

Donald Sheehy

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Employment

North Carolina State University, Associate Professor, 2019–present

University of Connecticut, Assistant Professor, 2013–2019

Geometrica, Inria Saclay, PostDoc, 2011–2013

Google (Pittsburgh, PA), Software Engineering Intern, Summer 2008.

Google (Mountain View, CA), Software Engineering Intern, Summer 2007.

Carnegie Mellon University, Graduate Student, 2005–2011.

Education

Ph.D. Computer Science, Carnegie Mellon University, 2011.

B.S.E. Computer Science, Princeton University, *Summa Cum Laude*, 2005.

Teaching

At NCSU:

Computational Geometry Spring 2021

Graph Theory Fall 2019, Fall 2020, Spring 2022, and Spring 2023

Automata, Grammars, and Computability Spring 2020, Fall 2021, and Fall 2022

At UConn:

Computational Geometry Fall 2013, Fall 2014, Fall 2015, Fall 2016, and Fall 2017

Senior Design Projects 2017-2018, and 2018-2019

Data Structures and Object-Oriented Design Spring 2016, Fall 2016, Spring 2017, Spring 2018, and Fall 2018

Data Structures and Intro to Algorithms Fall 2015

Theory of Computation Spring 2014, and Spring 2015

At Carnegie Mellon:

Computational Geometry Spring 2010

Grants and Funding

NSF. CRII: *AF: Principled Divide-and-Conquer for Topological Algorithms*. Start Date:02/01/2015; Award Amount: \$173,034.00.

NSF. *AF: Small: Homological Methods for Big Enough Data*. Start Date:08/01/2015; Award Amount: \$340,954.00.

NSF. CAREER: *Algorithmic Challenges and Opportunities in Spatial Data Analysis*. Start Date:02/01/2016; Award Amount: \$511,429.

AFRL. *Topological Detection of Geometric Structure*. Start Date: 04/15/2017; Award Amount: \$208,500.

AFRL. *Homological Methods for Sensor Network Integrity*. Start Date: 09/24/2018; Award Amount: \$82,000.

AFRL. *Conference: 2022 Fall Workshop on Computational Geometry*. Start Date: 09/01/2022; Award Amount: \$14,700.

Service

Chair, PC and Organizing Committee, 30th Fall Workshop on Computational Geometry, 2022

Chair, CGWeek: Multimedia Session, 2022

Co-Chair, Canadian Conference on Computational Geometry, 2021

Editorial Board, International Journal of Computational Geometry and Applications

Chair, Program Committee, CGWeek: Young Researchers Forum 2018

Program Committee, 27th Annual Fall Workshop on Computational Geometry 2017

Program Committee, CGWeek: Workshop Committee 2017

Program Committee, 26th Annual Fall Workshop on Computational Geometry 2016

Program Committee, The First International Workshop on Geometry and Machine Learning 2016

Program Committee, 25th Annual Fall Workshop on Computational Geometry 2015

Program Committee, International Symposium on Computational Geometry, 2015

Program Committee, CGWeek: Young Researchers Forum 2016

Co-Organizer, Mini-Symposium on Computational Topology 2015

Chair, Program Committee, 24th Annual Fall Workshop on Computational Geometry 2014

Co-Organizer NIPS Workshop on Algebraic Topology in Machine Learning, 2012

Graduate Admissions Committee Carnegie Mellon University

Organized Low-Dimensional Manifolds Reading Group (<http://www.cs.cmu.edu/~manifolds>)

Theory Lunch Organizer, 2007-2008

Immigration Course Student Coordinator, 2006

Publications

Journal Articles

An Efficient Algorithm for Topological Characterisation of Worm-Like and Branched Micelle Structures from Simulations

Breannan O Conchuir, Kirk Gardner, Kirk E. Jordan, David J. Bray, Richard L. Anderson, Michael A. Johnston, William C. Swope, Alex Harrison, Donald R. Sheehy, and Thomas J. Peters.
J. Chem. Theory Comput. 2020, 16, 7, 4588-4598, 2020

Adaptive Metrics for Adaptive Samples

Nicholas J. Cavanna, and Donald R. Sheehy.
Algorithms 13(8), 200:1-200:15, 2020

Efficient and Robust Persistent Homology for Measures

Mickael Buchet, Frederic Chazal, Steve Y. Oudot, and Donald R. Sheehy.
Computational Geometry: Theory and Applications. 58: 70-96, 2016

