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## JUSTIN M. CURRY

- appointments** Assistant Professor of Mathematics, University at Albany SUNY, 2017–present.  
Mentor: **Boris Goldfarb**
- Visiting Assistant Professor in Mathematics, Duke University, 2014–2017.  
Mentors: **John Harer**, **Ezra Miller**, **Sayan Mukherjee**
- Research Fellow for Semester Program *Topology in Motion* at ICERM, Fall 2016.
- education** Ph.D, Mathematics, University of Pennsylvania, 2008–2014.  
Dissertation: *Sheaves, Cosheaves and Applications*. 307 pages. 68 figures.  
Available as <https://arxiv.org/abs/1303.3255>.  
Advisor: **Robert Ghrist**
- Visiting Associate, Institute for Advanced Study, 2012–2014.  
Mentor: **Robert MacPherson**
- Exchange Scholar, Princeton University, 2011–2012.  
Mentor: **Amit Singer**
- B.S., Mathematics, Massachusetts Institute of Technology, 2004–2008.  
Thesis Equivalent: *Soliton Solutions to Integrable Systems and Hirota's Method*  
Mentors: **Aliaa Barakat** and **Haynes Miller**
- Cambridge-MIT Exchange, Churchill College at Cambridge University, 2006–2007  
Sat for and awarded (unofficial) first class honours for the *Part IB Tripos in Mathematics*  
Mentors: **Colmille Caulfield** and **Christopher Tout**
- grants & contracts** **\$390,000-\$650,000** NASA Glenn Research Center Contract  
*TIMAEUS: Topologically-Influenced Methods for Ad hoc, Evolving and Uncertain Systems*.  
8/1/2020–6/30/2023 (+2 years of optional support at \$130,000 per year)  
PI: **Justin M. Curry**
- \$174,074** NSF Division of Computing and Communication Foundations (CCF)  
*CRII: AF: Enriched Topological Summaries for Inverse Problems*.  
7/1/2019–6/30/2021  
PI: **Justin M. Curry**
- \$40,000** Institute for Mathematics and its Applications (IMA)  
Funds for organizing Special Workshop *Bridging Statistics and Sheaves*  
5/21/2018–5/25/2018, cf. <https://www.ima.umn.edu/2017-2018/SW5.21-25.18>  
PI: **Justin M. Curry**

## awards

Nominated for the *Torch Faculty/Student Engagement Award* at UAlbany in 2022.  
 Awarded a *Postdoc Mobility Grant* by the Technische Universität Munchen in 2016.  
 Awarded a *Good Teaching Award* by the University of Pennsylvania in 2011.

journal  
articles

**Nota Bene: In mathematics, author order is typically alphabetical.**  
 (§) and (¶) indicates student and postdoc status, respectively.

- J8. Justin Curry, Sayan Mukherjee and Katharine Turner. *How Many Directions Determine a Shape and other Sufficiency Results for Two Topological Transforms*. 38 pages.  
 Accepted on April 27, 2022. *Transactions of the American Mathematical Society* (TAMS).  
 Available as <https://arxiv.org/abs/1805.09782>.
- J7. Justin Curry, Haibin Hang (¶), Washington Mio, Tom Needham, Osman Okutan (¶). *Decorated Merge Trees for Persistent Topology*. 58 pages.  
 March 26, 2022. *Journal of Applied and Computational Topology* (JACT).  
 Available as <https://arxiv.org/abs/2103.15804>
- J6. Mike Catanzaro, Justin Curry, Brittany Fasy, Jānis Lazovskis (¶), Greg Malen, Hans Reiss (§), Bei Wang, Matthew Zabka. *Moduli Spaces of Morse Functions for Persistence*. 33 pages.  
 June 27, 2020. *Journal of Applied and Computational Topology* (JACT).  
 Available as <https://rdcu.be/b5hA9>
- J5. Justin Curry and Amit Patel. *Classification of Constructible Cosheaves*. 36 pages.  
 June 24, 2020. *Theory and Applications of Categories* (TAC).  
 Available as <http://www.tac.mta.ca/tac/volumes/35/27/35-27abs.html>
- J4. Justin Curry. *The Fiber of the Persistence Map for Functions on the Interval*. 21 pages.  
 February 7, 2019. *Journal of Applied and Computational Topology* (JACT).  
 Available as <https://arxiv.org/abs/1706.06059>
- J3. Justin Curry (¶). *Dualities between Cellular Sheaves and Cosheaves*. 28 pages.  
 June 27, 2017. *Journal of Pure and Applied Algebra* (JPAA).  
 Available as <https://arxiv.org/abs/1607.06942>.
- J2. Justin Curry (¶), Robert Ghrist and Vidit Nanda (¶). *Discrete Morse Theory for Computing Cellular Sheaf Cohomology*. 24 pages.

