

# Brittany Terese Fasy

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## CONTACT INFORMATION

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Montana State University  
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## EDUCATION

**Ph.D.**, Computer Science, 2012  
Duke University, Durham, NC

Thesis: *Modes of Gaussian Mixtures and an Inequality for the Distance Between Curves in Space*  
Adviser: Herbert Edelsbrunner

**B.S.**, Mathematics and Computer Science, 2007  
Saint Joseph's University, Philadelphia, PA

Honors Program. Summa Cum Laude.  
Thesis: *Homotopy Classification of the Components of the Space of Maps into an Aspherical Space: a Problem in the Intersection of Group Theory and Topology*  
Adviser: Samuel Smith

## RESEARCH POSITIONS

**Assistant Professor and Gianforte Faculty Fellow**, Computer Science, 2015–present  
**Affiliate Faculty**, Mathematical Sciences, 2017–present  
Montana State University, Bozeman, MT

**Postdoctoral Researcher and Newcomb Fellow**, Computer Science, 2013–2015  
Tulane University, New Orleans, LA  
Adviser: Carola Wenk

**Postdoctoral Fellow**, Computer Science, 2012–2013  
Carnegie Mellon University, Pittsburgh, PA

**Visiting Scientist**, 2009–2012  
IST Austria, Vienna, Austria

**College Student Senior Technical Specialist**, May 2006–August 2008  
Lockheed Martin, King of Prussia, PA  
Lockheed Martin, Gaithersburg, MD

**University Scholar Researcher**, Mathematics, 2006–2007  
Saint Joseph's University, Philadelphia, PA  
Adviser: Samuel Smith.

**Summer Research Scholar**, Computer Science Education, 2004–2005  
Saint Joseph's University, Philadelphia, PA  
Adviser: Stephen Cooper.

## CURRENT GRANTS

*CAREER: Topological Descriptors*  
07/01/2021–06/30/2026, NSF CCF 2046730, \$599,348.  
PI: BTF.

*Indian Education in Computing: a Montana Story*  
1 September 2020–30 June 2021 (est.), NSF DRL 2031795, \$635,255.  
PI: BTF; co-PIs: S. Hancock, T. Peters.  
Collaborative Grant: DRL 2031279 (PI Searle, Utah State U.; co-PI Tofel-Grehl).

*Topology for Data Science: An Introductory Workshop for Undergraduates*

15 January 2020–30 June 2021 (est.), NSF DMS 1955925, \$30,474.  
 PI: S. Hancock; co-PI: D. L. Millman; My role: SP.

*FRG: Statistical Approaches to Topological Data Analysis that Address Questions in Complex Data*  
 1 September 2019–31 August 2022 (est.), NSF DMS 1854336, \$404,183.  
 PI: BTF. CMU Subcontract: A. Rinaldo (PI) and L. Wasserman (co-PI).  
 Collaborative Grant: DMS 1854220 (PI J. Cisweski-Kehe, Yale).

*RET Site: Innovative Transportation Systems*  
 October 2017–September 2021 (est.), NSF EEC 1610089, \$594,426.  
 PI: C. Woolard; Co-PIs J. Stephens and S. Gallagher. My role: SP.

*QuBBD: Quantifying Morphologic Phenotypes in Prostate Cancer - Developing Topological Descriptors for Machine Learning Algorithms*  
 1 August 2017–31 July 2021 (est.), co-funded by NIH and NSF, DMS 1664858, \$420,706.  
 PI: BTF; co-PI J. Sheppard. Collaborative Grant: DMS 1557750 (PI C. Wenk, Tulane).

*Improving the Pathway for Rural and American Indian Students Entering Computer Science Via Storytelling*  
 1 August 2017–31 July 2021 (est.), National Science Foundation, DRL 1657553, \$1,149,691.  
 PI: BTF; co-PIs: S. Hancock, B. Komlos, S. Windchief, and M. Wittie.  
 • REU Supplement: Summer 2018 for \$16,000 (will fund two REU students).

## SELECT PREVIOUS GRANTS

*AF: Small: Geometric and Topological Algorithms for Analyzing Road Network Data*  
 1 July 2016–30 June 2020, National Science Foundation, CCF 1618605, \$152,824.  
 PI: BTF. Collaborative Grants: CCF 1618469 (PI C. Wenk, Tulane) and CCF 1618247 (PI Y. Wang, Ohio State).  
 • REU Supplement: Summer 2017 for \$19,000 (funded two REU students).

*QuBBD: Towards Automated Quantitative Prostate Cancer Diagnosis*  
 15 September 2015–31 August 2017, co-funded by NIH and NSF, DMS 1557716, \$46,639.  
 PI: BTF. Collaborative Grant: DMS 1557750 (PI C. Wenk, Tulane)

## GRADUATE

Olivia Firth, current M.S. student.

## STUDENT ADVISEES

School of Computing, Montana State University. Spring 2020–Present.

Anna Schenfisch, current Ph.D. student.  
 Department of Mathematical Sciences, Montana State University. Summer 2017–Present.

Sushovan Majhi, co-advised with C. Wenk, Ph.D. in Mathematics (Dec. 2020), Tulane University.  
 Now a postdoc at University of California Berkeley in January 2021.

Samuel Micka, Ph.D. in Computer Science (May 2020), MSU. Now an Assistant Professor of Computer Science at Western Washington University.

## UNDERGRADUATE RAS

McNair Scholars: Justin O'Dea (2016), Angus Tomlinson (2017).

MSU Emerging Scholars: Maia Grudzien (2016), Jachi Madubuko (2017).

2019 REU Students: Clare DuVal (Clemson U.), Tyler Fallis (Western Washington U.), Emily Flanagan (U. Washington), Luke Askew (Colorado State U.)

2018 REU Students: Thomas Li (UC Berkeley)

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2017 REU Students: Maia Grudzien (MSU), Carrington Metts (William & Mary), Kira Wencek (U Rhode Island).