Zigzag Zoology: Rips Zigzags for Homology Inference

Steve Y. Oudot, and Donald R. Sheehy.
Foundations of Computational Mathematics, 15:1151-1186, 2015

A New Approach to Output-Sensitive Construction of Voronoi Diagrams and Delaunay Triangulations

Gary L. Miller, and Donald R. Sheehy.
Discrete Comput Geom, 52(3): 476-491, 2014

Linear-Size Approximations to the Vietoris-Rips Filtration

Donald R. Sheehy.
Discrete Comput Geom, 49(4): 778-796, 2013

New Bounds on the Size of Optimal Meshes

Donald R. Sheehy.
Computer Graphics Forum, 31:5, 1627-1635, 2012

Approximate Centerpoints with Proofs

Gary L. Miller, and Donald R. Sheehy.
Computational Geometry: Theory and Applications, 43(8): 647-654, 2010

Shape Deformation in Continuous Map Generalization

Jeff Danciger, Satyan L. Devadoss, John Mugno, Donald R. Sheehy, and Rachel Ward.
GeoInformatica 13: 2, 203-221, 2009

Compatible Triangulations and Point Partitions by Series Triangular Graphs

Jeff Danciger, Satyan L. Devadoss, and Donald R. Sheehy.
Computational Geometry: Theory and Applications 34, 195-202, 2006

Peer-Reviewed Proceedings

Proximity Search in the Greedy Tree

Oliver Chubet, Parth Parikh, Donald R. Sheehy, and Siddharth Sheth.
SOSA: SIAM Symposium on Simplicity in Algorithms., 2023

Nearly-Doubling Spaces of Persistence Diagrams

Donald R. Sheehy, and Siddharth Sheth.
SOCG: The International Symposium on Computational Geometry, 60:1-60:15, 2022

A Sparse Delaunay Filtration

Donald R. Sheehy.

SOCG: The International Symposium on Computational Geometry, 58:1-58:16, 2021**Sketching Persistence Diagrams**

Donald R. Sheehy, and Siddharth Sheth.

SOCG: The International Symposium on Computational Geometry, 57:1-57:15, 2021**One Hop Greedy Permutations**

Donald R. Sheehy.

CCCG: Proceedings of the 32nd Canadian Conference on Computational Geometry, 221-225, 2020**A Simple Algorithm for kNN Sampling in General Metrics**

Kirk Gardner, and Donald R. Sheehy.

CCCG: Proceedings of the 32nd Canadian Conference on Computational Geometry, 345-351, 2020**Exact computation of a manifold metric, via Lipschitz Embeddings and Shortest Paths on a Graph**

Timothy Chu, Gary L. Miller, and Donald R. Sheehy.

SODA: Proceedings of the ACM-SIAM Symposium on Discrete Algorithms, 411-425, 2020**When Can We Treat Trajectories as Points?**

Parasara Sridhar Duggirala, and Donald R. Sheehy.

CCCG: The Canadian Conference in Computational Geometry, 340-345, 2018**Computing the Shift-Invariant Bottleneck Distance for Persistence Diagrams**

Nicholas J. Cavanna, Oliver Kiselius, and Donald R. Sheehy.

CCCG: The Canadian Conference in Computational Geometry, 78-84, 2018**Frechet-Stable Signatures Using Persistence Homology**

Donald R. Sheehy.

SODA: ACM-SIAM Symposium on Discrete Algorithms, 1100-1108, 2018**Supporting Ruled Polygons**

Nicholas J. Cavanna, Marc Houry, and Donald R. Sheehy.

CCCG: The Canadian Conference in Computational Geometry, 191-196, 2017**When and Why the Topological Coverage Criterion Works**

Nicholas J. Cavanna, Kirk Gardner, and Donald R. Sheehy.

SODA: ACM-SIAM Symposium on Discrete Algorithms, 2679-2690, 2017**Transforming Hierarchical Trees on Metric Spaces**

Mahmoodreza Jahanseir, and Donald R. Sheehy.

CCCG: The Canadian Conference in Computational Geometry, 107-113, 2016**kth Nearest Neighbor Sampling in the Plane**

Kirk Gardner, and Donald R. Sheehy.

