

Daniel Tolosa

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Algebraic Topology • Applied & Computational Topology

Education

- Ph.D. in Mathematics**, Purdue University, West Lafayette, IN 2024
Dissertation: *Hochschild and cyclic theory for categorical coalgebras*
Advisor: Manuel Rivera
- B.Sc. in Mathematics**, National University of Colombia, Bogotá 2018

Employment

- Presidential Postdoctoral Fellow**, Arizona State University 2025–present
School of Mathematical and Statistical Sciences, Tempe, AZ
- Visiting Postdoc**, Max Planck Institute for Molecular Cell Biology & Genetics Fall 2024 & Summer 2025
Mathematics for Systems Biology Group (Dr. Heather Harrington)
- Graduate Data Science Researcher**, The Data Mine, Purdue University, IN, USA 2023–2024

Publications and Preprints

- **D. Tolosa**, A. Volkening, *Quantifying biological pattern formation: a time-dynamic persistent homology approach*, in preparation (2025+).
- A. Carnero, S. Goyal, S. Martínez, C. Ng, C. Roitzheim, **D. Tolosa**. *Left and right Bousfield localization on posets*, arXiv:2511.07952 (2025).
- V. Galgano, H. Harrington, **D. Tolosa**., *Discrete signature tensors of persistence landscapes*, arXiv:2505.02800 (2025).
- **D. Tolosa**, M. Rivera, *Cyclic homology of categorical coalgebras and the free loop space*, arXiv:2403.08116 (2024).
- **D. Tolosa**, *Hochschild and cyclic theory for categorical coalgebras: an algebraic model for the free loop space and its equivariant structure*, Ph.D. Dissertation, Purdue University (2024).

Academic Activities and Service

- Organizer, *Mini-symposium “Beyond the Barcode: Emerging Methods in Applied Algebraic Topology”* 2025
SIAM Applied Algebraic Geometry Conference, Univ. of Wisconsin–Madison
- Organizer, *Special Session “AWM Purdue Chapter: Over a Decade of Empowering Women in Math”* 2025
Joint Mathematical Meetings, Seattle, WA
- Panelist, *Postdoc Job Search Perspectives* Arizona State University 2025
- Panelist, *Success in Graduate School* Arizona State University 2025
- Panelist, *Alumni Panel* Purdue University Recruiting Event 2025
- Panelist, *Graduate School abroad* 2024
ECOG&T: Colombian school in geometry and topology, National University of Colombia
- Organizer, *Reading group “Path signatures and rough paths”* 2024
Max Planck Institute CBG, Dresden, Germany
- Panelist, *Ask a mathematician, Math Summer Camp* 2023
Purdue University
- Poster Session Judge, *SURF Symposium* 2023
Purdue University

- Organizer, *Topology Student Seminar* 2022 – 2024 Purdue University
- Poster Session Judge, *Fall Undergraduate Research Expo* 2022
Purdue University
- Finalist, *Math challenges in biology contest* 2022
NSF-Simons Center for Quantitative Biology
- Member, *Anti-racist reading group* 2019 – 2024
Purdue University
- Member, *Post-quantum cryptography research group* 2017
Universidad del Rosario, Colombia
- Visiting Scholar, *Undergraduate Research Experience* (with Prof Giulio Caviglia) 2016
Purdue University
- Visiting Scholar *Undergraduate Research Experience* 2013
University of Bologna, Italy

Mentoring and DEI Engagement

- Barrett College Honors contracts (2 students), Arizona State University 2025
- Undergraduate thesis committee, Ron Balanay, Arizona State University 2025
- Undergraduate reading program, Daniel Armeanu, Purdue University 2024
- UREP-C: Mentoring Colombian visiting scholars on REU, Purdue University 2021-2022
- Participant, workshops *Advocating for Students of Color: There's More You Can Do* 2020

Professional Memberships: SIAM • AWM • AMS • MAA

Awards and Recognition

- MGB-SIAM Early Career Fellowship 2026
- Teaching Academy Graduate Teaching Award, Purdue University 2024
- Service Award: topology seminar organizer, Purdue University 2024
- Excellence in Graduate Teaching Award, Purdue University 2023
- Summer research grant awarded by Purdue University Summer 2023
- Summer research assistantship supported by NSF grant. Summer 2022

Teaching

Instructor of Record

- *Discrete Mathematical Structures*, Arizona State University Spring 2026
- *Linear Algebra with Applications*, Arizona State University Spring 2025, Fall 2025
- *Applied Calculus 2* (2 Sections), Purdue University Spring 2022
- *Applied Calculus 1* (2 Sections), Purdue University Fall 2021

Teaching Assistant (Recitation)

