

# ROBIN LYNNE BELTON

Montana State University  
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## EDUCATION

Montana State University (MSU), Bozeman, Montana

Ph.D. Candidate in Mathematics, Fall 2016-Present

Advisor: Dr. Tomas Gedeon

Thesis: *Directed Descriptors of Data*

M.S. in Mathematics, May 2019

Kenyon College, Gambier, Ohio

B.A. in Mathematics, May 2016

*magna cum laude* with Distinction and Honors in Mathematics

Concentration in Scientific Computing

## RESEARCH INTERESTS

Computational Topology, Applied Algebraic Topology, Topological Data Analysis (TDA), Data Science, Computational Geometry, Mathematical Biology

## FELLOWSHIPS & GRANTS

Graduate Leadership Fellow, MSU, 2020-2021

NSF Graduate Research Fellowship Program (GRFP) Recipient, 2018-2022

STEM Storyteller Communication Fellow, MSU, 2018-2019

Distinguished Academic Scholarship, Kenyon College, 2012-2016

## AWARDS & HONORS

Montana State University

William A. Stannard Award for Excellence in Graduate Student Teaching, 2020

Outstanding Graduate Student Award, 2018

Meritorious Award for incoming graduate students, 2016

Bridges Interdisciplinary Art and Mathematics Conference

Artwork featured on the cover of Bridges 2018 Poetry Anthology

Two pieces of artwork featured in exhibit at University of Jvaskylä, Finland, 2016

MAA Mathfest Undergraduate Presentation Session

Outstanding Presentation Award, 2015

Kenyon College

Risk-taker award from the Mathematics Department, 2015

## PUBLICATIONS

6. **Belton, R.**, Brooks, R., Ebli, S., Fajstrup L., Fasy, B. T., Sanderson, N., & Vidaurre E. *Combinatorial Conditions for Directed Collapsing*. To appear in Research in Computational Topology 2. 2021.

5. **Belton, R.**, Fasy, B. T., Mertz, R., Micka, S., Millman, D., Salinas, D., Schenfisch, A., Schupbach, & Williams, L. *Reconstructing Embedded Graphs from Persistence Diagrams*. Journal of Computational Geometry, Theory and Applications. 2020.

4. **Belton, R.**, Brooks, R., Ebli, S., Fajstrup L., Fasy, B. T., Ray, C., Sanderson, N., & Vidaurre E. *Towards Directed Collapsibility*, Advances in Mathematical Sciences: AWM Research Symposium. 2020.

3. Spaeth, D., Burch, M., **Belton, R.**, Demoret, B., Grosenbacher, N., David, J., Stets, C., Cohen, D., Shakya, R., Hays, J., & Chen, J. *Loss of TXNIP enhances peritoneal metastasis and can be abrogated by dual TORC1/2 inhibition*. *Oncotarget*, Nov. 2018.

2. **Belton, R.**, Fasy, B. T., Mertz, R., Micka, S., Millman, D., Salinas, D., Schenfisch, A., Schupbach, & Williams, L. *Learning Simplicial Complexes from Persistence Diagrams*. In Proceedings of Canadian Conference on Computational Geometry (CCCG), 2018.

1. Farnell, E., Farnell, S., Chang, J., Hoffman, M., **Belton, R.**, Keaty, K., Lederman, S., & Salafia, C. *A Shape-Context Model for Matching Placental Surface Vascular Networks*. *Image Analysis & Stereology*, 37(1), 55-62. 2018.

## BOOK REVIEWS

*The Structure and Stability of Persistence Modules*, by Chazal, F., Silva, V., Glisse, M., & Oudot, S. Review by **Belton, R.**, and Fasy, B. T., ACM SIGACT News, Vol. 48 Issue 2, June 2017.

## WORKS IN PROGRESS

**Belton, R.**, Cummins, B., Fasy, B. T., Gedeon, T., *Extremal Event Graphs: A (Stable) Directed Graph Descriptor to Analyze Noisy Time Series Data*.

**Belton, R.**, Brooks, R., Ebli, S., Edmonds, R., Fajstrup L., Fasy, B. T., Sanderson, N., & Vidaurre E. *Using Directed Topology to Study Multi-parameter Persistence*.

## RESEARCH EXPERIENCE

Research Assistant at Montana State University, 2016-Present  
Student Analyst for Institutional Research, Kenyon College, 2015-2016  
Undergraduate Research Assistant at The Ohio State University Cancer Center, 2015  
Kenyon College Summer Science Scholars Program, 2014

## TEACHING EXPERIENCE

### Courses Taught

Calculus II, Fall 2019 & Spring 2020, MSU  
Calculus I, Fall 2017, MSU  
College Algebra, Fall 2016 & Spring 2017, MSU

### Workshops

Teaching Assistant for Applied Mathematical Modeling with Topological Techniques workshop at ICERM, 2019  
Teaching Assistant for “Learning R” workshops at MSU, 2019

### Mentor

Met twice a week with an REU student on TDA applied to music, 2017  
Assisted math and CS undergraduates prepare presentations for the Computational Topology and Geometry Seminar

### Tutor

College Algebra, Precalculus, Calculus courses, and undergraduate Real Analysis, MSU  
Calculus courses, and Art of Mathematics (non-major’s course), Kenyon College

### Grader

Precalculus, 2019, MSU  
Multivariable Calculus, 2014, Kenyon College

## PROGRAMS/CONFERENCES

Computational Persistence Workshop, 2021, virtual  
BIRS Connecting Network Structure to its Dynamics: Fantasy or Reality?, 2021, virtual  
Mini Course: Understanding Nonlinear Dynamics with Finite Data, 2021, virtual  
Inner Mountain Leadership Program, MSU, 2020-2021  
Picture a Scientist Panel, MSU, 2020  
\* Invited Graduate Student Panelist  
Canadian Conference on Computational Geometry, 2020, virtual  
Applied Mathematical Modeling with Topological Techniques, ICERM, 2019  
Geometry and Topology meet Data Analysis and Machine Learning (GTDAML), The Ohio State University, 2019  
Geometric Data Analysis, University of Chicago, 2019