MSU USP Advisees (Undergraduate Research Grants): Mark Braun (Spr. '20), Ben Holmgren\* (AYs '18–'20), Brendan Kristiansen\* (Spr. '18, Fa. '18), Kevin Browder\* (Fa. '18), Ryan Hansen (Sum. '18), Arash Ajam (Spr. '18), Nathan Stouffer (Spr. '18), Jachi Madubuko (AY '17–'18), Rostik Mertz\* (AY '16–'17), Hayley Smith (Spr. '17), Angus Tomlinson\* (AY '16–'17), Maia Grudzien (Sum. '16), Ryan Thompson (AY '16–'17, Spr. '16), and Sawyer Payne (Spr. '16). (\* denotes co-advised with another MSU faculty member).

Other MSU Undergraduate Research Advisees: Kye Frazier-Harris, Eli Quist, Daniel Balentin (B.S., 2021), Kendall Black (B.S., 2018), James Soddy (B.S., 2017), Saurabh Tulsankar (B.S., 2018).

Tulane University Undergraduate Research Advisees: Parker Evans (Math, co-advised with C. Wenk, AYs '16–18), Lee Chedister (Math, co-advised with C. Wenk, AY '13–14).

### GRADUATE TEACHING

**Computational Topology (CSCI 535)**, Spring 2018, Spring 2020  
Montana State University, Bozeman, MT.

**Algorithms (CSCI 532)**, Spring 2017, Spring 2019, Spring 2021  
Montana State University, Bozeman, MT.

**Computational Geometry and Topology (Special Topics, CSCI 591)**, Spring 2016  
Montana State University, Bozeman, MT.

**Topology**, September 2011–April 2012  
Institute for Science and Technology Austria, Klosterneuburg, Austria.

### UNDERGRADUATE TEACHING

**Discrete Structures (CSCI 246)**, Fall 2018, Spring 2021, Spring 2022 (co-instructor)  
Montana State University, Bozeman, MT.

**Advanced Algorithmic Topics (CSCI 432)**, Fall 2015, Fall 2016, Fall 2017, Fall 2019, Fall 2020, Fall 2021  
Montana State University, Bozeman, MT.

**Computational Topology (CSCI 535)**, Spring 2018, Spring 2020, Spring 2022  
Montana State University, Bozeman, MT.

**Special Topics: Computational Topology and Geometry (CSCI 491)**, Spring 2016  
Montana State University, Bozeman, MT.

**Computational Geometry**, Spring 2013 (co-instructor)  
Computer Science Department, Carnegie Mellon University, Pittsburgh, PA.

**Discrete Mathematics for Computer Science**, Spring 2009 (co-instructor)  
Computer Science Department, Duke University, Durham, NC.

### OTHER TEACHING

**Teaching Assistant**, Principles of Computer Science, Spring 2008  
Computer Science Department, Duke University, Durham, NC

**Student Mentor and Grader**, Calculus I and III, January 2004–May 2007  
Mathematics and Computer Science Department, Saint Joseph's University, Philadelphia, PA.

**Recitation Leader**, Business Calculus, Spring 2004

Mathematics and Computer Science Department, Saint Joseph's University, Philadelphia, PA.

**Textbook Assistant**, *Learning to Program with Alice*, December 2004

Saint Joseph's University, Philadelphia, PA

## AWARDS AND HONORS

Postdoc of the Month, Journal of Postdoctoral Research, January 2016.

Graduate Aid in Areas of National Need Fellowship, August 2007–May 2011.

Barry M. Goldwater Scholarship, 2006.

Google Anita Borg Scholarship Finalist, 2007.

USA Today All-USA College Academic Team, honorable mention, 2005.

Honor Societies: Phi Beta Kappa, Upsilon Pi Epsilon (Computer Science), Pi Mu Epsilon (Mathematics), Sigma Xi

## UNIVERSITY AWARDS

*Excellence in Outreach* Award, College of Engineering, MSU, 2018.

Faculty Excellence Grants: 2017, 2018.

Departmental Research Award, School of Computing, MSU, 2017.

Nominated, CFE Teaching Award, MSU, 2016.

Duke University Computer Science Award for Teaching Discrete Mathematics, Spring 2009

Saint Joseph's University Mathematics Award, May 2007.

University Scholar, Saint Joseph's University, 2006-2007.

Presidential Scholarship and Del Marco Scholarship, Saint Joseph's University, 2003-2007.

Diocesan Scholar Fellowship, Archdioceses of Philadelphia, 2002-2003.

## SIGNIFICANT ADVISEE AWARDS

Anna Schenfisch (Ph.D. Student, Mathematics), 2019 NSF GRFP recipient.

Robin Belton (Ph.D. Student, Mathematics), 2018 NSF GRFP recipient.

Parker Evans (Undergraduate, Tulane U., Mathematics), 2017 Goldwater scholar.

## BOOK CHAPTERS

3. R. Belton, R. Brooks, S. Ebli, L. Fajstrup, BTF, N. Sanderson, and E. Vidaurre. Combinatorial Conditions for Directed Collapsing. AWM Springer Series, special issue on Research in Computational Topology 2, to appear. 23 pages. Also available at [arXiv:1912.12759](https://arxiv.org/abs/1912.12759).
2. R. L. Belton, R. Brooks, S. Ebli, L. Fajstrup, BTF, C. Ray, N. Sanderson, and E. Vidaurre. Towards Directed Collapsibility. AWM Springer Series, special issue on AWM Research Symposium, 2020. Also available at [arXiv:1902.01039](https://arxiv.org/abs/1902.01039).
1. A. Bittner, BTF, M. Grudzien\*, S. Ghosh Hajra, J. Huang, K. Pelatt, C. Thatcher, A. Tumurbaatar, and C. Wenk. Comparing Directed and Weighted Road Maps. AWM-IMA Special Issue

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\* Undergraduate student at time of research or submission.

on Research in Computational Topology, pp.57–70, Springer, 2018.

