Jose A. Perea

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Contact	j.pereabenitez@northeastern.edu
Web	https://www.joperea.com
Google Scholar	Profile

Education

Stanford University	Ph.D. in Mathematics, 2011 Advisor: Gunnar Carlsson
Universidad del Valle	B.Sc. in Mathematics, 2006 *Summa Cum Laude* and *Valedictorian (out of 850)* Advisor: Gonazalo Garcia

Research Interests

Topological data analysis ● Algebraic topology ● Machine learning
Time Series Analysis ● Computer Vision ● Dynamical Systems ● Computational Biology

Employment

2021 -	Northeastern University *Associate Professor (Tenured)* Department of Mathematics & Khoury College of Computer Sciences
2015 - 2022	Michigan State University *Associate Professor (2021 - 2022 / Tenured / on leave)* *Assistant Professor (2015 - 2021)* Department of Computational Mathematics, Science & Engineering Department of Mathematics
2011 - 2015	Duke University *Visiting Assistant Professor* Department of Mathematics
2014	Institute for Mathematics and its Applications (IMA), University of Minnesota *Long Term Visitor* Thematic program on scientific & engineering applications of algebraic topology

Funding (Total: $1,142,093)

2024 - 2025	*NSF (DMS) Conference grant: Mid-Atlantic Topology Conference 2024* Role: **coPI** (1 of 4), Amount: **$30,000**, Institution: Northeastern
2023 - 2024	*2024 Northeastern TIER 1 Award, Seed grant* Role: **coPI** (1 of 2), Amount: **$50,000**, Institution: Northeastern
2020 - 2025	*NSF CAREER Award # DMS-1943758* Role: **PI**, Amount: **$400,000**, Institution: MSU/Northeastern
2020 - 2023	*NSF Research grant Award # CCF-2006661* Role: **PI**, Amount: **$350,843**, Institution: MSU/Northeastern
2017 - 2019	*Center for Business and Social Analytics (MSU), Seed grant* Role: **coPI** (1 of 2), Amount: **$20,000**, Institution: MSU
2016 - 2019	*NSF Collaborative research grant Award # DMS-1622301* Role: **PI** , Amount: **$105,000**, Institution: MSU
2016 - 2018	*DARPA Research grant Award # HR0011-16-2-0033* Role: **PI**, Amount: **$186,250**, Institution: MSU

Honors, Awards and Fellowships

Spring **2021**
Mathematical Association of America (MAA) - National Association of Mathematicians (NAM)
Inaugural MAA-NAM Lecturer (2022 - 2024)

Spring **2020**
National Science Foundation
Faculty Early Career Development Award (CAREER)
The CAREER program is a Foundation-wide activity offering the NSF's most prestigious awards in support of early-career faculty. Division of Mathematical Sciences 2019 **funding rate**: 15%.

Summer **2018**
Michigan State University
Faculty Fellow of the Hub for Innovation in Learning and Technology

Spring **2013**
Duke University
Top 5% teachers at Duke
For ranking among the top 5% (university wide) in student evaluations for Quality of Course/Intellectual Stimulation

May **2006**
Universidad del Valle
Special Recognition
Resolution 042, May 10th of 2006, Faculty of Sciences, Universidad del Valle. For graduating with the highest honors and academic achievements

Apr **2006**
Universidad del Valle
Valedictorian, Summa Cum Laude and Laurate Thesis
Highest ranking graduating student (out of 850), Highest honors for undergraduate research, Thesis title: The Borsuk-Ulam theorem and applications

Publications and preprints

Authorship convention: Authors are ordered by decreasing relative contribution.

Submitted preprints

29. A. Lee, H. Lee, **J. A. Perea**, N. Schonsheck, and M. Weinstein, $O(k)$-*Equivariant Dimensionality Reduction on Stiefel Manifolds*, Preprint arXiv:2309.10775, 2023.

28. A. Elchesen[°], I. Hartsock[‡], **J. A. Perea**, and T. Rask[‡], *Learning on Persistence Diagrams as Radon Measures*, Preprint, arXiv:2212.08295, 2022.
    [°]Non-Northeastern Postdoc   [‡]Non-Northeastern PhD student

27. H. Gakhar[†] and **J. A. Perea**, *Künneth Formulae in Persistent Homology*, Preprint, arXiv:1910.05656, 2019.
    [†]MSU PhD advisee

Other writing

26. **J. A. Perea**, Book Chapter, *Testimonios: Stories of Latinx and Hispanic Mathematicians (edited by: P.E. Harris, A. Prieto Langarica, V. Rivera Quiñones, R. Uscanga, L. Sordo Vieira, and A. R. Vindas-Meléndez)*, AMS/MAA Classroom Resource Materials, vol 67, Chapter 18, pp. 175-182, 2021

