Benjamin Jones

Department of Mathematics, Michigan State University

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Education

Michigan State University, East Lansing, MI

Ph.D. Mathematics — Aug 2021 - Present

Dissertation: *"Aspects of Applied Algebraic and Geometric Topologies"*

Advisor: Guo-Wei Wei

The University of Alabama, Tuscaloosa, AL

M.A. Mathematics — May 2021

Thesis: *"Adaptive pseudo-time methods for the Poisson-Boltzmann equation with Eulerian solvent excluded surface."*

Advisor: Shan Zhao

B.S. Computer Science — Dec 2020

B.S. Mathematics — May 2020

Minor in Randall Research Scholars

Budapest Semesters in Mathematics, Hungary — Summer 2019

Papers and Preprints

9. Meta-analysis and Topological Perturbation in Interactomic Network for Anti-opioid Addiction Drug Repurposing
   C. Zhang, S. Cottrell, **B. Jones**, Y. Zhu, H. Qiu, B. Zhang, T. Zhou, and J. Jiang
   arXiv:2509.19410, (2025)
8. PETLS: PErsistent Topological Laplacian Software
   B. Jones and G.-W. Wei
   arXiv:2508.11560, (2025)
7. Unexpected Applications of AlphaFold in Molecular Sciences: A Review
   J. Jiang, G. Wang, D. Li, N. Hayes, **B. Jones**, Y. Shi, H. Qiu, B. Zhang, T. Zhou, and G.-W. Wei
   Annual review of Biochemistry, accepted, (2025)
6. Drug Resistance Predictions Based on a Directed Flag Transformer
   D. Chen, G. Liu, H. Du, **B. Jones**, J. Wee, R. Wang, J. Chen, J. Shen, and G.-W. Wei
   Advanced Science **12**(36):e02756, (2025)
5. Khovanov Laplacian and Khovanov Dirac for Knots and Links
   B. Jones and G.-W. Wei
   J. Phys. Complex. **6**(2):025014, (2025)
4. Persistent Directed Flag Laplacian (PDFL)-Based Machine Learning for Protein–Ligand Binding Affinity Prediction
   M. Zia, **B. Jones**, H. Feng, and G.-W. Wei
   Journal of Chemical Theory and Computation, **21**(8):4276–4285, (2025)
3. Persistent Directed Flag Laplacian
   B. Jones and G.-W. Wei
   Foundations of Data Science, **7**(3):737–758, (2025)
2. Bridging Eulerian and Lagrangian Poisson–Boltzmann solvers by ESES
   S. Ahmed-Ullah, X. Yang, **B. Jones**, S. Zhao, W. Geng, and G.-W. Wei
   J. Comput. Chem., **45**(6):306-320, (2023)

1. Adaptive pseudo-time methods for the Poisson-Boltzmann equation with Eulerian solvent excluded surface
   B. Jones, S. Ahmed-Ullah, S. Wang, and S. Zhao
   Communications in Information & Systems, **21**(1):85-123, (2021)

Invited Talks

3. EPFL Applied Topology Reading Group (virtual), *"Computing Persistent Laplacians: Toward Broader Applications in TDA,"* November 2025.
2. Joint Mathematics Meetings, Seattle, WA. MRC Climate Science at the Interface Between Topological Data Analysis and Dynamical Systems Theory, *"Dynamics-Aware Filtrations*," January 2025.
1. SIAM Conference on Mathematics of Data Science, Atlanta, GA. Minisymposium on Exploring the Intersection of Topological and Geometric Data Analysis with Biological Applications. *"Persistent Directed Flag Laplacian,"* October 2024.