JOURNAL PAPERS

16. M. Buchin, E. Chambers, P. Fang, BTF, E. Gasparovic, E. Munch, and C. Wenk. Distances Between Immersed Graphs: Metric Properties. 24 pages. *La Matematica*, to appear.
15. J. Cisewski-Kehe, BTF, W. Hellwing, P. Drozda, M.R. Lovell, and M. Wu. Uncovering Small-Scale Differences in the Large-Scale Structure of the Universe with Persistent Homology. Differentiating Small-Scale Subhalo Distributions in CDM and WDM Models Using Persistent Homology. *Physical Review D*, to appear.
14. A. Myers, F. Khasawneh, and BTF. Separating Persistent Homology of Noise from Time Series Data Using Topological Signal Processing. *Foundations of Data Science* 4(2:243–269. May 2021. <http://dx.doi.org/10.3934/fods.2022005>. Also available at [arXiv:2012.04039](https://arxiv.org/abs/2012.04039).
13. Y. Qin, BTF, C. Wenk, and B. Summa. A Domain-Oblivious Approach for Learning Concise Representations of Filtered Topological Spaces. *IEEE Transactions on Visualization and Computer Graphics (VIS2021)*. October 2021. Also available at [arxiv:2105.12208](https://arxiv.org/abs/2105.12208)
12. R. L. Belton, BTF, R. Mertz\*, S. Micka, D. L. Millman, D. Salinas, A. Schenfisch, J. Schupbach, and L. Williams. Reconstructing Embedded Graphs from Persistence Diagrams. *Computational Geometry: Theory and Applications*, Vol. 90. Elsevier, Oct. 2020.
11. M. J. Catanzaro, J. M. Curry, BTF, J. Lazovskis, G. Malen, H. Riess, B. Wang, and M. Zabka. Moduli Spaces of Morse Functions for Persistence. *Journal of Applied and Computational Topology (APCT)*, online first. Springer, June 2020.
10. E. Berry, Y.-C. Chen, J. Cisewski-Kehe, and BTF. Functional Summaries of Persistence Diagrams. *Journal of Applied and Computational Topology (APCT)*, Vol. 4, Issue 1. Springer, March 2020. Also available at [arXiv:1804.01618](https://arxiv.org/abs/1804.01618).
9. E. Chambers, BTF, Y. Wang. and C. Wenk. Map-Matching Using Shortest Paths. *Transactions on Spatial Algorithms and Systems (TSAS)*, Vol. 6, No. 1, Article no. 6. ACM, Feb. 2020.
8. P. Lawson, A. Sholl, J. Q. Brown, BTF, and C. Wenk. Persistent Homology for the Quantitative Evaluation of Architectural Features in Prostate Cancer Histology. *Scientific Reports* 9, Article 1139, Feb. 2019.
7. F. Chazal, BTF, F. Lecci, B. Michel, A. Rinaldo, and L. Wasserman. Robust Topological Inference: Distance to a Measure and Kernel Distance. *Journal of Machine Learning Research (JMLR)*, 2018. Also available at [arXiv:1412.7197](https://arxiv.org/abs/1412.7197).
6. BTF. Statistical Techniques in TDA with Applications to Real Data. *Postdoc Journal* 4 (1), Jan. 2016.
5. M. Ahmed, BTF, K. S. Hickmann, and C. Wenk. A Path-Based Distance for Street Map Comparison. *ACM TSAS Inaugural Volume 1* (1). Article 3, 28 pages. Aug. 2015.
4. T. Roman, A. Nayyeri, BTF, and R. Schwartz. A Simplicial Complex-Based Approach to Unmixing Tumor Progression Data. *BMC Bioinformatics* 16, Article no. 254, Aug. 2015.
3. BTF, F. Lecci, A. Rinaldo, L. Wasserman, S. Balakrishnan, and A. Singh. Confidence Sets for Persistence Diagrams. *Annals of Statistics*, vol. 42 (6), pages 2301–2339, 2014. Also available at [arXiv:1303.7117](https://arxiv.org/abs/1303.7117).
2. H. Edelsbrunner, BTF, and G. Rote. Add Isotropic Gaussian Kernels at Own Risk: More and More Resilient Modes in Higher Dimensions. *Discrete and Comp. Geom.*, vol. 49 (4), pages 797–822, June 2013.
1. F. Chazal, BTF, F. Lecci, A. Rinaldo, A. Singh, and L. Wasserman. On the Bootstrap for Persistence Diagrams and Landscapes. *Modeling and Analysis of Information Systems*, vol. 20 (6), pages 96–105, Dec. 2013. Also available at [arXiv:1311.0376](https://arxiv.org/abs/1311.0376).
0. BTF. The Difference in Lengths of Curves in  $\mathbb{R}^n$ . *Acta Sci. Math. (Szeged)*, vol. 77 (1-2), pages 359–67, 2011.

