Joshua Mirth

Curriculum Vitae

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Education

2015–present **Doctorate**, *(To be completed spring 2020)*, Colorado State University, *Mathematics*.
Advisor: Henry Adams

2015–2017 **Master of Science**, Colorado State University, *Mathematics*.
Thesis – *Metric Thickenings of Euclidean Submanifolds*. Advisor: Henry Adams.

2011–2015 **Bachelor of Science**, *Summa Cum Laude, with Departmental Honors*, Hillsdale College, *Mathematics*.
Senior Thesis – *Functional Analysis and the Dirichlet Problem*, minor in physics. Advisor: David Gaebler.

Publications

2019 *On the nonlinear statistics of optical flow* with Henry Adams, Johnathan Bush, Brittany Carr, and Lara Kassab. Proceedings of Computational Topology in Image Context, LNCS volume 11382 (2019), 151-165. Available at arXiv:1812.00875.

2019 *Metric thickenings of Euclidean submanifolds* with Henry Adams. *Topology and its Applications*, 254:69-84, 2019. Available at arXiv:1709.02492.

Submitted *A fractal dimension for measures via persistent homology* with Henry Adams, Manuchehr Aminian, Elin Farnell, Michael Kirby, Rachel Neville, Chris Peterson, Patrick Shipman, and Clayton Shonkwiler. Available at arXiv:1808:01079.

Talks and Presentations

Research Talks

2019 Jul. *Morse Theory for Wasserstein Spaces*, Young Topologists Meeting, École Polytechnique Fédérale de Lausanne.

2019 May *Morse Theory for Wasserstein Spaces*, Geometric Data Analysis Conference, University of Chicago (poster presentation).

2018 Nov. *On the nonlinear statistics of optical flow*, SPAMlab, Colorado State University.

2018 Apr. *Metric Thickenings of Euclidean Submanifolds*, Graduate Student Topology and Geometry Conference, University of Chicago.

2017 Sep. *Metric Thickenings of Euclidean Submanifolds*, SIAM Central States Sectional Meeting, Applied Algebraic Topology session, Colorado State University.

2017 Jul. *Metric Thickenings of Euclidean Submanifolds*, TDA: Theory and Applications, workshop at Macalaster College (poster presentation).

2015 Apr. *Functional Analysis and the Dirichlet Problem*, Michigan Undergraduate Mathematics Conference, Hope College.

2013 Jul. *Simulating Post-Reconnection Coronal Flux Tubes* American Astronomical Society Solar Physics Division Meeting (Poster with Dana Longcope).

Expository Talks

2019 Oct. *Optimal Transport and Machine Learning*, Data Science Seminar, CSU.

2019 Sep. *Optimal Transport and PDEs*, SPAM Lab, CSU.

2019 May *The Optimal Transport Problem*, SPAM Lab, CSU.

2018 Oct. *Simplicial Complexes, Simplicial Sets, and Realizations*, CSU Category Theory Seminar.

2018 Oct. *Introduction to Derived Categories*, CSU Category Theory Seminar.

2018 Sep. *Smooth and Discrete Morse Theory*, CSU Topology Seminar.

2018 Sep. *Limits and Colimits*, CSU Category Theory Seminar.

2018 Jul. *The Yoneda Lemma*, CSU Category Theory Seminar.

2018 Jun. *Simplicial Sets*, CSU Category Theory Seminar.

2017 Dec. *Morse Theory: An Introduction*, CSU Greenslopes seminar.

Conferences and Workshops

2019 Aug. Workshop on Applied Mathematical Modeling with Topological Techniques, ICERM

2019 Jul. Young Topologists Meeting, École Polytechnique Fédérale de Lausanne

2019 May Geometric Data Analysis Conference, University of Chicago

2018 Aug. Tutorial on Multiparameter Persistence, Computation, and Applications, The Institute for Mathematics and its Applications

2018 May TGDA@OSU TRIPODS Center Summer School and Workshop, Mathematical Biosciences Institute at the Ohio State University

2018 Apr. Graduate Student Topology and Geometry Conference 2018, University of Illinois at Chicago

2017 Jun. Topological Data Analysis: Theory and Applications, Macalaster College

2017 Apr. Graduate Student Topology and Geometry Conference 2017, Michigan State University

Teaching

2015–present **Graduate Teaching Assistant**, *Colorado State University*, Mathematics Department.

Instructor of record:

- Math 340 – Introduction to Ordinary Differential Equations, Spring 2018, Fall 2018, Spring 2019, Fall 2019
- Math 261 – Calculus for Physical Scientists III, Fall 2017
- Math 160 – Calculus for Physical Scientists I, Fall 2016, Sprint 2017
- Math 141 – Calculus in Management Sciences (online), Summer 2019

Teaching assistant:

- Math 161 – Calculus for Physical Scientists II, Fall 2015, Sprint 2016

Outreach:

- Co-taught (with Henry Adams) a two week course on Applied and Computational Topology at the Universidad de Costa Rica, Summer 2017.

Service and Administrative

Peer-Review

2019 Symposium on Computational Geometry

Seminar and Conference Organization

2018-present **Co-organizer**, *Category Theory Seminar*, Colorado State University.

2018 **Co-organizer**, *Greenslopes Seminar*, Colorado State University.

Miscellaneous

2019-2020 **President**, *AMS*, Colorado State University Graduate Student Chapter.

2019-2020 **Webmaster**, *SIAM*, Colorado State University Student Chapter.

2017-2018 **Secretary**, *SIAM*, Colorado State University Student Chapter.

2016-2017 **Treasurer**, *SIAM*, Colorado State University Student Chapter.

2014-2015 **Vice-President**, *Kappa Mu Epsilon*, Hillsdale College Chapter.

2013-2014 **Treasurer**, *Kappa Mu Epsilon*, Hillsdale College Chapter.

2013-2015 **Putnam Team**, Hillsdale College.

Other Experience

Computational

2016–2017 **Programmer**, *Colorado State University*, Environmental Health Department.
Developed tools for analysis of motion tracker data in MatLab.

2013 **REU**, *Montana State University*, Solar Physics.
Developed and tested numerical models of magnetic reconnection in the solar corona.

Awards

- Outstanding Graduate Teaching Assistant - Colorado State University Mathematics Department (2018-2019)

- Taylor Award - Highest GPA among Hillsdale College Mathematics graduates (2015)
- Kimball Medal - top male athlete at Hillsdale College (2015).
- Hillsdale College Dean's List (8 semesters)
- National Merit Scholar (2011)
- NCAA Division II All-American – Cross Country: 2012 and 2014, Indoor Track: 2015