American Association for the Advancement of Science (AAAS), D.C., 2019  
 Nebraska Conference for Undergraduate Women in Mathematics, 2019  
 \* Invited Graduate Student Panelist  
 SIAM Central States Meeting - Mini Symposium on Applied and Computational Topology, University of Oklahoma, 2018  
 Algebraic Topology in Data and Dynamics (ATDD), Montana State University, 2018  
 Algebraic Topology: Methods, Computation, and Science (ATMCS), IST Austria, 2018  
 Women in Topology (WIT) Workshop, MSRI, 2017  
 Spring School and Conference in Applied and Computational Algebraic Topology, Hausdorff Research Institute for Mathematics (HIM), 2017  
 Park City Mathematics Institute (PCMI) Undergraduate Summer School, 2016  
 \* Special topic: Visualizing and Learning the Structure of Data  
 Joint Mathematics Meeting (JMM), Seattle WA, 2016  
 Ohio State University/Kenyon College Undergraduate Pelotonia Program, 2015  
 MAA Mathfest, Washington D.C., 2015  
 Nebraska Conference for Undergraduate Women in Mathematics, 2015  
 MAA Mathfest, Portland OR, 2014

## SELECTED PRESENTATIONS

(\*) denotes invited presentation

*Extremal Event Graphs: A Stable Directed Graph Descriptor*, Graduate Student Seminar, MSU, 2021

(\*) *Going Backwards. Reconstructing Simplicial Complexes from Persistence Diagrams*, Kenyon College, 2021 (virtual)

*Directed Descriptors of Data*, Applied Mathematics Seminar, MSU, 2020

(\*) *Going Backwards. Reconstructing Simplicial Complexes from Persistence Diagrams*, Augustana University, 2020 (virtual)

*How Algebraic Topology can Verify Concurrent Programs*, GTDAML, The Ohio State University, 2019

*Even the Processors in Computers have to Share*, White Dog Brewery, Bozeman MT, 2019

(\*) *Learning Simplicial Complexes from Persistence Diagrams*, SIAM Central States Meeting – Mini Symposium on Applied and Computational Topology, University of Oklahoma, 2018

*Analyzing Music Using Persistent Homology*, Algebraic Topology in Data and Dynamics (ATDD), MSU, 2018 (poster)

*Analyzing Music Using Persistent Homology*, Algebraic Topology: Methods, Computation, and Science, IST Austria, 2018 (poster)

(\*) *Introduction to TDA*, Undergraduate Mathematics Seminar, MSU, 2018

*The Erosion Distance on the Space of Persistence Diagrams*, Women in Topology Workshop, MSRI, 2017

(\*) *An Overview of TDA*, College of Letters and Sciences Board of Trustees Meeting, 2017

*An Overview of TDA*, Computer Science Seminar, MSU, 2017

*Playing with Numbers*, Carroll College, 2017

*Distance Metrics on the Space of Persistence Diagrams*, MSU, Graduate Students Mathematics Seminar, 2017

*Identifying Genes of Interest through Clustering and Outlier Analysis of Genomic Time Series Data*, Translational Data Analytics Forum at Ohio State University, 2015 (poster)

*A Shape-Context Model to Characterize Altered Geometry In Placental Chorionic Surface Vascular Networks Introduced by Paint Injection*, MAA Mathfest, 2015

\* Received Outstanding Presentation Award

*Numerical Techniques of Integration for Volumes of Revolution*, Nebraska Conference for Undergraduate Women in Mathematics, 2015

*Numerical Techniques of Integration for Volumes of Revolution*, MAA Mathfest, 2014

## SERVICE

### Montana State University

President of Graduate Women in Science and Engineering (WISE), 2020-2022

- Apply for funding and maintain the budget
- Organize events such as seminars, article discussions, book clubs, and social events

Graduate Program Committee Representative (GPC Rep) for Math Dept., 2018-2020

President of the Computational Topology and Geometry (CompTaG) club, 2017-2019

### Professional

Referee for Symposium on Computational Geometry (SoCG)

Referee for European Symposium on Algorithms (ESA)

Referee for European Workshop on Computational Geometry (EuroCG)

Referee for Symposium on Discrete Algorithms (SODA)

Referee for Women in Computational Topology (WinCompTop)

Referee for AWM/Springer volume for the proceedings of the Women in Data Science and Mathematics (WiSDM) workshop

Reviewer for Grace Hopper Celebration (GHC) Poster Session (2018, 2019)

### Outreach

Co-organized Math Craft Workshop at Girls for a Change Workshop, 2020

STEM Expo judge at Longfellow Elementary School, 2017-2020

Volunteer for (middle school) Girl Science Saturdays at Kenyon College, 2014-2016

### Kenyon College

STEM mentor for first year students, 2015-2016

Upper Classman Counselor, 2013-2016

## COMPUTER SKILLS

Python, R, Github, Matlab, Mathematica, Linux, Microsoft, C++

## ORGANIZATIONS

### Montana State University

Graduate Women in Science and Engineering (WISE)

Topology and Geometry Seminar

Computational Topology and Geometry (CompTaG)

### Professional

Women in Topology (WIT)

Women in Computational Topology (WinCompTop)

Pi Mu Epsilon National Mathematics Honor Society

Association for Women in Mathematics

Sigma Xi Scientific Research Society