17. BTF, B. Holmgren\*, B. McCoy, and D. L. Millman. If You Must Choose Among Your Children, Pick the Right One. *Proc. CCCG*, Aug. 2020.
16. P. Evans\*, BTF, C. Wenk. Combinatorial Properties of Self-Overlapping Curves and Interior Boundaries. *Proc. 36<sup>th</sup> Annu. Symp. Comp. Geo.*, June 2020. 34.1% acceptance rate.
15. BTF, S. Hancock, B. Komlos, B. Kristiansen\*, S. Micka and A. Theobald. Bring the Page to Life: Engaging Rural Students in Computer Science Using Alice. *Proc. ITiCSE*, June 2020. 27.6% acceptance rate.
14. R. L. Belton, BTF, R. Mertz\*, S. Micka, D. L. Millman, D. Salinas, A. Schenfisch, J. Schupbach, and L. Williams. Learning Simplicial Complexes from Persistence Diagrams. *Proc. CCCG*, Aug. 2018.
13. P. Lawson, B. Hu, BTF, B. Summa, C. Wenk, and J.Q. Brown. Assessment of Sampling Adequacy Using Persistent Homology for the Evaluation of Heterogeneity in 3D Histology Acquired Through Inverted Selective Plane Illumination Microscopy (iSPIM). *Proc. SPIE 11073, Clinical and Preclinical Optical Diagnostics II: 1107316*, (SPIE European Conferences on Biomedical Optics (ECBO)), invited paper, 5 pages), 2019.
12. E. Chambers, BTF, Y. Wang, and C. Wenk. Map-Matching Using Shortest Paths. *Proc. IWISC*, Apr. 2018.
11. K. Buchin, M. Buchin, D. Duran, BTF, R. Jacobs, V. Sacristn, R. I. Silveira, F. Staals and C. Wenk. Clustering Trajectories for Map Construction. *Proc. ACM SIGSPATIAL GIS*, article 14 (10 pages), Nov. 2017. 17.9% acceptance rate.
10. S. Micka, S. Yaw, BTF, B. Mumey and M. P. Wittie. Efficient Multipath Flow Monitoring. *Proc. IFIP Networking*, June 2017. 28.7% acceptance rate.
9. U. Goel, C. Cooper\*, BTF, and M. P. Wittie. A First Look at Web Browsing Predictions Using DNS Logs. *Proc. 25<sup>th</sup> Int. Conf. on Software Eng. and Data Eng. (SEDE)*, Sept. 2016, pp. 53–60.
8. BTF, and B. Wang. Exploring Persistent Local Homology in Topological Data Analysis. *Proc. IEEE Int. Conf. Acoustics, Speech, and Signal Processing (ICASSP)*, Mar. 2016, pp. 6430–6434. 49.7% acceptance rate.
7. M. Ahmed, BTF, M. Gibson, and C. Wenk. Choosing Thresholds for Density-Based Map Construction Algorithms. *Proc. ACM SIGSPATIAL GIS*, pp. 43–52, Nov. 2015. 17.9% acceptance rate.
6. M. Cohen\*, BTF, G. L. Miller, A. Nayyeri, D. Sheehy, and A. Velingker. Approximating Nearest Neighbor Distances. *Proc. WADS*, Aug. 2015. 36.5% acceptance rate.
5. F. Chazal, BTF, F. Lecci, B. Michel, A. Rinaldo, and L. Wasserman. Subsampling Methods for Persistent Homology. *Proc. ICML*, Jul. 2015. Also available at [arXiv:1406.1901](https://arxiv.org/abs/1406.1901). 26% acceptance rate.
4. M. Ahmed, BTF, and C. Wenk. Local Persistent Homology Based Distance Between Maps. *Proc. ACM SIGSPATIAL GIS*, Nov. 2014. 21.2% acceptance rate.
3. F. Chazal, BTF, F. Lecci, A. Rinaldo, and L. Wasserman. Stochastic Convergence of Persistence Landscapes and Silhouettes. *Proc. 27<sup>th</sup> Annu. Symp. Comp. Geo.*, pages 474–83, June 2014. Also available at [arXiv:1313.0308](https://arxiv.org/abs/1313.0308). 34% acceptance rate.
2. M. Cohen\*, BTF, G. L. Miller, A. Nayyeri, R. Peng, and N. Walkington. Solving 1-Laplacians in Nearly Linear Time: Collapsing and Expanding a Topological Ball. *Proc. ACM-SIAM Symposium on Discrete Algorithms*, pages 204–16, January 2014. 28% acceptance rate.
1. H. Edelsbrunner, BTF, and G. Rote. Add Isotropic Gaussian Kernels at Own Risk: More and More Resilient Modes in Higher Dimensions. *Proc. of the 27<sup>th</sup> Annu. Symp. Comp. Geo.*, pages 91–100, June 2012. 35% acceptance rate.

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| INVITED ARTICLES       | <p>2. BTF and B. Wang. Open Problems Column, ACM SIGACT News 48 (1), Aug. 2017.</p> <p>1. E. Chambers, BTF, and L. Ziegelmeier. WinCompTop 2016. Association for Women in Mathematics (AWM) Newsletter 46(6), Nov. 2016.</p>  |
| WORKSHOP CONTRIBUTIONS | <p>13. E. Chambers, BTF, B. Holmgren*, S. Majhi, and C. Wenk. Path-Connectivity of Fréchet Spaces of Graphs. <i>Computational Geometry: Young Researchers Forum</i>, 2022.</p> <p>12. BTF, D. L. Millman, E. Pryor, and N. Stouffer. DBSpan: Density-Based Spanner for Clustering Complex Data, With an Application to Persistence Diagrams. Applications of Topological Data Analysis to Data Science, Artificial Intelligence, and Machine Learning (TDA at SDM). April 2022. 6 pages.</p> <p>11. H. Bratterud, M. Burgess, BTF, D. L. Millman, T. Oster, and C. Sung. The Sung Diagram: Revitalizing the Eisenhower Matrix (poster paper). <i>Diagrams</i> 2020.</p> <p>10. BTF, Samuel Micka, David L. Millman, Anna Schenfisch, and Lucia Williams. Challenges in Reconstructing Shapes from Euler Characteristic Curves. <i>Fall Workshop on Computational Geometry</i>, 2018.</p> <p>9. BTF, Sushovan Majhi and Carola Wenk. Threshold-Based Graph Reconstruction Using Discrete Morse Theory. <i>Fall Workshop on Computational Geometry</i>, 2018.</p> <p>8. Ahmed Abdelkader, Geoff Boeing, BTF, and David L. Millman Topological Distance Between Nonplanar Transportation Networks. <i>Fall Workshop on Computational Geometry</i>, 2018.</p> <p>7. A. Schenfisch, and BTF. Curvature Estimates of Point Clouds as a Tool in Quantitative Prostate Cancer Classification. <i>Computational Geometry: Young Researchers Forum</i>, 2018.</p> <p>6. P.J. Lawson, B. Hu, BTF, C. Wenk, J.Q. Brown. Quantifying Prostate Cancer Morphology in 3D Using Light Sheet Microscopy and Persistent Homology (Conference Presentation). Proc. SPIE 10472, Diagnosis and Treatment of Diseases in the Breast and Reproductive System IV: 1047209, (SPIE BIOS), Jan. 2018. doi: 10.1117/12.2290994.</p> <p>5. BTF, R. Komendarczyk, S. Majhi, and C. Wenk. Topological and Geometric Reconstruction of Metric Graphs in <math>\mathbb{R}^n</math>. <i>Fall Workshop on Computational Geometry</i>, 2017. Also available at <a href="https://arxiv.org/abs/1912.03134">arXiv:1912.03134</a>.</p> <p>4. BTF, S. Karakoç, and C. Wenk. On Minimum Area Homotopies. <i>Computational Geometry: Young Researchers Forum</i>, 2016.</p> <p>3. M. Ahmed, BTF, and C. Wenk. New Techniques in Road Network Comparison. <i>Proc. Grace Hopper Celebration for Women in Computing</i>, Oct. 2014. 22% acceptance rate.</p> <p>2. T. Roman, BTF, A. Nayyeri, G. L. Miller and R. Schwartz. Improved Geometric Unmixing Models for Tumor Progression. <i>Proc. Great Lakes Bioinformatics Conf.</i>, May 2014.</p> <p>1. T. Roman, BTF, A. Nayyeri, G. L. Miller and R. Schwartz. Determining Low-Dimensional Embeddings in High-Dimensional Genotype Space for Tumor Phylogeny Reconstruction. <i>Proc. Great Lakes Bioinformatics Conf.</i>, May 2013.</p> |
| WORKS IN PROGRESS      | <p>10. R. Belton, B. Cummins, BTF, and T. Gedeon. Extremal Event Graphs: A (Stable) Tool for Analyzing Noisy Time Series Data. In submission.</p> <p>9. E. Chambers, BTF, B. Holmgren*, S. Majhi, and C. Wenk. Path-Connectivity of Paths and Graphs Under the Fréchet Distance. In submission.</p> <p>8. BTF, X. He, Z. Liu, S. Micka, D. L. Millman, and B. Zhu. Approximate Nearest Neighbors in the Space of Persistence Diagrams. In submission. Available at <a href="https://arxiv.org/abs/1812.11257">arXiv:1812.11257</a>.</p> <p>7. BTF, R. Komendarczyk, S. Majhi, and C. Wenk. On the Reconstruction of Metric Graphs in <math>\mathbb{R}^n</math>. In submission. Available at <a href="https://arxiv.org/abs/1810.10144">arXiv:1810.10144</a>.</p> <p>6. BTF, S. Micka, D. L. Millman, A. Schenfisch, and L. Williams. Efficient Graph Reconstruction and Representation Using Augmented Persistence Diagrams. In submission.</p>   |

