Joshua Mirth

Curriculum Vitae

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Academic Employment

Beginning Fall 2020 **Postdoctoral Research Associate**, Michigan State University, Department of Computational Mathematics, Science, and Engineering.

Education

2015–2020 **Doctorate**, Colorado State University, *Mathematics*.
Thesis – *Vietoris–Rips Metric Thickenings and Wasserstein Spaces.* 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

Submitted *Operations on Metric Thickenings* with Henry Adams and Johnathan Bush.

2020 "A torus model for optical flow." With Henry Adams, Johnathan Bush, Brittany Carr, and Lara Kassab. *Pattern Recognition Letters* 129 (2020), 304-310. Conference version, "On the nonlinear statistics of optical flow," *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 (2019), 69-84. Available at arXiv:1709.02492.

2019 *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. To appear in *Topological Data Analysis – The Abel Symposia*, 2020. Available at arXiv:1808:01079.

Talks and Presentations

Research Talks

2020 Apr. *Algebraic Topology in Chemistry*, Greenslopes seminar, Colorado State University.

2020 Jan. *Morse Theory for Wasserstein Spaces*, Joint Mathematics Meetings, Denver, Colorado.

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

2019 Apr. *Metric Spaces in Applied Topology*, Regional Workshop in Qualitative Geometry & Topology, The Ohio State University.

2018 Oct. *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 (upcoming).

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).

Teaching

2015–2020 **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, Spring 2017

Online Course Facilitator:

- Math 141 – Calculus for Management Sciences, Summer 2019 (Online)

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.

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.

Miscellaneous

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

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

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

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.

Awards

- Outstanding Graduate Teaching Assistant - Colorado State University, 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 – three times (track and field, cross country)
- GLIAC conference champion – four times (indoor track)