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 asymptoitic 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 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.

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 over two years.

MIT Directed Reading Program, 2024.
Led three MIT undergraduates in reading through *The Knot Book* by Colin Adams for a month.

Mentoring undergraduate research, 2023.
Mentored UROP student Roni Edwin alongside Professor Henry Cohn on a problem in discrete geometry for a semester.

Seminar and conference talks

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.