CCCG: The Canadian Conference in Computational Geometry, 34-41, 2016**Adaptive Metrics for Adaptive Samples**

Nicholas J. Cavanna, and Donald R. Sheehy.

CCCG: The Canadian Conference in Computational Geometry, 128-132, 2016**Exploring Circle Packing Algorithms**

Kevin Pratt, Connor Riley, and Donald R. Sheehy.

SOCG: Symposium on Computational Geometry (Multimedia Session), 69:1-69:4, 2016

Interactive Geometric Algorithm Visualization in a Browser

Lynn Asselin, Kirk Gardner, and Donald R. Sheehy.

SOCG: Symposium on Computational Geometry (Multimedia Session), 64:1-64:5, 2016**Persistent Homology and Nested Dissection**

Michael Kerber, Donald R. Sheehy, and Primoz Skraba.

SODA: ACM-SIAM Symposium on Discrete Algorithms, 1234-1245, 2016**An Output-Sensitive Algorithm for Computing Weighted α -Complexes**

Donald R. Sheehy.

CCCG: The Canadian Conference in Computational Geometry, 145-150, 2015**A Geometric Perspective on Sparse Filtrations**

Nicholas J. Cavanna, Mahmoodreza Jahanseir, and Donald R. Sheehy.

CCCG: The Canadian Conference in Computational Geometry, 116-121, 2015**Approximating Nearest Neighbor Distances**

Michael B. Cohen, Brittany Terese Fasy, Gary L. Miller, Amir Nayyeri, Donald R. Sheehy, and Ameya Velingker.

WADS: Algorithms and Data Structures Symposium, 200-211, 2015**Visualizing Sparse Filtrations**

Nicholas J. Cavanna, Mahmoodreza Jahanseir, and Donald R. Sheehy.

SOCG: Symposium on Computational Geometry (Multimedia Session), 23-25, 2015**Efficient and Robust Persistent Homology for Measures**

Mickael Buchet, Frederic Chazal, Steve Y. Oudot, and Donald R. Sheehy.

SODA: Symposium on Discrete Algorithms, 168-180, 2015**The Persistent Homology of Distance Functions under Random Projection**

Donald R. Sheehy.

SOCG: Symposium on Computational Geometry, 328-334, 2014**Geometric Separators and the Parabolic Lift**

Donald R. Sheehy.

CCCG: The Canadian Conference in Computational Geometry, 253-258, 2013**A New Approach to Output-Sensitive Voronoi Diagrams and Delaunay Triangulations**

Gary L. Miller, and Donald R. Sheehy.

SOCG: ACM Symposium on Computational Geometry, 281-288, 2013**A Fast Algorithm for Well-Spaced Points and Approximate Delaunay Graphs**

Gary L. Miller, Donald R. Sheehy, and Ameya Velingker.

SOCG: ACM Symposium on Computational Geometry, 289-298, 2013**Zigzag Zoology: Rips Zigzags for Homology Inference**

Steve Y. Oudot, and Donald R. Sheehy.

SOCG: ACM Symposium on Computational Geometry, 387-396, 2013**A Multicover Nerve for Geometric Inference**

Donald R. Sheehy.

CCCG: The Canadian Conference in Computational Geometry, 309-314, 2012**Minimax Rates for Homology Inference**

Sivaraman Balakrishnan, Alessandro Rinaldo, Aarti Singh, Donald R. Sheehy, and Larry Wasserman.

AISTATS: AI and Statistics, 64-72, 2012

Linear-Size Approximations to the Vietoris-Rips Filtration

Donald R. Sheehy.

*SOCG: ACM Symposium on Computational Geometry, 239-248, 2012***Beating the Spread: Time-Optimal Point Meshing**

Gary L. Miller, Todd Phillips, and Donald R. Sheehy.

*SOCG: ACM Symposium on Computational Geometry, 321-330, 2011***Topological Inference via Meshing**

Benoit Hudson, Gary L. Miller, Steve Y. Oudot, and Donald R. Sheehy.

*SOCG: ACM Symposium on Computational Geometry, 277-286, 2010***The Centervortex Theorem for Wedge Depth**

Gary L. Miller, Todd Phillips, and Donald R. Sheehy.