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|----------------------|---|
| OTHER<br>MANUSCRIPTS | <ol style="list-style-type: none"> <li>5. BTF, S. Micka, D. L. Millman, A. Schenfisch, and L. Williams. A Faithful Discretization of the Persistent Homology Transform and Euler Characteristic Transform. In submission. Available at <a href="https://arxiv.org/abs/1912.12759">arXiv:1912.12759</a>.</li> <li>4. BTF, S. Hancock, S. Micka, D. L. Millman, J. Soddy*, A. Theobald. Computer Science Students' Perspectives on Plagiarism. In preparation.</li> <li>3. BTF, S. Karakoç, C. Wenk. On Minimum Area Homotopies of Normal Curves in the Plane. In preparation. Available at <a href="https://arxiv.org/abs/1707.02251">arXiv:1707.02251</a>.</li> <li>2. BTF and A. Patel. Persistent Homology Transform Cosheaf. In preparation.</li> </ol>  |
| SOFTWARE             | <p>TDA: Statistical Tools for Topological Data Analysis, R Package. Co-developed with Fabrizio Lecci in 2014. Maintained by BTF, J. Kim, C. Maria, D. L. Millman, and V. Rouvreau<br/> <a href="http://cran.r-project.org/web/packages/TDA/">http://cran.r-project.org/web/packages/TDA/</a>.</p>   |
| VIDEOS               | <p>Teaching Computer Science through Storytelling, 2018 STEM for All Video Showcase. <a href="http://stemforall2018.videohall.com/presentations/1293">http://stemforall2018.videohall.com/presentations/1293</a>. <b>Presenter's Choice Award.</b></p>  |
| BOOK REVIEWS         | <p><i>Statistical Analysis of Contingency Tables</i> by M.W. Fagerland, S. Lydersen, P. Laake. Review by A. Schenfisch and BTF. <i>The American Statistician</i> 73(2), p. 208, 2019.</p> <p><i>The Structure and Stability of Persistence Modules</i> by F. Chazal, V. de Silva, M. Glisse, and S. Oudot. Review by R. Belton and BTF. <i>ACM SIGACT News</i> 48 (2), pp.7–11, June 2017.</p> <p><i>Polyhedral and Algebraic Methods in Computational Geometry</i> by M. Joswig and T. Theobald. Review by BTF and D. L. Millman. <i>ACM SIGACT News</i>, 2015.</p> <p><i>Discrete and Computational Geometry</i> by S.L. Devadoss and J. O'Rourke. <i>ACM SIGACT News</i> 45(1), Mar. 2014.</p> <p><i>How to Fold It</i> by J. O'Rourke. Review by BTF and David L. Millman. <i>ACM SIGACT News</i> 44(3), Sept. 2013.</p> <p><i>Geometric Algebra: an Algebraic System for Computer Games and Animation</i> by J. Vince. Review by BTF and D. L. Millman, <i>ACM SIGACT News</i>, March 2011.</p> <p><i>Geometric Folding Algorithms: Linkages, Origami, Polyhedra</i> by E. D. Demaine and J. O'Rourke. Review by BTF and D. L. Millman. <i>ACM SIGACT News</i> 42(1), March 2011.</p> <p><i>Higher Arithmetic: An Algorithmic Introduction to Number Theory</i> by H. Edwards. Review by BTF and D. L. Millman. <i>ACM SIGACT News</i> 40(2), June 2009.</p> |



*Geometric Algebra for Computer Science* by L. Dorst, D. Fontijne, and S. Mann. Review by BTF and D. L. Millman. ACM SIGACT News 39(4), Dec. 2008.

CONFERENCE  
PAPER  
PRESENTATIONS

*Stochastic Convergence of Persistence Landscapes and Silhouettes*. Annu. Symp. Comp. Geo. Kyoto University, Japan. June 2014.

