

Benjamin Holmgren

Montana State University

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Education

- 2018–present **Computer Science (Interdisciplinary) and Mathematics (Pure) Majors.**
Montana State University, Bozeman, MT
- 2018 **General Coursework with focus in Neuroscience and Economics.**
Middlebury College, Middlebury, Vermont

Projects

- November 2019 to present **Research in Discrete Morse Theory (DMT).**
Publication: CCCG 2020: *If You Must Choose Among Your Children, Always Pick the Right One*
Description: Proposal of novel fast algorithms to generate Discrete Morse Functions on a simplicial complex. I later implemented these in Python.
Talk: *Using Hasse Diagrams to Compute a Gradient Vector Field*
Description: Poster Presentation accepted to NCUR 2020 (which was later cancelled due to COVID-19)
Video: *Poking a Simplicial Complex*
Description: Multidisciplinary Research Project to visualize Morse Theory and simplicial collapses.
- Fall 2018 to present **R Package 'TDA'.**
Description: Generated tutorials for the R package 'TDA'. Implemented website tutorials using a combination of R, html, javascript, and CSS, which culminated in a nationwide workshop funded by the NSF. Also a featured story on the *Montana State University homepage*.
- Fall 2018 to present **Relevant Course Projects.**
Graphics: Implemented interactive scenes in C++ with movement, smoothing, shading, and other linear algebra intensive techniques using OpenGL and Ray-tracing.
Machine Learning: Implemented algorithms including Bayesian learning models, nearest neighbor, k-means clustering algorithms.
Networks: Implemented HTTP client-server networks to play simple games and Stop-and-Wait protocol for Reliable Data Transmission
Multidisciplinary Engineering: Programmed and wired an RC vehicle to complete an obstacle course. My vehicle also played music and used voice recognition in a mobile app.
- Fall 2018 to present **Other Side Projects.**
Working currently on developing new persistent homology techniques for categorizing neurons, on implementing new models to topologically categorize economic data, as well as continued theoretical contributions in computational topology and geometry. I also make personal websites upon request.

Honors and Awards

- Montana State University Cameron Presidential Scholar
- School of Engineering John C. Felton and John L. Magaret Scholarships
- Member of Phi Kappa Phi and Pi Mu Epsilon Academic Societies
- 2019-2020 MSU School of Computing Undergraduate Researcher of the Year
- MSU Honors College
- 3.93 GPA, President's List

Other Skills

- Proficient In:** Java, C, C++, Python, Git **Experience with:** R, MATLAB, Fortran, Dart, Go, Lisp, Javascript, CSS
- Interests:** Rock/Ice/Alpine Climbing, Trail Ultra-marathon Running, Fly Fishing, Hunting, Painting
- Website:** <https://benholmgren.github.io/ben-holmgren/>