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: Randall Research Scholars Program
  Study Abroad: Budapest Semesters in Mathematics, Hungary   Summer 2019

Papers and Preprints

9. Chunhuan Zhang, Sean Cottrell, **Benjamin Jones**, Yueying Zhu, Huahai Qiu, Bengong Zhang, Tianshou Zhou, Jian Jiang, "Meta-analysis and Topological Perturbation in Interactomic Network for Anti-opioid Addiction Drug Repurposing," 2025. arxiv.org/abs/2509.19410.

8. **Benjamin Jones** and Guo-Wei Wei, "PETLS: PErsistent Topological Laplacian Software," 2025. arxiv.org/abs/2508.11560.

7. Jian Jiang, Guilin Wang, Daixin Li, Nicole Hayes, **Benjamin Jones**, Yazhou Shi, Huahai Qiu, Bengong Zhang, Tianshou Zhou, and Guo-Wei Wei, "Unexpected Applications of AlphaFold in Molecular Sciences: A Review," *Annual review of Biochemistry*, accepted, 2025.

6. Dong Chen, Gengzhuo Liu, Hongyan Du, **Benjamin Jones**, Junjie Wee, Rui Wang, Jiahui Chen, Jana Shen, and Guo-Wei Wei, "Drug Resistance Predictions Based on a Directed Flag Transformer," *Advanced Science* e02756, 2025. *DOI: doi.org/10.1002/advs.202502756*.

5. **Benjamin Jones** and Guo-wei Wei. "Khovanov Laplacian and Khovanov Dirac for Knots and Links." *Journal of Physics: Complexity*, 2025. URL: iopscience.iop.org/article/10.1088/2632-072X/adde9f.

4. Mushal Zia, **Benjamin Jones**, Hongsong Feng, and Guo-Wei Wei. "Persistent Directed Flag Laplacian (PDFL)-Based Machine Learning for Protein–Ligand Binding Affinity Prediction." *Journal of Chemical Theory and Computation*, 21(8):4276–4285, 2025. *DOI: doi.org/10.1021/acs.jctc.5c00074*.

3. **Benjamin Jones** and Guo-Wei Wei. "Persistent Directed Flag Laplacian." *Foundations of Data Science*, 7(3):737–758, 2025. *DOI: doi.org/10.3934/fods.202404*.

2. S. A. Ullah, X. Yang, **B. Jones**, S. Zhao, W. Geng, G.-W. Wei. "Bridging Eulerian and Lagrangian Poisson–Boltzmann solvers by ESES." *J. Comput. Chem. 2023, 1. DOI: doi.org/10.1002/jcc.27239*.

1. **Benjamin Jones**, Sheik Ahmed-Ullah, Siwen Wang, and Shan Zhao. "Adaptive pseudo-time methods for the Poisson-Boltzmann equation with Eulerian solvent excluded surface." *Communications in Information & Systems, (2021). DOI: dx.doi.org/10.4310/CIS.2021.v21.n1.a5.*

Presentations

14. Workshop on Computational Persistence (ComPer), SUNY Albany, October 2025.
13. SIAM Great Lakes Section Annual Meeting, Illinois Institute of Technology, September 2025.
12. The Geometric Realization of the Applied Algebraic Topology Research Network (AATRN), IMSI, Chicago. Poster + Lightning talk. August 2025.
11. MSU TDA Seminar. "Computing Persistent Laplacians: Toward Broader Applications in TDA," April 2025.
10. 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.
9. WinCompTop + AATRN Spring 2025 Tutorial-a-thon, YouTube tutorial. "Persistent Laplacians: What they are, why you should care, and how to compute them," February 2025.
8. Joint Mathematics Meetings (JMM), Seattle, WA. AMS Special Session on Topological Data Analysis: Theory and Applications. "Efficient Computation of Persistent Laplacians," January 2025.
7. Joint Mathematics Meetings (JMM), Seattle, WA. MRC Climate Science at the Interface Between Topological Data Analysis and Dynamical Systems Theory. "Dynamics-Aware Filtrations," January 2025.
6. SIAM Conference on Mathematics of Data Science (MDS24), Atlanta, GA. Minisymposium on Exploring the Intersection of Topological and Geometric Data Analysis with Biological Applications. "Persistent Directed Flag Laplacian," October 2024.
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 (by zoom). "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 Math Graduate Student Peer Mentoring Group	2024-2025
MSU Summer Topology Program Mentor	2023

Awards

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 (MDS) ($650)	2024
MSU College of Natural Sciences Recruiting Fellowship ($75,000)	2021-2022
UA Randall Outstanding Undergraduate Research Award	2020
UA Phi Beta Kappa	2020
UA Tau Beta Pi Engineering Honors Society	2020
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 Salary Bargaining Committee	2024
MSU Graduate Employees Union Retirement Benefits Bargaining Committee	2024
Graduate Student Geometry and Topology Conference 2024 Organizing Committee	2024

Professional Experience

Virtual Student Federal Service Intern, NOAA Fisheries	Jan 2021 – Sept 2021
Automated resource allocation for the National Coral Reef Monitoring Program.	
Computer Science Intern, U.S. Census Bureau	Aug 2020 – Jan 2021
Developed efficient Python software for processing Economic Census data.	