June 20, 2015. Foundations of Computational Mathematics (FoCM).

Available as <http://arxiv.org/abs/1312.6454>.

- J1. Justin Curry (¶). *Topological Data Analysis and Cosheaves*. 39 pages.

June 18, 2015. Japan Journal of Industrial and Applied Mathematics (JJIAM).

Available as <http://arxiv.org/abs/1411.0613>.

conference  
papers

**Nota Bene: Author order for AeroConf papers is by institution and effort.**

- C5. Brendan Mallery (§), Adélie Garin (§), Justin Curry. *A Lattice-Theoretic Perspective on the Persistence Map*. 4 pages.

April 11, 2022. Young Researchers Forum (YRF) of the 38th International Symposium on Computational Geometry (SoCG).

Available as <https://arxiv.org/abs/2203.00643>.

- C4. Robert Cardona (§), Justin Curry, Tung Lam (§), Michael Lesnick. *The Universal  $\ell^p$ -Metric on Merge Trees*. 20 pages.

February 9, 2022. 38th International Symposium on Computational Geometry (SoCG).

Available as <http://arxiv.org/abs/2112.12165>.

- C3. Robert Short, Alan Hylton, Jacob Cleveland (§), Michael Moy (§), Robert Cardona (§), Robert Green (§), Justin Curry, Brendan Mallery (§), Gabriel Bainbridge (§), Zander Memon (§). *Sheaf Theoretic Models for Routing in Delay Tolerant Networks*. 19 pages.

Accepted on November 16, 2021. AeroConf 2022.

Available as <https://ntrs.nasa.gov/citations/20220002277>.

- C2. Alan Hylton, Robert Short, Jacob Cleveland (§), Olivia Freides (§), Zander Memon (§), Robert Cardona (§), Robert Green (§), Justin Curry, Sriram Gopalakrishnan, Devavrat Vivek Dabke (§), Brittany Story (§), Michael Moy (§), Brendan Mallery (§). *A Survey of Mathematical Structures for Lunar Networks*. 17 pages.

Accepted on November 16, 2021. AeroConf 2022.

Available as <https://ntrs.nasa.gov/citations/20220003566>.

- C1. Jacob Cleveland, Alan Hylton, Robert Short, Brendan Mallery (§), Robert Green (§), Justin Curry, Devavrat Vivek Dabke (§), Olivia Freides (§). *Introducing Tropical Geometric Approaches to Delay Tolerant Networking Optimization*. 11 pages.

Accepted on November 16, 2021. AeroConf 2022.

Available as <https://ntrs.nasa.gov/citations/20220003679>.

submitted  
articles**Nota Bene: Number indicates order of submission.**

- s4. Shreya Arya (§), Justin Curry, Sayan Mukherjee. *A Sheaf-Theoretic Construction of Shape Space*. 17 pages, 6 figures.  
Available as <https://arxiv.org/abs/2204.09020>.
- s3. Justin Curry, Jordan DeSha (§), Adélie Garin (§), Kathryn Hess, Lida Kanari (¶), Brendan Mallery (§). *From Trees to Barcodes and Back Again II: Combinatorial and Probabilistic Aspects of a Topological Inverse Problem*. 39 pages, 17 figures.  
Submitted to Computational Geometry: Theory and Applications (CGTA) on July 26, 2021.  
Available as <https://arxiv.org/abs/2107.11212>.
- s2. Magnus Botnan, Justin Curry and Elizabeth Munch. *A Relative Theory of Interleavings*. 50 pages.  
Submitted to JACT on May 13, 2020. Revisions requested on February 4th, 2021.  
Available as <https://arxiv.org/abs/2004.14286>.
- s1. Justin Curry. *Functors on Posets Kan Extend to Cosheaves*. 10 pages.  
Erratum for JPAA article.  
Available as <https://arxiv.org/abs/1907.09416>.

