

# Ryan Slechta

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## Research Interests

Data Science; Topological Data Analysis; Machine Learning; Computational Geometry; Mathematical Finance; Dynamical Systems

## Education

- 2022 Doctor of Philosophy, Computer Science  
Purdue University, West Lafayette, Indiana, USA  
Advisor: Tamal K. Dey
- 2020 Master of Science, Computer Science and Engineering  
The Ohio State University, Columbus, Ohio, USA
- 2016 Bachelor of Arts, *summa cum laude*, Mathematics, Computer Science  
University of St. Thomas, St. Paul, Minnesota, USA

## Appointments

- 2022-Present Innovation Fellow, University of Michigan
- 2021-2022 Graduate Teaching Assistant, Purdue University
- 2020-2021 Graduate Research Assistant, Purdue University
- 2017-2020 Graduate Research Associate, The Ohio State University
- 2016-2017 University Fellow, The Ohio State University
- 2015-2016 Research Assistant, Los Alamos National Laboratory
- 2014-2015 Research Assistant, University of Minnesota
- 2013-2014 Research Assistant, University of St. Thomas

## Grants, Honors, & Awards

- 2016-2017 University Fellowship, The Ohio State University
- 2012-2016 Deans List (each semester), University of St. Thomas
- 2012-2016 Aquinas Scholars Honors Program, University of St. Thomas
- 2015 Barry M. Goldwater Scholarship, Honorable Mention, Goldwater Foundation
- 2014 Collaborative Inquiry Grant, University of St. Thomas
- 2014 MAA Outstanding Presentation Award, MAA at MathFest
- 2012 Collaborative Inquiry Grant, University of St. Thomas

## Publications

### CONFERENCE PROCEEDINGS

- 2022 T. K. Dey, M. Lipiński, M. Mrozek, and R. Slechta. “Tracking Dynamical Features via Continuation and Persistence.” Presented at the 38th International Symposium on Computational Geometry (SoCG).
- 2020 T. K. Dey, M. Mrozek, and R. Slechta. “Persistence of the Conley Index in Combinatorial Dynamical Systems.” Presented at the 36th International Symposium on Computational Geometry (SoCG).
- 2019 T. K. Dey and R. Slechta. “Filtration Simplification for Persistent Homology via Edge Contraction.” Presented at the 21st International Conference on Discrete Geometry for Computer Imagery (DGCI).
- 2018 T. K. Dey and R. Slechta. “Edge Contraction in Persistence-Generated Discrete Morse Vector Fields.” Presented at Shape Modeling International 2018 (SMI).
- 2017 R. Slechta, L. Monroe, N. DeBardleben, Q. Guan, J. Wendelberger, and S. Michalak. “Resilience Analysis of Top K Selection Algorithms.” Presented at the 13th European Dependable Computing Conference (EDCC).
- 2014 R. Slechta, J. Sawin, B. McCamish, D. Chiu, and G. Canahuate. “Optimizing Query Execution for Variable-Aligned Length Compression of Bitmap Indices.” Presented at the 18th International Database Engineering and Applications Symposium (IDEAS).

### JOURNAL ARTICLES

*NB: Papers in conference proceedings that are published in journals are excluded from this section. Extended versions of conference papers are included.*

- 2023 T. K. Dey, M. Lipiński, M. Mrozek, and R. Slechta. “Computing Connection Matrices via Persistence-like Reductions.” *SIAM Journal on Applied Dynamical Systems (SIADS)*, to appear.
- 2022 T. K. Dey, M. Mrozek, and R. Slechta. “Persistence of the Conley-Morse Graph in Combinatorial Dynamical Systems.” *SIAM Journal on Applied Dynamical Systems (SIADS)*, Volume 21, Issue 2.
- 2020 T. K. Dey and R. Slechta. “Filtration Simplification for Persistent Homology via Edge Contraction.” In *Journal of Mathematical Imaging and Vision*, Volume 62, Issue 5.
- 2020 G. Damiand, E. Paluzo-Hidalgo, R. Slechta, and R. Gonzalez-Diaz. “Approximating Lower-Star Persistence via 2D Combinatorial Map Simplification.” In *Pattern Recognition Letters*, Volume

131.

- 2016 A. Grim, T. O'Connor, P. J. Olver, C. Shakiban, R. Slechta, and R. Thompson. "Automatic Re-assembly of Three-Dimensional Jigsaw Puzzles." In *International Journal of Image and Graphics*, Volume 16, Issue 2.

#### DISSERTATION

- 2022 R. Slechta. "Capturing Changes in Combinatorial Dynamical Systems via Persistent Homology." Purdue University.

### Selected Talks

- 2021 "Persistence of Conley-Morse Graphs in Combinatorial Dynamical Systems." Computational Persistence Workshop, Purdue University. November 5.
- 2021 "Persistence of the Conley Index in Combinatorial Dynamical Systems." Topological Data Analysis Seminar, Purdue University. April 14.
- 2021 "Persistence of the Conley Index in Combinatorial Dynamical Systems." Topological Data Analysis Seminar, University of California, San Diego. February 26.
- 2020 "Persistence of the Conley Index in Combinatorial Dynamical Systems." Computational Mathematics Seminar, Jagiellonian University. October 15.
- 2020 "Persistence of the Conley Index in Combinatorial Dynamical Systems." Second Symposium on Machine Learning and Dynamical Systems, Fields Institute. September 29.
- 2019 "Filtration Simplification for Persistent Homology via Edge Contraction." Ohio TDA Day, Dayton, Ohio. July 29.
- 2018 "Filtration Simplification for Persistent Homology via Edge Contraction." Topology, Geometry, and Data Analysis Seminar, The Ohio State University. October 30.
- 2016 "Resilience of a Top K Selection Algorithm." USRC Research Symposium, Los Alamos National Laboratory. August 4.
- 2015 "Reassembling Humpty Dumpty: 3D Puzzles and Invariant Signature Curves." Joint Mathematics Meeting, San Antonio, Texas. January 10.
- 2014 "Reassembling Humpty Dumpty: 3D Puzzles and Invariant Signature Curves." Math Physics Seminar, University of Minnesota. November 19.
- 2014 "Reassembling Humpty Dumpty: 3D Puzzles and Invariant Signature Curves." MathFest, Portland, Oregon. August 7.

### Service

- 2019-2020 Senator, University Senate, The Ohio State University
- 2019-2020 Member, Council on Academic Affairs, The Ohio State University
- 2019-2020 Member, CAA — Graduate Council Joint Subcommittee, The Ohio State University
- 2018-2019 Chair, Bylaws Committee, Council of Graduate Students, The Ohio State University
- 2016-2020 Delegate, Council of Graduate Students, The Ohio State University
- 2017-2018 Member, Core Curriculum Committee, College of Engineering, The Ohio State University

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