized boundary Dehn twists on connected sums of complete intersections, *Preprint, available upon request*, 2026.

Proves that notable boundary Dehn twists known to be non-trivial by work of Kronheimer-Mrowka, Jianfeng Lin, Baraglia-Konno, and Tilton become trivial after abelianization.

Lifting design curves, *Preprint, available upon request*, 2026.

We formalize efficient constructions which build a t -design curve on the $(2n+1)$ -sphere from a $\lfloor t/2 \rfloor$ -design curve on the $2n$ -dimensional complex projective space. These are combined with constructions of design curves on projective spaces to give improved bounds on the minimal asymptotic order of length of a sequence of t -design curves on all spheres of dimension greater than 4.

Design submanifolds, *In preparation*, 2026.

We introduce t -design submanifolds—submanifolds which provide good “global approximations” of the spaces they lie in—as an extension of t -designs and t -design curves. We prove bounds about these objects and formalize geometric constructions to prove asymptotic existence results.

Dynamical stability of translators under mean curvature flow, *Posted to MIT SPUR website*, 2022, advised by Tang-Kai Lee, joint with Carlos Alvarado.

Convergence under mean curvature flow of codimension 2 curves in a certain family to a line is proven. Similar results for hypersurfaces are presented.

Expository work

Instanton Floer homology and applications, *To appear as a chapter in the book New Structures in Low-Dimensional Topology*, joint with John Baldwin, Joye Chen, Nathan Geist, Tomasz Mrowka, and Ollie Thakar.

Instanton Floer homology—a powerful invariant of 3-manifolds—is defined and applications to low-dimensional topology are presented. These notes follow a mini-course presented at the meeting *New structures in low-dimensional topology* in Budapest.

Khovanov Skein lasagna modules for the working topologist, *In preparation*, joint with Enrico Colon, Gage Martin, and Mira Watal.

Khovanov skein lasagna modules are presented and their impacts discussed from the perspective of low-dimensional topology.

Diffeomorphisms of 4-manifolds, *In preparation*.

A survey is provided of results concerning diffeomorphisms of 4-manifolds present in the literature as of the end of 2025.

Mentorship

MIT Grad-Undergrad Math Mentoring Initiative, 2024-2025.

Met with an undergraduate to discuss preparing for graduate school in mathematics.

MIT Directed Reading Program, 2024.

Led three MIT undergraduates in reading through *The Knot Book* by Colin Adams.

Mentoring undergraduate research, 2023.

Mentored UROP student Roni Edwin alongside Professor Henry Cohn on a problem in discrete geometry.

Seminar and conference talks

London Low Dimensional Topology Seminar, *Boundary Dehn twists after abelianization*, 2026.

Discussed my forthcoming work on abelianized boundary Dehn twists on connected sums of complete intersections, which proves that notable boundary Dehn twists known to be non-trivial by work of Kronheimer-Mrowka, Jianfeng Lin, Baraglia-Konno, and Tilton become trivial after abelianization.

Scottish Talbot On Algebra and Topology, *Skein lasagna modules and handle attachments*, 2026.

Discussed work of Manolescu and Neithalath describing how 4- and 3-handle attachments affect the skein lasagna modules of 4-manifolds and computing the skein lasagna modules of 2-handlebodies.

MIT PuMaGraSS, *Geometrically designing geometric designs*, 2025.

Discussed geometric constructions of spherical t-designs and t-design curves.

MIT Juvitop, *Monopole Floer homology and a refinement of Manolescu*, 2024.

Gave an overview of the construction of monopole Floer homology and discussed a refinement due to Manolescu involving finite-dimensional approximations of the Seiberg-Witten map which produces a space whose homotopy groups are the monopole Floer homology groups.

MIT PuMaGraSS, *In case you're curious what your local low-dimensional topologists do all day*, 2024.

Spoke about Morse theory and Floer theories.

AMS Spring Eastern Sectional FRACTals, *Designs related through projective and Hopf maps*, 2024.

Provided an overview of my manuscript of the same name.

Conferences and workshops organized

The Low-dimensional Princeton-Cambridge Exchange Conference (The Low PriCE Conference), *MIT and Harvard*, organized with Ollie Thakar, 2025.