survey  
articles

- R2. Justin Curry (§), Robert Ghrist and Michael Robinson (¶). *Euler Calculus with Applications to Signals and Sensing*. 71 pages.  
February 1, 2012. Proceedings of Symposia in Applied Mathematics Vol. 70. pp. 75-146.  
Available as <http://arxiv.org/abs/1202.0275>.
- R1. Justin Curry (§). *Soliton Solutions of Integrable Systems and Hirota's Method*. 16 pages.  
Published in Harvard College Mathematics Review Vol. 2, No. 1, Spring 2008, pp. 43-59  
Available as <http://justinmcurry.com/wp-content/uploads/2017/01/soliton.pdf>.

service  
articles

- H1. Mikael Vejdemo-Johansson, Justin Curry and Julie Corrigan. *Mental Health in the Mathematics Community*. 6 pages.  
August 2019. Notices of the American Mathematical Society. Vol. 66, No. 7, pp. 1079-1084.  
Available as <https://www.ams.org/journals/notices/201907/rnoti-p1079.pdf>.

articles  
in preparation

**Draft available on request.**

P1. Justin Curry and Jordan DeSha (§). *Counting Spheres with the Same Persistence.*

referee  
for

*Journal of Topology and Analysis (JTA)*  
*Journal of Pure and Applied Algebra (JPAA)*  
*Symposium on Computational Geometry (SoCG)*  
 MIT Press  
*Algebraic and Geometric Topology (AG&T)*  
*Notices of the AMS*  
*Journal of Applied and Computational Topology (JACT)*  
*SIAM Journal on Applied Algebra and Geometry (SIAGA)*  
*Homotopy, Homology, and Applications (HHA)*  
*Oxford Journal of Complex Networks*  
*SIAM Journal of Undergraduate Research Online (SIURO)*  
*Discrete & Computational Geometry (DCG)*  
*Symposium on Discrete Algorithms (SODA)*

programming

Competent with Python, L<sup>A</sup>T<sub>E</sub>X, HTML; Previous experience with Matlab and Scheme.

students  
mentored

**Nota Bene: Reverse-ordered by graduation date, expected or actual.**  
 (Ⓞ) Indicates Ph.D. students who have graduated and where I was chair or co-chair.

Robby Green, Ph.D. student, University at Albany SUNY, 09/2020–Present.

**Expected Chair of Thesis Committee.** Robby is a second year PhD student.

Tung Lam, Ph.D. student, University at Albany SUNY, 06/2020–Present.

**Expected Co-Chair of Thesis Committee with Mike Lesnick.** Tung is a third year PhD student working on presentation-based metrics and temporal networking.

Robert Cardona, Ph.D. student, University at Albany SUNY, 09/2018–Present.

**Expected Co-Chair of Thesis Committee with Mike Lesnick.** Robert is a fourth year Ph.D. student working on presentation-based metrics, persistent versions of the nerve theorem, and temporal networking. Estimated Fall 2022 graduation.

Doug Lenseth, Ph.D. student, University at Albany SUNY, 04/2018–04/2022.

**Member of Thesis Committee.**

Dissertation: *Stubbornly Merging Discrete Vector Fields*

Brendan Mallery, RF Employee, University at Albany SUNY, 2020–2021 & Sp22.

**Supervisor on Contract Work.** Brendan was employed as a freelance researcher under my NASA contract. Brendan is now a PhD student at Tufts University.

Nicolas Carrara, Ph.D. student, University at Albany SUNY, 09/2018–06/2021.

**Member of Thesis Committee.**

Dissertation: *The Foundations of Inference and its Application to Fundamental Physics.*

Current Position: Postdoc at UC Davis.

(∅) Jordan DeSha, Ph.D. student, University at Albany SUNY, 08/2018–05/2021.

**Chaired Thesis Committee.**

Dissertation: *Inverse Problems for Topological Summaries in Topological Data Analysis.*

Current Position: Software Developer at The Mailworks

Nicolas Berkouk, Ph.D. student, École Polytechnique – INRIA Saclay, 03/2017–09/2020.