Contributed Talks

14. Joint Mathematics Meetings, Washington, DC. SIAM Minisymposium on Geometric & Topological Data Analysis with Applications, *"Computing Persistent Laplacians: Toward Broader Applications in TDA,"* January 2026.
13. Conference on Topological Data Analysis: Recent Developments and Applications. University of Missouri-Columbia, *"Computing Persistent Laplacians: Toward Broader Applications in TDA,"* November 2025.
12. Workshop on Computational Persistence (ComPer), *"Computing Persistent Laplacians: Toward Broader Applications in TDA,"* SUNY Albany, October 2025.
11. SIAM Great Lakes Section Annual Meeting, Illinois Institute of Technology, "*Scalable Persistent Laplacians for Biological Data Analysis,"* September 2025.
10. The Geometric Realization of the Applied Algebraic Topology Research Network (AATRN), IMSI, Chicago, *"Efficient Computation of Persistent Laplacians,"* Poster + Lightning talk. August 2025.
9. MSU TDA Seminar. *"Computing Persistent Laplacians: Toward Broader Applications in TDA,"* April 2025.
8. Graduate Student Geometry and Topology Conference (GSTGC) 2025, IU Bloomington. *"Persistent and Combinatorial Laplacians for topological data analysis and their introduction to knot theory,"* April 2025.
7. WinCompTop + AATRN Tutorial-a-thon, YouTube tutorial. *"Persistent Laplacians: What they are, why you should care, and how to compute them,"* February 2025.
6. Joint Mathematics Meetings, Seattle, WA. AMS Special Session on Topological Data Analysis: Theory and Applications. *"Efficient Computation of Persistent Laplacians,"* January 2025.
5. MSU Student Geometry and Topology Seminar. *"Combinatorial and Persistent Laplacians: from Graphs to TDA,"* October 2024.
4. Workshop on Computational Persistence (ComPer), Graz University of Technology (virtual). *"Efficient Computation of Persistent Laplacians,"* September 2024.
3. Mathematical Biosciences Workshop, Penn State University. *"Persistent Directed Flag Laplacian,"* August 2024.
2. MSU Operator Algebras Reading Seminar. *"The story of how Vaughan Jones used operator algebras to spark a revolution in topology,"* March 2024.
1. UA Applied Math Seminar, Tuscaloosa, AL. *"Adaptive Pseudo-Time Methods for the Poisson-Boltzmann Equation with Eulerian Solvent Excluded Surface,"* December 2020.

Teaching and Mentoring

MSU MTH 132: Calculus I (TA)	Fall 2025
MSU MTH 299: Transitions (TA)	Spring 2025
MSU MTH 994: Graduate Machine Learning (TA)	Fall 2023
MSU MTH 234: Calculus III (Lecturer)	Summer 2023
MSU MTH 133: Calculus II (TA)	Fall 2022
MSU Teaching Mentor	Spring 2025
MSU Math Graduate Student Peer Mentoring Group	2024-2025
MSU Summer Topology Program (Directed Reading Program) Mentor	Summer 2023
MSU Teaching Mentor	Fall 2022

Awards

MSU Council of Graduate Students Conference Award ($300)	2025
MSU Sigma Xi Scientific Research Honors Society Full Member	2025
AMS Graduate Student Travel Grant to Joint Mathematics Meetings ($1,430)	2025
MSU G.R.E.A.T. Inclusive Teaching Tips Video Fellowship ($100)	2024
SIAM Student Travel Grant to Conference on Mathematics of Data Science ($650)	2024
MSU College of Natural Sciences Recruiting Fellowship ($75,000)	2021-2022
MSU College of Natural Sciences Early Start Fellowship ($6,000)	2021
UA Randall Outstanding Undergraduate Research Award	2020
UA Phi Beta Kappa	2020
UA Tau Beta Pi Engineering Honors Society	2020
UA Henry Copeland Scholarship	2019
UA Upsilon Pi Epsilon Computer Science Honors Society	2019

Service

SURIEM Graduate Student Panel	2025
MSU American Mathematical Society President	2024-2025
MSU Graduate Employees Union Math Department Steward	2023-2025
UA Accelerated Master's Program Graduate Student Panel	2024
MSU Graduate Employees Union Bargaining Committee	2024
Graduate Student Geometry and Topology Conference Organizing Committee	2024

Professional Experience

NOAA Fisheries, Virtual Student Federal Service Intern, Jan 2021 – Sept 2021
Automated resource allocation for the National Coral Reef Monitoring Program.

U.S. Census Bureau, Computer Science Intern Aug 2020 – Jan 2021
Developed efficient Python software for processing Economic Census data.