

Johnathan Bush

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Education

Colorado State University, Ph.D. Mathematics, expected May 2021.

Advisor: Dr. Henry Adams.

Colorado State University, M.S. Mathematics, December 2018.

Advisor: Dr. Henry Adams.

Thesis: *Vietoris–Rips Thickenings of the Circle and Centrally–Symmetric Orbitopes*

University of Montana, B.A. Mathematics with High Honors, May 2016.

Advisor: Dr. George McRae.

Thesis: *Rethinking Leibniz' Infinitesimals*.

University Scholar – Davidson Honors College. Minor in Physics.

Research

I am a graduate student interested in computational, applied, and algebraic topology and geometry.

Research Papers

On the Nonlinear Statistics of Optical Flow with Henry Adams, Brittany Carr, Lara Kassab, and Joshua Mirth. Proceedings of Computational Topology in Image Context, LNCS volume 11382, 2019. Submitted and available at [arXiv:1812.00875](https://arxiv.org/abs/1812.00875), 2018.

Vietoris–Rips Thickening of the Circle and Centrally–Symmetric Orbitopes with Henry Adams. Submitted in partial fulfillment of the requirements for the degree of Master of Science at Colorado State University. Available at <https://www.math.colostate.edu/~bush/files/MastersThesis.pdf>, 2018.

Research Talks

2019 Jan, *On the Nonlinear Statistics of Optical Flow*, Workshop on Computational Topology in Image Context 2019, Universidad de Málaga, Spain.

2018 Oct, *Vietoris–Rips Thickenings of the Circle and Centrally–Symmetric Orbitopes*, SPLINTER Seminar, Colorado State University.

2018 Oct, *Vietoris–Rips Thickenings of the Circle and Centrally–Symmetric Orbitopes*, master's thesis defense, Colorado State University.

2018 Oct, *Vietoris–Rips Thickenings of the Circle and Centrally–Symmetric Orbitopes*, SIAM Central States Sectional Meeting, Applied and Computational Topology session, The University of Oklahoma.

Expository Talks and Departmental Talks

- 2019 Feb, *Comma Categories*, Category Theory Lab, Colorado State University.
- 2018 Nov, *Ends and Coends*, Category Theory Lab, Colorado State University.
- 2018 Sept, *An Introduction to Applied Algebraic Topology*, Greenslopes Seminar, Colorado State University.
- 2018 Aug, *Topoi and the Category of Sets*, Category Theory Lab, Colorado State University.
- 2016 Apr, *Rethinking Leibniz' Infinitesimals*, UMCUR (University of Montana Conference on Undergraduate Research), University of Montana.
- 2014 Nov, *An Ultrafilter Construction of the Hyperreal Numbers*, Undergraduate Mathematics Seminar, University of Montana.
- 2014 Aug, *Exploring Leibniz' Infinitesimals*, Pi Mu Epsilon Student Paper Session, MAA Mathfest.

Reading and Research Experiences

- 2017 May – present, reading and research on Vietoris-Rips metric thickenings of circles, ellipses, and regular polygons under the direction of Dr. Henry Adams.
- 2013 Aug – 2016 Dec, undergraduate reading on category theory, set theory and infinitesimal calculus under the direction of Dr. George McRae.
- 2014 Jan – 2015 May, undergraduate reading and research on geometric topology and knot theory under the direction of Dr. Eric Chesebro.

Academic Employment

Graduate Teaching Assistant at Colorado State University Dept. of Mathematics, 2016–present.

Teaching

Colorado State University

- Instructor of record for Math 261, *Calculus for Physical Scientists III*, Fall 2018 and Spring 2019.
- Instructor of record for Math 160, *Calculus for Physical Scientists I*, Fall 2017 and Spring 2018.
- Instructor of record for Math 155, *Calculus for Biological Scientists I*, Summer 2017.
- Teaching assistant for Math 161, *Calculus for Physical Scientists II*, Fall 2016 and Spring 2017.

University of Montana

- Homework grader and tutor for Math 172, *Calculus II*, Fall 2014.
- Homework grader and tutor for Math 181/182, *Honors Calculus I/II*, Fall 2013 and Spring 2014.

Awards and Scholarships

Joseph Hashisaki Memorial Scholarship, awarded to top undergraduate in mathematics, University of Montana Department of Mathematical Sciences, 2015-2016.

Undergraduate Research Award, for research or creative activity, Davidson Honors College, 2016.

Undergraduate Teaching Scholarship, academic merit-based scholarship, University of Montana Department of Mathematical Sciences, 2014-2015.

In my role as an Undergraduate Teaching Scholar, I offered tutoring for students in the University of Montana's Math 307, *Introduction to Abstract Mathematics*, for one semester.

MUS Honor Scholarship, academic merit-based scholarship, Montana University System, 2012-2016.

Merle Manis Award, academic merit-based award, University of Montana Department of Mathematical Sciences, 2014-2015.

Wayne and Sallie Linnell Scholarship, academic merit-based scholarship, Davidson Honors College, 2012-2014.

Haynes Foundation Scholarship, academic merit-based scholarship, University of Montana, 2012-2014.

University of Montana's 4.0 GPA list, Spring 2013-Spring 2016 (seven semesters).

Service and Administrative

Peer-Review

2019, Symposium on Computational Geometry

Seminar Organization

2019 – present, Co-organizer of *Greenslopes Seminar*, Colorado State University.

Miscellaneous

2013 – 2015, President of the University of Montana Mathematics Club.

2015 – 2016, Vice President of the University of Montana Mathematics Club.

2014 – 2016, President of the University of Montana chapter of Alpha Lambda Delta Honor Society.