**Mentor and External Jury Member.** Nicolas was a PhD student of Steve Oudot in Paris. I mentored one key project for his thesis and served as an external thesis jury member for his defense in September 2020. He is now a post-doc at EPFL under Kathryn Hess.

Jānis Lazovskis, Ph.D. student, University of Illinois at Chicago, 05/2018–05/2019.

**Served as Outside Member of Thesis Committee.** Jānis’s thesis work creates a universal model for persistent homology of configurations of point clouds and uses ideas from my thesis.

(∅) Anastasios Stefanou, Ph.D. student, University at Albany SUNY, 08/2017–08/2018.

**Co-Chaired Thesis Committee with Elizabeth Munch.**

Dissertation: *Dynamics on Categories and Applications.*

Current Position: Assistant Professor (W1) at the University of Bremen

conference  
talks

**Talks with a (†) were cancelled due to the COVID-19 pandemic.**

**Talks with a (★) were delivered online due to the COVID-19 pandemic.**

**(🔑) Indicates a keynote address.**

(★) “Advancing the Theory of TDA.” Invited panel discussion with Leland McInnes and Bei Wang at SIAM Data Mining 2022. April 28, 2022. <https://sites.google.com/view/tdaworkshopatsdm22/home>

(🔑) “Exemplars of Sheaf Theory in TDA.” University of Florida TDA Meeting 2022. January 21, 2022. <https://people.clas.ufl.edu/peterbubenik/uftda2022/>

(★) “Decorated Merge Trees for Persistence.” Joint Math Meeting, AMS Special Session on Combinatorial Approaches to Topological Structures and Applications. Washington D.C. January 9, 2021.

(★) “Counting Problems in Persistence.” Joint Math Meeting, AMS Special Session on Applied Topology. Washington D.C. January 8, 2021.

(🔑,†) Invited Plenary Lecture at VBAC 2020: Integral functors, finite spaces and Krichever-Novikov algebras. University of Salamanca, Salamanca, Spain. July 17, 2020.

(★) “Counting Embedded Spheres with the Same Persistence.” Invited presentation at the Fields Institute for Research in the Mathematical Sciences. June 15, 2020.

- (☞,†) “Refining Persistence.” Invited Plenary Lecture for the Georgia Topology Conference at UGA. June 5, 2020.
- (★) “Counting Embedded Spheres with the Same Persistence.” Invited presentation at SIAM conference: Mathematics of Data Science. June 2, 2020.
- “Refining Persistence.” Invited lecture at the Summer Conference on Topology and its Applications (SUMTOPO 2019) in Johannesburg, South Africa. July 1–4, 2019.
- (☞) “Refining Persistence I and II.” Two invited plenary lectures for the Workshop on Applied Topology at Kyoto University. January 7 and 10, 2019.
- “The Many Forms of Merge Trees” at AbelSymposium 2018 in Geiranger, Norway. June 4, 2018.
- “The Fiber of the Persistence Map and Other Problems from TDA.” *Invited Junior Faculty Speaker* at the Graduate Student Topology and Geometry Conference (GSTGC), April 7, 2018.
- “The Role of (Co)Sheaves in TDA” at AMS Special Session on Sheaves in TDA at the 2017 Joint Math Meetings (JMM) in Atlanta. January 4, 2017.
- “Counting Realizations of a Barcode” at Union College. December 3, 2016.
- “Realization Problems in Persistence” at Applied Topology: Methods, Computations, and Science (ATMCS7). July 25-29, 2016.
- “Realization Problems in Persistence” at Topology, Geometry, and Data Analysis @ OSU. May 16-20, 2016.
- “Recent results on constructible Reeb spaces and the interleaving distance.” at the AMS Special Session on Applied and Computational Topology of the Joint Mathematics Meeting (JMM) in Seattle, January 9, 2016.
- “Clustering with Cosheaves” at the Applied Topology and High Dimensional Data Analysis (ATHDDA) in Victoria, August 12-21, 2015.
- “Persistent Homology via Cellular Cosheaves” at the mini-symposium on Applied and Computational Topology at the SIAM conference on Applied Algebraic Geometry in Fort Collins, CO, August 1-4, 2013.
- “Persistent Homology via Cellular Cosheaves.” Applied and Computational Algebraic Topology at the University of Bremen, Germany, July 15-19, 2013.
- “Persistent Homology via Cellular Cosheaves” Symposium on Computational Geometry in Rio de Janeiro, Brasil, June 17-20, 2013.
- “Cosheaves, Persistence, and Sensor Networks.” AMS Sectional Meeting: Akron, Ohio. Special Session on Applied Topology, October 21, 2012.
- “Cosheaves and Dualities in Generalized Sensor Networks.” Special Session on Applied and Computational Topology at MAA MathFest, Aug 2-4 2012.
- “Cosheaves and Dualities in Generalized Sensor Networks.” Stanford Symposium - July 23-27, 2012. Algebraic Topology: Applications and New Directions. A