*CCCG: The Canadian Conference in Computational Geometry, 79-82, 2009***Approximate Center Points with Proofs**

Gary L. Miller, and Donald R. Sheehy.

*SOCG: Proceedings of the 25th ACM Symposium on Computational Geometry, 153-158, 2009***Size Complexity of Volume Meshes vs. Surface Meshes**

Benoit Hudson, Gary L. Miller, Todd Phillips, and Donald R. Sheehy.

*SODA: ACM-SIAM Symposium on Discrete Algorithms, 1041-1047, 2009***Achieving Spatial Adaptivity while Finding Approximate Nearest Neighbors**

Jonathan Derryberry, Daniel D. Sleator, Donald R. Sheehy, and Maverick Woo.

*CCCG: The Canadian Conference in Computational Geometry, 163-166, 2008***Linear-size meshes**

Gary L. Miller, Todd Phillips, and Donald R. Sheehy.

*CCCG: The Canadian Conference in Computational Geometry, 175-178, 2008***Size Competitive Meshing without Large Angles**

Gary L. Miller, Todd Phillips, and Donald R. Sheehy.

*ICALP: 34th International Colloquium on Automata, Languages and Programming, 655-666, 2007**Workshop Papers***Linear-time Approximate Hausdorff Distance**

Oliver Chubet, Parth Parikh, Donald R. Sheehy, and Siddharth Sheth.

*The Fall Workshop in in Computational Geometry, 2022***The Persistent Homology of Lipschitz Extensions**

Kirk Gardner, and Donald R. Sheehy.

*The Fall Workshop in in Computational Geometry, 2022***Low Dimensional Spaces of Persistence Diagrams**

Donald R. Sheehy, and Siddharth Sheth.

*The Fall Workshop in in Computational Geometry, 2021***Persistent Nerves Revisited**

Nicholas J. Cavanna, and Donald R. Sheehy.

CG Week: Young Researchers Forum, 2017

Constructing Hierarchical Trees from Locally Greedy Permutations

Mahmoodreza Jahanseir, and Donald R. Sheehy.

*The Fall Workshop in in Computational Geometry, 2016***Optimal Size kNN Sampling**

Kirk Gardner, and Donald R. Sheehy.

*The Fall Workshop in in Computational Geometry, 2016***Persistent Nerves Revisited**

Nicholas J. Cavanna, and Donald R. Sheehy.

*The Fall Workshop in in Computational Geometry, 2016***Generalized Coverage in Homological Sensor Networks**

Nicholas J. Cavanna, Kirk Gardner, and Donald R. Sheehy.

*CG Week: Young Researchers Forum, 2016***Certified Homology Inference**

Nicholas J. Cavanna, Kirk Gardner, and Donald R. Sheehy.

*CG Week: Young Researchers Forum, 2016***Transforming Hierarchical Trees on Metric Spaces**

Mahmoodreza Jahanseir, and Donald R. Sheehy.

*CG Week: Young Researchers Forum, 2016***Characterizing the Distortion of Some Simple Euclidean Embeddings**

Jonathan Lenchner, Krzysztof Onak, Donald R. Sheehy, and Liu Yang.

*The European Workshop on Computational Geometry, 2016***Approximating the Simplicial Depth in High Dimensions**

Peyman Afshani, Donald R. Sheehy, and Yannik Stein.

*The European Workshop on Computational Geometry, 2016***From Cover Trees to Net-Trees**

Mahmoodreza Jahanseir, and Donald R. Sheehy.

*The Fall Workshop in in Computational Geometry, 2015***Generalized Coverage in Homological Sensor Networks**

Nicholas J. Cavanna, Kirk Gardner, and Donald R. Sheehy.

*The Fall Workshop in in Computational Geometry, 2015***A Geometric Perspective on Sparse Filtrations**

Nicholas J. Cavanna, Mahmoodreza Jahanseir, and Donald R. Sheehy.

*The Fall Workshop in in Computational Geometry, 2015***Persistent Homology and Nested Dissection**

Michael Kerber, Donald R. Sheehy, and Primoz Skraba.

*The Fall Workshop in in Computational Geometry, 2013***A New Approach to Output-Sensitive Voronoi Diagrams and Delaunay Triangulations**

Gary L. Miller, and Donald R. Sheehy.