*Add Isotropic Gaussian Kernels at Own Risk*. Annu. Symp. Comp. Geo. University of North Carolina, Chapel Hill, NC, June 2012. **Runner up for best student presentation award.**

INVITED  
PRESENTATIONS

TBD. Bridging Applied and Quantitative Topology, online workshop. May 2022.

TBD. Workshop on Computational Topology and Applications, Spring Western AMS Sectional Meeting May 2022.

*Topological Descriptors: A Cellular View*. Special Session on Algebraic Combinatorics and Category Theory in Topological Data Analysis, AMS Spring Southeastern Sectional Meeting. March 2022. Canceled.

*Searching in the Space of Persistence Diagrams*. Topological Data Analysis and Beyond, Neurips Workshop (virtual). Dec. 2020.

Panelist, *What Do We Mean When We Say We're Being Culturally Responsive?* Association for Educational Communications and Technology (AECT) Conference (virtual). Nov. 2020.

*Fostering Collaboration among Research Groups*. AISES Lighting the Pathway to Faculty Careers for Natives in STEM" (LTP). Webinar. Aug. 2020.

*Finite Representations of Shapes in Euclidean Space*. Optimal Transport, Topological Data Analysis and Applications to Shape and Machine Learning. July 2020.

*Inverse Problems with Persistence*. Special Session on Applied Topology JMM. Jan. 2020.

*Topology Tutorial*, an invited two-part lecture series at ICERM workshop, *Applied Mathematical Modeling with Topological Techniques*, Aug. 2019.

*LPH on Real Roads*. AWM Workshop for Women in Applied and Computational Topology, JMM. Jan. 2019.

*Topological Data Analysis: Roads and Histology*. Machine Learning Workshop, CG Week. Budapest, Hungary. June 2018.

*Locality-Sensitive Searching in the Space of Persistence Diagrams*. Abel Symposium. Geiranger, Norway. June 2018.

*Topological Descriptors for Data Comparison* SIAM SEAS, Chapel Hill, NC. March 2018.

*Understanding and Comparing Data Sets Using Topological Descriptors*. Hausdorff Institute for Mathematics, Bonn, Germany. May 2017.

*Storytelling to Improve the Pipeline to CS*. Big Ideas in Big Sky; Big Sky, MT. May 2017.

*Topological Descriptors*. Joint Mathematics Meeting. Atlanta, GA. January 2017.

*Using Topological Data Analysis to Study Glandular Architecture.* 1<sup>st</sup> International Workshop on Topological Data Analysis in Biomedicine (TDA-Bio), ACM BCB, Seattle, WA. October 2016.

*Road Network Comparison: an Application of Topological Data Analysis.* XXI<sup>st</sup> Oporto meeting on Geometry, Topology, and Physics; session on Applications of Topology. Lisbon, Portugal. February 2015.

*Map Construction and Comparison Using Local Structure.* Workshop on Topological Data Analysis. SAMSI, Research Triangle Park, NC. February 2014.

*The Intersection of Statistics and Topology.* AWM Workshop for Women Graduate Students and Recent PhDs, Joint Mathematics Meetings, January 2014.

*Modes of Gaussian Mixtures.* Workshop on Topological Data Analysis and Machine Learning Theory, Banff International Research Station, October 2012.

*Geometry of Gaussian Mixtures.* Yaroslavl' International Conf. Discrete Geometry. Yaroslavl', Russia. August 2012.

*Persistence of Extra Modes in Gaussian Mixtures.* Workshop on Computational Topology at CG Week 2012, University of North Carolina, Chapel Hill, NC. June 2012.

*Finding Ghost Features in Gaussian Mixture Models.* Workshop on Sphere Arrangements. Field's Institute, Toronto, Canada, Nov. 2011.

*Computing with Alice.* SIGCSE Kid's Camp, Milwaukee, WI, March 2010.

## CONTRIBUTED PRESENTATIONS

*Directed Homotopy Collapses,* Women in Topology research session at AWM Research Symposium, April 2019.

*Persistence of Wild Type.* HerbertFest. Klosterneuberg, Austria. June 2018.

*Teaching Computational Geometry and Topology.* Educational Forum, CG Week. Budapest, Hungary. June 2018.

*Topological Descriptors: Statistics and Applications.* Applied Algebraic Topology. Sapporo, Japan. August 2017.

*Using Statistics in Topological Data Analysis.* AWM Research Symposium. College Park, MD. April 2015.

*Statistical Inference for Persistent Homology.* International Conf. Geometry, Topology, and Applications, Yaroslavl', Russia. Sept. 2013.

*Statistical Inference for Persistent Homology.* Fifth Discrete Geometry and Algebraic Combinatorics Conf., Brownsville, TX, April 2013.

*A Geometric View of Gaussian Mixtures.* Young Researcher's Forum at CG Week 2012, University of North Carolina, Chapel Hill, NC. June 2012.

*Understanding Isotropic Gaussian Mixture Models.* Discrete and Computational Geometry and Topology Workshop. IST Austria, Klosterneuburg, Austria. March 2012.

*Exploring Computational Mathematics: Unfolding Polyhedra.* Joint presentation with D. L. Millman.

Contributed Paper Session, MathFest. Madison, WI, August 2008.

*Realizability Problems in Group Theory*. Spring Meeting of the EPADEL Section of the Mathematics Association of America. Shippensburg State University, April 2006.

## COLLOQUIA AND SEMINARS

*TDA in Graph Comparison*. TDA Class guest lecture, University of Utah, April 2021.

*Finite Representations of Shapes in Euclidean Space*. Michigan State University, November 2020.

*Topological Descriptors*, Mathematics Seminar, University of Delaware, May 2018.

*Topological Descriptors for Data Comparison*, Engineering Seminar, Arizona State University, March 2018.

*Applied Algebraic Topology: Integrating Math, Statistics, Computer Science, and Applications*. University of Puget Sound, Tacoma, WA. Oct. 2016.

*Using TDA in Prostate Cancer Diagnosis and Prognosis*. Applied Math Seminar, Colorado State University. Fort Collins, CO. Oct. 2016.