conference to celebrate the birthdays of Gunnar Carlsson, Ralph Cohen, Ib Madsen. July 27th, 2012.

“Cosheaves and Dualities in Generalized Sensor Networks,” Applied and Computational Topology: ATMCS 5 International Centre for Mathematical Sciences (ICMS), 15 S. College St. Edinburgh, Scotland, July 6th, 2012.

“Obstruction-Theoretic Sensing.” Indiana University Graduate Student Topology Conference, March 31, 2012.

“Obstruction-Theoretic Sensing.” AMS Special Session on Computational and Applied Topology, Joint Meetings. Jan 5, 2012.

poster  
presentations

(★) “Decorated Merge Trees for Persistent Topology.” Institute for Mathematical Statistics and Innovation (IMSI) hosted at the University of Chicago, Workshop on Topological Data Analysis. April 27, 2021.

selected  
workshop  
talks

“Refining Persistence” at Topological Data Analysis with Applications, University of Western Ontario, London, Ontario, Canada. May 2–5, 2019.

“The Utility of Sheaves in Persistence” at BIRS-CMO Special Workshop on Multiparameter Persistent Homology. August 8, 2018.

“Bi-stable invariants of Time Series” at the Wright Brothers Institute in Dayton, Ohio. July 26, 2018.

“Introduction to (Co)Sheaves and Open Problems” at Bridging Statistics and Sheaves (SW5.21-25.18) at the Institute for Math and its Applications (IMA) in Minneapolis, MN. May 21, 2018.

“The Fiber of the Persistence Map” BIRS Workshop 17w5108 Topological Data Analysis: Developing Abstract Foundations, BIRS, July 30, 2017.

“Stratified Covering Maps and Interleavings” as part of the Applied Algebraic Topology Research Network on October 27, 2015.

“Multi-dimensional persistence and vineyards” at the Multi-Dimensional Persistent working group on June 10th, 2015

“Applications of Sheaf Theory to TDA Parts I and II” as part of a Workshop on Topological Data Analysis at the Department of Mathematics, Kyoto University, on June 6-7, 2014.

“Parameterized Filtrations and Persistence” as part of the AIM Workshop on Generalized Persistence and Applications, September 10th, 2014

“Applied Sheaf Theory I,II, and III” Three invited talks at the Workshop on Applied Topology at RIMS, Kyoto University, June 10-14, 2013.

“Linear Algebra over Cell Complexes: Applications to Data, Coding and Sensor Networks.” IAS-Penn-Rutgers joint workshop in Identifying Order in Complex Systems, given at Rutgers joint with the BioMaPS institute, February 6, 2013.



selected  
seminars*Topology and Dynamics Seminar at UF*

“Metrics and Stratifications in Modern Applied Topology.” January 18, 2022.  
*Oxford TDA Seminar*

“Exemplars of Sheaf Theory in TDA.” October 15, 2021.  
*Valley Geometry Seminar at UMASS Amherst*

“When Computer Science Meets Sheaf Theory.” December 7, 2018.  
*Departmental Colloquium at UAlbany*

“How Many Directions Determine a Shape?” Oct. 12, 2018.  
*DAT Seminar at CUNY Graduate Center*

“The Fiber of the Persistence Map.” December 1, 2017.  
*Algebra and Topology Seminar at UAlbany*

“Foundations of TDA I, II, III.” November 2, 9, 16, 2017.  
*Brown Applied Topology and Geometry Seminar*

“The Fiber of the Persistence Map.” September 21, 2017.  
*The MacPherson Seminar*

“Notes from the Field.” June 23, 2016.

