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 (2026+).
- 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

- Program Committee Member, *Workshop Title TBD* 2026
  Arizona State University
- 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 contract, Bryce Vu, Arizona State University 2026
- 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 • ASU–Banner Neurodegenerative Disease Research Center

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

- *MAT 300: Mathematical Structures*, Arizona State University Fall 2026
- *MAT 243: Discrete Mathematical Structures*, Arizona State University Spring 2026
- *MAT 343: 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
- *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