- *Multivariate Calculus* (3 Sections), Purdue University Fall 2019, Summer 2021, Spring 2022
- *Linear algebra and differential equations* (2 sections), Purdue University Fall 2020
- *Discrete mathematics and applications* (2 sections), Purdue University Summer 2020
- *Calculus 2* (2 sections), Purdue University Fall 2018 and Spring 2019
- *ODEs and Linear Algebra* (1 section), National University of Colombia Spring 2016
- *Fundamentals of mathematics* (1 section), National University of Colombia Fall 2015

Invited Talks

- (Upcoming) *Discrete signatures of topological summaries in machine learning* 2026
University of New Mexico
- (Upcoming) *The topology of biology: mathematical tools for revealing structure in biological data* 2026
Director's Lecture Series, ASU-Banner Neurodegenerative Disease Research Center, Arizona
- *Alumni speaker: A topological journey* 2025
Recruiting event, Purdue University
- *Topological methods for quantifying time-dynamics in biological pattern formation* 2025
JMM, Special Session in Results on curves inspired by applications, Seattle, WA
- *A topological description of collective behavior* 2025
Math Biology seminar, Arizona State University
- *Loop spaces* Geometry seminar, TU Dresden, Germany 2024
- *Topological methods for quantifying time-dynamics in biological pattern formation* 2024
Postdoc seminar, Max Planck Institute for Molecular Cell Biology and Genetics, Dresden, Germany
- *An algebraic model for the free loop space as an S^1 -space* 2024
JMM, Special Session in Equivariant techniques in stable homotopy theory, San Francisco, CA
- *Topological methods for quantifying time-dynamics in biological pattern formation* 2024
AMS Sectional Meeting, Special Session in Diversity in Mathematical Biology, Florida State University
- *How zebrafish get their stripes: a TDA approach* 2023
TDA Seminar, Michigan State University
- *Cyclic homology and the free loop space* 2023
Topology Seminar, Michigan State University
- *Cyclic homology of categorical coalgebras and the free loop space* 2023
Topology Seminar, University of Minnesota
- *An algebraic model for the free loop space as an S^1 -space* 2023
Topology Seminar, Indiana University
- *An algebraic model for the free loop space as an S^1 -space* 2023
Topology Seminar, Purdue University
- *Quantifying biological pattern formation* 2023
Applied Geometry and Topology Seminar (Online), Potsdam University, Germany
- *An equivariant algebraic model for the free loop space* 2023
Algebra and Geometry Seminar, University of Genova, Italy
- *Topological techniques to quantify biological pattern formation* 2023
AMS Spring Sectional Meeting, University of Cincinnati
- *Describing biological pattern formation in time* 2023
Synergies between TDA and Life Sciences Workshop (Online), Heidelberg University, Germany

Contributed Talks

- *Path signatures, TDA, and machine learning* 2025
AMPD paper club, ASU
- *Transcriptomic circle bundles* 2025
Young Topologists Meeting, KTH, Stockholm
- *Future directions in the intersection of Cyclic Homology, Equivariant Homology, and TDA* 2023
Student Topology Seminar, Purdue University

- *An algebraic model for the free loop space as an S^1 space* 2023
Midwest Topology Seminar, UIUC
- *An algebraic model for the S^1 -homology of the free loop space* 2022
Graduate Research Day, Purdue University
- *Time dynamics in Topological Data Analysis of Zebrafish Patterns* 2022
Student Colloquium, Purdue University
- *Whitehead's theorem for Model Categories* 2021
Student Topology Seminar, Purdue University
- *An introduction to persistent homology using zebrafish-skin patterns* 2021
Student Topology Seminar, Purdue University
- *Goppa Codes in PQ-Crypto* 2017
Code Theory Seminar, Universidad de los Andes, Colombia
- *Finite fields in code-based cryptography* 2017
Post-Quantum Cryptography Seminar, Universidad del Rosario, Colombia
- *Gröbner Bases, Stillman's Conjecture and F5 algorithms* 2016
UREP-C Symposium, Purdue University
- *Bridges between Algebra and Geometry* 2016
Next Generation Researchers, Lafayette, IN
- *Recent developments on Cerny's Conjecture* 2016
CS and Discrete Mathematics Seminar, National University of Colombia
- *The Euler Characteristic: development through history and complexity* 2015
CIMPA Summer School 'Geometric, Algebraic and Topological Methods for Quantum Field Theory'
Villa de Leyva, Colombia

Poster Sessions

- *Quantifying biological pattern formation in time* 2023
3rd workshop on Computational Persistence (ComPer), Purdue University
- *Quantifying biological patterns using persistent homology* 2023
PULSe Orientation Faculty Poster Session, Purdue University
- *Uncertainty analysis of Alzheimer's Disease cell-free mRNA assay classifier* 2023
The Data Mine Symposium, Purdue University
- *Cerny's Conjecture and the method of extension* 2017
Graduation Poster Session, National University of Colombia
- *Gröbner Bases Computation* 2016
C-SAP Academic Event, Purdue University