*Persistent Local Homology in Road Network Analysis*. Topology Seminar, Pomona College. Claremont, CA. Oct. 2016.

*Finding Shape in Data*. Claremont Colleges Mathematics Colloquia (CCMC). Claremont, CA. Oct. 2016.

*The Intersection of Statistics and Topology*. Institute of Statistical Mathematics. Tachikawa, Japan. June 2014.

*Local Homology Based Distance Between Embedded Graphs*. Active Robotic Sensing Lab. North Carolina State University, Raleigh, NC. March 2014.

*Local Homology Based Distance Between Embedded Graphs*. Data Seminar. Duke University, Durham, NC. March 2014.

*From Point Clouds to Computations: How to Understand Data from the Perspective of a Topologist*. Rhodes University, Memphis, TN. October 2013.

*Gaussian Mixtures: A Common Model with Unexpected Features*. Department of Mathematics, Bremen University, Bremen, Germany. May 2013.

*Counting and Locating Ghost Modes in a Gaussian Mixture*. Department of Mathematics, University of Pennsylvania, Philadelphia, PA. January 2013.

*Metrics on Persistence Diagrams*. Discrete and Computational Geometry Summer School. Yaroslavl', Russia. July 2012.

*Ghosts in Gaussian Mixture Models*. Data Seminar. Duke University, Durham, NC. January 2012.

*Finding Ghost Features in Gaussian Mixture Models*. CMU Theory Lunch. Carnegie Mellon University, Pittsburgh, PA. Nov. 2011.

*Finding Ghost Features in Gaussian Mixture Models*. Mathematics and Computer Science Colloquium. Saint Joseph's University, Philadelphia, PA. Nov. 2011.

*What is Computational Topology?* Mathematics and Computer Science Colloquium. Saint Joseph's University, Philadelphia, PA. December, 2008.

*Realizability Problems in Group Theory.* Joint presentation with Julia Fox. Research Seminar, Program for Women in Mathematics. Institute for Advanced Study, Princeton, NJ, May 2006.

## CAMPUS TALKS

*Bringing Research to the Community ... and Across Campus.* CBME Webinar Series, Jan. 2022.

*Directional Topological Descriptors for Shape Representation.* Mathematics Seminar, MSU, Bozeman, MT. March 2021.

*Computational Topology and CS Outreach.* Honors Seminar, MSU, Bozeman, MT. Oct. 2018.

*Studying Data Through the Lens of (Persistent) Homology.* Applied Math Seminar, MSU, Bozeman, MT. Nov. 2016.

*A Biased Introduction to Computational Topology.* Graduate Student Colloquium. Mathematics Department, Tulane University, New Orleans, LA. March 2014.

*Persistent Homology.* Topology Seminar. Mathematics Department, Tulane University, New Orleans, LA. Sept. 2013.

*Modes of Gaussian Mixtures.* CMU Statistical Machine Learning Reading Group, Carnegie Mellon University, Pittsburgh, PA. October 2012.

*Realizability Problems in Group Theory.* Mathematics Awareness Day. Saint Joseph's University, Philadelphia, PA. March 2006.

*Teaching with Alice.* Joint presentation with John Paul Craig. Summer Research Seminar. Saint Joseph's University, Philadelphia, PA. August 2004 and 2005.

*Alice.* Joint presentation with John Paul Craig. Mathematics Awareness Day, Saint Joseph's University. March 2005.

## POSTER PRESENTATIONS

*Comparing Distance Metrics on Vectorized Persistence Summaries* Co-authored poster with Yu Qin, Brian Summa, and Carola Wenk. (Presented by Yu Qin). Topological Data Analysis Workshop, IMSI (virtual), April 2021.

*Comparing Distance Metrics on Vectorized Persistence Summaries* Co-authored poster with Yu Qin, Brian Summa, and Carola Wenk. (Presented by Yu Qin). Topological Data Analysis and Beyond, Neurips Workshop (virtual), December 2020.

*Directed Collapsibility.* Co-authored poster with Robin Belton, Robyn Brooks, Stefania Ebli, Lisbeth Fajstrup, Nicole Sanderson, and Elizabeth Vidaurre. (Presented by Robin Belton). ATMCS, 2020 (postponed due to COVID-19).

*Analyzing Musical Compositions with Topological Data Analysis.* Co-authored poster with Robin Belton, David L. Millman, Angus Tomlinson\*, and Kira Wencek\*. (Presented by Robin Belton). ATMCS, Jun. 2018.

*Representing Musical Structure with Simplicial Complexes.* Co-authored poster with Angus Tomlinson\*, Robin Belton, Kira Wencek\*, and David L. Millman. (Presented by Angus Tomlinson). ERN, Feb. 2018.

*Quantifying Music Complexity Using Topological Data Analysis.* Co-authored poster with Kira Wencek\*. Robin Belton, Angus Tomlinson\*, and David L. Millman. (Presented by Kira Wencek). ERN, Feb. 2018.

*American Indian Storytelling with Alice.* Co-authored poster with Jachi Madubuko\*, Sam Micka, Allison Theobold (Presented by Sam Micka). SIGCSE, Feb. 2018.

*Topological Descriptors for Quantitative Prostate Cancer Morphology Analysis.* Co-authored poster with Pete Lawson, Eric Berry, J. Quincy Brown, BTF, and Carola Wenk. (Presented by Pete Lawson). Conference on Digital Pathology, SPIE Medical Imaging. Feb. 2017. **Honorable Mention, Digital Pathology Poster Award**

*Persistent Homology for Pan-Genome Analysis.* Co-authored poster with Alan Cleary, BTF, Thiruvarangan Ramaraj, Joann Mudge, and Brendan Mumey. (Presented by BTF). WinCompTop, Institute for Mathematics and its Applications, Minneapolis, MN. August 2016.

*Road Network Analysis.* M. Grudzien\* and BTF. WinCompTop, Institute for Mathematics and its Applications, Minneapolis, MN. August 2016.

*Persistent Homology for Pan-Genome Analysis.* Co-authored poster with Alan Cleary, BTF, Thiruvarangan Ramaraj, Joann Mudge, and Brendan Mumey. (Presented by Alan Cleary). Sequencing, Finishing, and Analysis in the Future (SFAF), Santa Fe, NM. June 2016.