Research - Peer reviewed

25. M. Piekenbrock[†] and **J. A. Perea**, *Move Schedules: Fast persistence computations in sparse dynamic settings*, Journal of Applied and Computational Topology, 2024.
    [†]Northeastern PhD advisee

24. **J. A. Perea**, L. Scoccola[◇], and C. J. Tralie[*], *DREiMac: Dimensionality Reduction with Eilenberg-MacLane Coordinates*, The Journal of Open Source Software, 2023.
    [◇]Northeastern Postdoc mentee   [*]Ursinus Junior faculty
    Software: DREiMac

23. H. Gakhar[†] and **J. A. Perea**, *Sliding Window Persistence of Quasiperiodic Functions*, Journal of Applied and Computational Topology, 2023.
[†]MSU PhD advisee

22. S. Manjunath[†], **J. A. Perea** and A. Sathyanarayana[∗], *Topological Data Analysis of Electroencephalogram Signals for Pediatric Obstructive Sleep Apnea*, IEEE EMBC '23 – Proceedings of the 45th International Conference of the IEEE Engineering in Medicine and Biology Society, 2023.
[†]Northeastern PhD student   [∗]Northeastern junior faculty

21. L. Scoccola[⋄], H. Gakhar[∘], J. Bush[∘], N. Schonsheck[∘], T. Rask[‡], L. Zhou[‡], and **J. A. Perea**, *Toroidal Coordinates: Decorrelating Circular Coordinates With Lattice Reduction*, SoCG '23 – Proceedings of the 39th International Symposium on Computational Geometry, vol. 258, pp. 57:1–57:20,
DOI: 10.4230/LIPIcs.SoCG.2023.57, 2023.
[⋄]Northeastern Postdoc mentee   [∘]Non-Northeastern Postdoc   [‡]Non-Northeastern PhD student
Software: DREiMac

20. L. Scoccola[⋄] and **J. A. Perea**, *FibeRed: Fiberwise Dimensionality Reduction of Topologically Complex Data with Vector Bundles*, SoCG '23 – Proceedings of the 39th International Symposium on Computational Geometry, vol. 258, pp. 56:1–56:18, DOI: 10.4230/LIPIcs.SoCG.2023.56, 2023.
[⋄]Northeastern Postdoc mentee
Software: FibeRed

19. L. Scoccola[⋄] and **J. A. Perea**, *Approximate and Discrete Euclidean Vector Bundles*, Forum of Mathematics, Sigma, 11, E20. DOI: 10.1017/fms.2023.16, 2023.
[⋄]Northeastern Postdoc mentee

18. **J. A. Perea**, E. Munch[∗] and F. A. Khasawneh[∗], *Approximating Continuous Functions on Persistence Diagrams Using Template Functions*, Foundations of Computational Mathematics,
DOI: https://doi.org/10.1007/s10208-022-09567-7, 2022.
[∗]MSU Junior faculty

17. D. Barnes[†], L. Polanco[†] and **J. A. Perea**, *A Comparative Study of Machine Learning Methods for Persistence Diagrams*, Frontiers in Artificial Intelligence-Machine Learning and Artificial Intelligence, vol. 4,
DOI: 10.3389/frai.2021.681174, 2021.
[†]MSU PhD advisee

16. **J. A. Perea**, *Sparse Circular Coordinates via Principal $\mathbb{Z}$-bundles*, The Abel Symposium (Book Series): Topological Data Analysis, vol. 15, no.1, pp. 435-458, 2020.
Software: DREiMac

15. **J. A. Perea**, Book Review: *Elementary Applied Topology*, by Robert W. Ghrist, Create Space 2014, and *Persistence Theory: From Quiver Representations to Data Analysis*, by Steve J. Oudot, Mathematical Surveys and Monographs, Vol. 209, American Mathematical Society, 2015. Bulletin (New Series) of the American Mathematical Society, vol. 57, no. 1, pp. 153–159, 2020.

14. J. L. Mike[⋄] and **J. A. Perea**, *Geometric Data Analysis Across Scales via Laplacian Eigenvector Cascading*, in Proceedings of the 18th IEEE ICMLA, pp. 1091-1098, DOI: 10.1109/ICMLA.2019.00183, 2019.
[⋄]MSU Postdoc mentee

13. L. Polanco[†] and **J. A. Perea**, *Adaptive template systems: Data-driven Feature Selection for Learning with Persistence Diagrams*, in Proceedings of the 18th IEEE ICMLA, pp. 1115-1121,
DOI: 10.1109/ICMLA.2019.00186, 2019.
[†]MSU PhD advisee
Software: AdTemplates

12. L. Polanco[†] and **J. A. Perea**, *Coordinatizing Data With Lens Spaces and Persistent Cohomology*, in Proceedings of the 31st Canadian Conference on Computational Geometry (CCCG), pp. 49-57, 2019.
[†]MSU PhD advisee
Software: DREiMac

11. **J. A. Perea**, *Topological Time Series Analysis*, Notices of the American Mathematical Society, vol. 66, no. 5, pp. 686-694, 2019.