Conferences and workshops attended

Virginia topology conference, UVA, 2025.

Workshop: Low-Dimensional Topology and Floer Theory, CRM, 2025.

Workshop: Knots, Groups, and Manifolds, CRM, 2025.

Modern Tools in Low-Dimensional Topology Summer School and Conference, ICTP, 2025.

Georgia International Topology Conference, UGA, 2025.

Links in Dimensions 3 and 4, ICERM, 2025.

Graduate Student Topology and Geometry Conference, IU Bloomington, 2025.

The Low-Dimensional Princeton-Cambridge Exchange Conference (The Low PriCE Conference), MIT and Harvard, 2025.

Simons Collaboration on New Structures in Low-Dimensional Topology, NYC, 2025.

Simons Collaboration Satellite Conference, Princeton University, 2025.

Foliations and Diffeomorphism Groups, CIRM, 2024.

New Structures in Low-Dimensional Topology Summer School and Conference, The Rényi Institute, 2024.

41st Workshop in Geometric Topology, Calvin University, 2024.

Georgia Topology Summer School and Conference, UGA, 2024.

Graduate Student Topology and Geometry Conference, MSU, 2024.

AMS Spring Eastern Sectional Meeting, Howard University, 2024.

Simons Collaboration on New Structures in Low-Dimensional Topology, NYC, 2024.

Simons Collaboration Satellite Conference, Princeton University, 2024.

Hot Topics: Artin Groups and Arrangements - Topology, Geometry, and Combinatorics, SLMath, 2024.

Equivariant Methods in Geometry, Cambridge University, 2024.

Early Career Symposium for Topology, Actions, and Symmetry, University of Southampton, 2023.

Gauge Theory and Topology: in Celebration of Peter Kronheimer's 60th Birthday, Oxford University, 2023.

RTG Summer School in Geometry and Topology, Princeton University, 2023.

40th Workshop in Geometric Topology, Colorado College, 2023.

New Developments in 3- and 4-Manifold Topology, UVA, 2023.

Discrete and Computational Geometry, Shape Analysis, and Applications, Rutgers University, 2023.

MIT Summer Program in Undergraduate Research, MIT, 2022.

GPA

MIT: 5.0/5.0.

Other institutions: 4.0/4.0.

Mathematics coursework

Gauge theory and related tools, Harvard University, Peter Kronheimer.

Applications of Khovanov homology in low-dimensional topology, Harvard University, Gage Martin.

Topics in Geometric PDEs, MIT, Tobias Colding.

Sutured 3-Manifolds and Floer Homology, Harvard University, Fan Ye.

Geometry of Manifolds II (Mean Curvature Flow), MIT, William Minicozzi.

Algebraic Topology II, MIT, Tomasz Mrowka.

Topological Modular Forms, Harvard University, Stephen McKean.

Geometry of Manifolds II (Minimal Surfaces), MIT, Tobias Colding.

Project Lab in Mathematics, MIT, Andrei Negut.

Discrete Geometry, MIT, Henry Cohn.

Geometry of Manifolds II, MIT, Tobias Colding.

Seminar in Topology, MIT, Anthony Conway.

Geometry of Manifolds I, MIT, William Minicozzi.

Algebraic Topology I, MIT, Jeremy Hahn.

Probability and Random Variables, MIT, Jonathan Kelner.

Microlocal Analysis, MIT, Peter Hintz.

Algebra II, MIT, Michael Artin.

Theory of Differential Forms, MIT, Victor Guillemin.

Differential Analysis I, MIT, Tomasz Mrowka.

Algebra I, MIT, Bjorn Poonen.

Analysis and Manifolds, MIT, Richard Melrose.

Functional Analysis, MIT, Richard Melrose.

Real Analysis, MIT, Roman Bezrukavnikov.

Geometry and Topology in the Plane, MIT, Paul Seidel.

Linear Algebra, MIT, David Vogan.

Calculus III, CCBC, Robert Brown.

Differential Equations, JHU, Richard Brown.

Linear Algebra, UCSD, Laura Stevens.