*On Minimum Area Homotopies.* BTF, S. Karakoç, C. Wenk, Topology, Geometry, and Data Analysis Conference (TGDA), Ohio State University, May 2016.

*Towards an Automated Quantitative Diagnosis of Prostate Cancer.* BTF, Q. Brown, P. Lawson, C. Miller, and C. Wenk. (Presented by BTF). BD2K All-Hands Grantee Meeting, NIH, November 2015.

*Statistical Inference for Persistent Homology.* SSE Research Day, School of Science and Engineering, Tulane University, New Orleans, LA. April 2014.

*Statistical Inference For Persistent Homology.* Joint presentation with F. Lecci. Workshop on Topological Data Analysis, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. October 2013.

*Homotopy Classification.* MathFest, Madison, WI, August 2008.

*QShuffler.* Joint presentation with Herodotos Herodotou. Graduate Student Research Day Presentation, Duke University, Durham, NC, April 2008.

*Two Classification Problems in Group Theory and Homotopy Theory.* BTF and S. Smith. (Presented by BTF). 18th Annual Student Research Symposium. Saint Joseph's U, Philadelphia, PA, April 2007.

*Visualizing Lists and Arrays.* Consortium for Computing Sciences in Colleges Southeastern Region, Lenoir Rhyne College, Hickory, NC, Nov. 2005.

*Expanding Alice.* Regional Sigma Xi Symposium, Saint Joseph's University, Philadelphia, PA, April 2005.

*Expanding Alice.* Celebration of Student Scholar Activities, Saint Joseph's University, Philadelphia, PA, Sept. 2005.

*Alice.* Celebration of Student Scholar Activities, Saint Joseph’s University, Philadelphia, PA, Sept. 2004.

EVENT  
ORGANIZATION

AWM Special Session on Women in Computational Topology, Joint Mathematics meeting (JMM). Co-organizers: BTF and Lori Ziegelmeier. Seattle, Jan. 2022.

Fall Workshop on Computational Geometry. Co-organizers: BTF, D. Millman, and B. Zhu. Virtual, Oct. 2021.

Topological Data Analysis Workshop, Institute for Mathematical and Statistical Innovation (IMSI). Co-organizers: BTF, Kathryn Hess, Matthew Kahle, Sayan Mukherjee, and Jose Perea. April 2021.

Computational Topology research session at AWM Research Symposium, April 2019.

HerbertFest, a celebration of Herbert Edelsbrunner’s 60th Birthday. Co-organizers BTF, Dmitriy Morozov, Amit Patel, and Yusu Wang. June 2017.

Applications of Algebraic Topology, minisymposium at the SIAM Central States Meeting. Co-organizers BTF and Lori Ziegelmeier. Colorado State University, Oct. 2017.

Statistics and Applied Algebraic Topology, minisymposium at the SIAM Conference on Applied Algebraic Geometry. Co-organizers BTF and Sayan Mukherjee. Georgia Tech, Aug. 2017.

From Observations to Prediction of Movement. Dagstuhl seminar 17282. Co-organizers Mark Birkin, Somayeh Dodge, BTF, Richard Mann. Germany, Jul. 2017.

Workshop for Women in Computational Topology (WinCompTop). Co-organizers Erin Chambers, BTF, Lori Ziegelmeier. IMA, Minneapolis, MN. Aug. 2016.

Mini-symposium on Computational Topology, workshop during CG Week. Co-organizers BTF, Elizabeth Munch, Don Sheehy. TU Eindhoven, Netherlands, Jun. 2015.

COMMITTEES

Advisory Board, Grace Hopper Conference; 2022–Present.

Program Committee, CCCG 2022.

Program Committee, CG Week: Media Exposition, 2022.

Scientific Committee, ATMCS 2022.

Program Committee, CCCG 2021.

Evaluator, ACM Student Research Competition (SRC) Grand Finals, 2021–22.

Program Committee, SoCG 2021.

Program Committee, CG Week: Young Researcher’s Forum (YRF), 2021.

Co-Chair, Poster Committee, Grace Hopper Conference; 2020–2021.

Committee member, Justice, Equity, Diversity, and Inclusion (JEDI) Outreach group, American Statistical Association, summer 2020–present.

Scientific Committee, ATMCS 2020.

Diversity Initiative Task Force, American Statistical Association, 2019.

Program Committee, EuroCG 2019.

Steering Committee, Women in Computational Topology, 2016–present.

Poster Committee, Grace Hopper Conference; 2015–2019.

Workshop Committee, CG Week (SoCG), 2018.

EDITORIAL BOARD   Editorial Board Member, AIMS Foundations of Data Science, Jan. 2019–Present

UNIVERSITY   Committee Member, University Teacher Education Committee, December 2021–Present.  
SERVICE

Committee Member, Broadening Participation in Computing, GSoC, Fall 2020–Present.

Adviser (and Founding Member), Upsilon Pi Epsilon (UPE) Honor Society, MSU, 2017–present.

Adviser, CompTaG (research seminar and student club), MSU, 2015–present.

Committee Member, Undergraduate Curriculum, GSoC, 2015–present.

Faculty Engagement Committee for NCUR 2020, May 2019–March 2020.

Organizer, Computer Science Seminar, AY 2017–2018.

Committee Member, Promoting Academic Honesty, Fall 2016.

Adviser, Association for Women in Computing (AWC), MSU, 2015–2018.

Committee Member, Academic Integrity, COE, AY 2016–2017.

Committee Member, Faculty Search (NTT and TT), GSoC, AY 2016–2017.

Committee Member, Computer Science B.A., GSoC, AY 2016–2017.

Re-founding Member, Upsilon Pi Epsilon (UPE), Tulane University, 2015.

ART   *CAVE: An Artscience Installation.* The NeuroCave Collaborative. Holter Museum of Art, August 2017–December 2017.

*Art-Math Display.* The curious construction conclave, 2014. On display, Museum of Mathematics (MoMath), New York City.