*The Fall Workshop in in Computational Geometry, 2012***Tighter Bounds on the Size of Optimal Meshes**

Donald R. Sheehy.

The European Workshop on Computational Geometry, 2012

Fat Voronoi Diagrams

Gary L. Miller, Todd Phillips, and Donald R. Sheehy.
The Fall Workshop in in Computational Geometry, 2010

(Multi)Filtering Noise in Geometric Persistent Homology

Donald R. Sheehy.
The Fall Workshop in in Computational Geometry, 2010

Mesh-Enhanced Persistent Homology

Benoit Hudson, Gary L. Miller, Steve Y. Oudot, and Donald R. Sheehy.
The Fall Workshop in in Computational Geometry, 2009

Approximating Voronoi Diagrams with Voronoi Diagrams

Gary L. Miller, Todd Phillips, and Donald R. Sheehy.
The Fall Workshop in in Computational Geometry, 2009

Fast sizing calculations for meshing

Gary L. Miller, Todd Phillips, and Donald R. Sheehy.
The Fall Workshop in in Computational Geometry, 2008

Cone Depth and the Center Vertex Theorem

Gary L. Miller, Todd Phillips, and Donald R. Sheehy.
The Fall Workshop in in Computational Geometry, 2008

Selected Talks

Proximity Search in the Greedy Tree

SIAM Symposium on Simplicity in Algorithms (SOSA), Florence Italy, Jan 24, 2023

Semi-Supervised TDA

International Conference on Advances in Interdisciplinary Statistics and Combinatorics (AISC) 2022 October 8, 2022.

The Persistent Homology of Lipschitz Extensions

The Applied Algebraic Topology Research Network Vietoris-Rips Seminar, Feb 4, 2022

Discrete Voronoi Refinement

Duke Algorithms Seminar, Nov 18, 2021

Discrete Voronoi Refinement

Workshop on Computational Persistence, Purdue University, Nov 2, 2021

A Sparse Delaunay Filtration

The International Symposium on Computational Geometry, Univ. of Buffalo, June 7, 2021

Sketching Persistence Diagrams

The International Symposium on Computational Geometry, Univ. of Buffalo, June 7, 2021

Sketching Persistence Diagrams

Dagstuhl Seminar on Computational Geometry, May 5, 2021

Sketching Persistence Diagrams

Oxford TDA Seminar, April 30, 2021

A Sparse Delaunay Filtration

Neurips Workshop on TDA and Beyond, December 11, 2020

A Simple Algorithm for kNN Sampling in General Metrics

The Canadian Conference on Computational Geometry, August 8, 2020

One Hop Greedy Permutations

The Canadian Conference on Computational Geometry, August 8, 2020

Conformal Change of Metrics in Data Analysis

University of Florida Topological Data Analysis conference, January 30, 2020

Conformal Change of Metrics in Data Analysis

Duke Theory Seminar, December 12, 2019

The Cohomology of Impossible Figures, Revisited

TGDA@OSU Seminar, November 5, 2019

The Cohomology of Impossible Figures, Revisited

NCSU Topology, October, 1, 2019

The Cohomology of Impossible Figures, Revisited

Union College Math Conference, September, 14, 2019

Topological Data Analysis

NCSU Computer Science Department Colloquium, January 17, 2019

Topological Data Analysis

Notre Dame Computer Science Department Colloquium, January 17, 2019

Fréchet-Stable Signatures Using Persistent Homology

Fall Eastern Sectional Meeting, Newark, Delaware, September 29, 2018

Fréchet-Stable Signatures Using Persistent Homology

ACM-SIAM Symposium on Discrete Algorithms, New Orleans, LA, January 8, 2018

Fréchet-Stable Signatures Using Persistence Homology

B.I.R.S. Seminar on Topological Data Analysis, Banff, Canada, August 3, 2017

Supporting Ruled Polygons

Canadian Conference on Computational Geometry, Ottawa, Canada, July 27, 2017

Discrete Morse Theory and the Persistent Homology of Simplicial Maps

Dagstuhl Seminar on Topological Data Analysis, Wadern, Germany, July 19, 2017

What Can Persistent Homology Tell Us About Fréchet Distance?