“(Co)Sheaves over Posets: A Tool for Applications.” Oct. 8, 24, Nov. 5, 2012.

“Derived Equivalence b/w Cellular Sheaves and Cosheaves.” Apr. 19, 2012

“Sensor Networks and Constructible (Co)Sheaves.” December 15, 2011.

“Cellular Sheaves, Cohomology and Applications.” December 5, 2011.

*Mini-Course at OSU*

“Sheaves as a Foundation for Persistence” on March 9, 2015.

“Understanding the interleaving distance between sheaves” on March 10, 2015.

“Open problems and higher categories for persistence” on March 13, 2015.

## organizer

Creator and Co-organizer of the *Applied Topology in Albany (ATiA)* Seminar. Fall 2019-Present. <https://atia-seminar.github.io/>

Co-organizer of Discrete Math Day at Albany. April 25-26, 2020.

★ I spearheaded the effort to convert this conference to a two day online event.

Co-organizer of the Union College Math Conference. September 13-15, 2019.

Co-organizer of the AMS Special Session at the Joint Math Meeting on  
*Topological Data Analysis: Theory and Applications*. January 19th, 2019.

Co-organizer of the MAA Panel at the Joint Math Meeting on  
*Mental Health in the Mathematics Profession*. January 16th, 2019.

Co-organizer of Bridging Statistics and Sheaves (SW5.21-25.18) at the Institute for Math and its Applications (IMA) in Minneapolis, MN. May 21-25, 2018.

Co-organizer of the *Mini-Symposium on Applied and Computational Topology* as part of SIAM Algebraic Geometry 2017.

Co-organizer of the *5th Mini-Symposium on Computational Topology* as part of the Symposium on Computational Geometry (SoCG), June 14-18, 2016.

Organizer of *John Harer's Group Seminar*, Fall 2014.

Organizer of *The MacPherson Seminar* at the IAS, Fall 2012–Spring 2014.

teaching  
experience

*Modern Computing for Mathematicians (AMAT 502)* at SUNY Albany.

(2x) Fa2019, Sp2020, (2x) Fa2020, Sp2021, (2x) Fa2021, Sp2022.

*Probability for Statistics (AMAT 362)* at SUNY Albany.

Sp2019, Sp2020, Sp2021, Sp2022.

*Topics Course on Sheaf Theory (AMAT 899)* at SUNY Albany. Fa2018.

*Topological Data Analysis III (AMAT 585)* at SUNY Albany. Fa2018.

*Discrete Probability (AMAT 367)* at SUNY Albany. Sp2018, Sp2019.

*Topological Data Analysis II (AMAT 584)* at SUNY Albany. Sp2018.

*Topological Data Analysis I (AMAT 583)* at SUNY Albany. Fa2017.

*Linear Programming and Game Theory (Math 375)* at Duke University. Fa2015, Sp2017.

*Partial and Ordinary Differential Equations (Math 353)* at Duke University. Fa2014.

*Applied Algebraic Topology (ESE 680)* at the University of Pennsylvania. Fa2013.

departmental  
& collegiate  
service

**Ordered by accumulated time and effort:**

Actuarial Math Major Advisor and Undergraduate Student Outreach.

I advise  $\sim 7$  undergrads per semester. Fall 2017–Present.

Graduate Admissions Committee:

For admission to the PhD program in mathematics. December 2020—Present.

Undergraduate Education Committee

Working to develop a data science BS degree. Fall 2021–Present.

Diversity Committee

To improve diversity in the Math Dept. Spring 2022–Present.

Webmaster and Facebook Admin for the UAlbany Math and Statistics webpage.

I assist in updating the math department website for colloquia, events and other design changes.

I also created <https://www.facebook.com/ualbanymath>. Fall 2018–Present.

Daniel and Wendy J.L. Keyser Teaching Excellence Award Committee:

CAS teaching award committee for graduate student instructors. Fall 2021