Brown Seminar on Applied Topology, Brown University February 23, 2017

When and Why the Topological Coverage Criterion Works

ACM-SIAM Symposium on Discrete Algorithms, Barcelona, Spain, January 18, 2017

Persistent Nerves Revisited

Union College Math Conference: Applied Topology, December 3, 2016

Transforming Hierarchical Trees on Metric Spaces

The Canadian Conference on Computational Geometry, Vancouver, Canada, August 4, 2016

Sampling Uncertain Manifolds

CG Week Workshop on Geometric Computing on Uncertain Data, Boston, MA, June 15, 2016

Some Thoughts on Sampling

Topology, Geometry, and Data Analysis Conference at Ohio State University, May 16, 2016

Characterizing the Distortion of Some Simple Euclidean Embeddings

The European Workshop on Computational Geometry, Lugano, Switzerland, March 31, 2016

Persistent Homology and Nested Dissection

The ACM-SIAM Symposium on Discrete Algorithms, Arlington, VA, January 11, 2016

Sensors and Samples: A Homological Approach

Presented at the Institute for Advanced Study in Princeton, NJ. Workshop on Topology: Identifying Order in Complex Systems

The Persistent Homology of Distance Functions under Random Projection

Presented at the Symposium on Computational Geometry, Kyoto Japan, June, 2014.

Persistent Homology and Nested Dissection

Presented at the 23rd Fall Workshop on Computational Geometry, New York City, October 2013.

Geometric and Topological Data Analysis

Presented at the Air Force Research Lab, Rome, New York

Geometric Separators and the Parabolic Lift

Presented at The Canadian Conference on Computational Geometry, Waterloo, Canada, August 2013.

A New Approach to Output-Sensitive Voronoi Diagrams and Delaunay Triangulations

Presented at The Symposium on Computational Geometry 2013, Rio de Janeiro, Brazil

Optimal Meshing

Presented at the Workshop on Computational Geometry (Mesh Generation) at SoCG 2013 in Rio de Janeiro

Mesh Generation and Topological Data Analysis

Banff Workshop on Topological Data Analysis and Machine Learning Theory 2012

A Multicover Nerve for Geometric Inference

Presented at the Canadian Conference on Computational Geometry 2012, PEI Canada

New Bounds on the Size of Optimal Meshes

Presented at the Symposium on Geometry Processing 2012, Tallinn Estonia

Minimax Rates for Homology Inference

Geometrica Seminar, Inria Saclay

Linear-Size Approximations to the Vietoris-Rips Filtration

Presented at The Symposium on Computational Geometry 2012, University of North Carolina Chapel Hill

Beating the Spread: Time-Optimal Point Meshing

Presented at Symposium on Computational Geometry, 2011, Paris, France

Learning with Nets and Meshes

Computational Geometry Learning Workshop (CGL), Paris, France

Meshes and Nets

Presented at CMU Theory Lunch, April 6, 2011

Ball Packings and Fat Voronoi Diagrams

Presented at CMU Theory Lunch, September 15, 2010

Topological Inference via Meshing

Presented at Symposium on Computational Geometry, 2010, in Snowbird, Utah

Prospective Students Research Talk: Geometry, Topology and All of Your Wildest Dreams Will Come True.

Presented to CMU Prospective Grad Students, Feb 27, 2010

The Centervortex Theorem for Wedge Depth

Presented at the Canadian Conference on Computational Geometry, 2009, in Vancouver

Approximate Centerpoints with Proofs

Presented at the Symposium on Computational Geometry, 2009, in Aarhus, Denmark.

Planar Graphs in $2\frac{1}{2}$ Dimensions

Presented at Theory Lunch, Carnegie Mellon University, March 18, 2009

Linear-size meshes

Presented at the Canadian Conference on Computational Geometry, 2008, in Montreal

Achieving Spatial Adaptivity while Finding Approximate Nearest Neighbors

Presented at the Canadian Conference on Computational Geometry, 2008, in Montreal

Cone Depth and the Center Vertex Theorem

Presented at The Fall Workshop in Computational Geometry, October 31, 2008

Searching for the Center

Presented at Theory Lunch, Carnegie Mellon University, October 8, 2008

A Competitive Algorithm for No-Large-Angle Triangulation

Presented at Theory Lunch, Carnegie Mellon University, May 2, 2007

Flips in Computational Geometry

Presented at Theory Lunch, Carnegie Mellon University, Nov. 15, 2006