10. B. Xu[§], C. J. Tralie[◇], A. Antia[§], M. Lin[§] and **J. A. Perea**, *Twisty Takens: A Geometric Characterization of Good Observations on Dense Trajectories*, Journal of Applied and Computational Topology, vol 3, no. 4, pp. 285-313, 2019.
    [§]REU Undergraduate   [◇]Non-MSU Postdoc
    Software: TwistyTakens

9. **J. A. Perea**, *A Brief History of Persistence*, Morfismos, vol. 23, no. 1, pp. 1-16, 2019.

8. F. A. Khasawneh[*], E. Munch[*] and **J. A. Perea**, *Chatter Classification in Turning Using Machine Learning and Topological Data Analysis*, In 14th IFAC Workshop on Time Delay Systems TDS 2018, vol. 51, pp. 195–200. International Federation of Automatic Control, 2018.
    [*]MSU Junior faculty

7. C. J. Tralie[†] and **J. A. Perea**, *(Quasi)Periodicity Quantification in Video Data, Using Topology*, SIAM Journal on Imaging Sciences, vol. 11, no. 2, pp. 1049–1077, 2018.
    [†]Non-MSU PhD student.
    Software: Video-SW1PerS
    Journal Info: rank 12 of 255 in subject category Applied Mathematics, 2016 Impact Factor 2.485; Journal Citation Reports, Thomson Reuters.

6. **J. A. Perea**, *Multiscale Projective Coordinates via Persistent Cohomology of Sparse Filtrations*, Discrete & Computational Geometry, vol. 59, no. 1, pp. 175-255, 2018.
    Software: DREiMac
    Journal Info: rank 28 of 452 in subject category Computational Theory and Mathematics, 2017 SJR 0.944, SCImago Journal Rank.

5. **J. A. Perea** and Chris Traile[†], *Sliding windows and persistence*, The Journal of the Acoustical Society of America, vol. 141, no. 5, pp. 3585-3585, 2017.
    [†]Non-MSU PhD student.
    Journal Info: rank 11 of 100 in subject category Acoustics and Ultrasonics, 2016 SJR 0.695, SCImago Journal Rank.

4. **J. A. Perea**, *Persistent Homology of Toroidal Sliding Window Embeddings*, In 2016 IEEE International Conference on Acoustics, Speech and Signal Processing (IEEE ICASSP), pp. 6435-6439, 2016.
    Journal Info: rank 3 of 147 in subject category Signal Processing (Conferences and Proceedings), 2016 SJR 0.469, SCImago Journal Rank.

3. **J. A. Perea**, A. Deckard, S. Haase, and J. Harer, *SW1PerS: Sliding Windows and 1-Persistence Scoring; Discovering Periodicity in Gene Expression Time Series Data*, BMC Bioinformatics, vol. 16, no. 1, p. 257, 2015.
    Software: SW1PerS
    Journal Info: rank 8 of 52 in subject category Mathematical & Computational Biology, 2013 Impact Factor 2.67; Journal Citation Reports, Thomson Reuters.

2. **J. A. Perea** and J. Harer, *Sliding Windows and Persistence: An Application of Topological Methods to Signal Analysis*, Foundations of Computational Mathematics, vol. 15 no. 3, pp. 799-838, 2015.
    Journal Info: rank 7 of 296 in subject category Mathematics, 2012 Impact Factor 1.918; Journal Citation Reports, Thomson Reuters.

1. **J. A. Perea** and G. Carlsson, *A Klein-Bottle-Based Dictionary for Texture Representation*, International Journal of Computer Vision, vol. 107 no. 1, pp. 75-97, 2014.
    Journal Info: rank 9 of 115 in subject category Computer Science/Artificial Intelligence, 2012 Impact factor 3.623; Journal Citation Reports, Thomson Reuters.

Advising and Mentoring (Total: 68 mentees)

Postdoctoral Mentees (**4**)

2022 - 2023	Dr. Olakunle Abawonse	MTH	Northeastern
2020 - 2023	Dr. Luis N. Scoccola *2023- Visiting Scholar @ Oxford*	MTH	Northeastern + MSU
2020 - 2021	Dr. Joshua Mirth	CMSE	MSU
2017 - 2020	Dr. Joshua L. Mike *2020- MTH Instructor @ SVSU*	CMSE	MSU

PhD Advisees (**10**)

2022 -	Xiaochen Xiao	MTH	Northeastern
2022 -	Tanishq Bhatia	MTH	Northeastern
2022 -	Brad Turow	MTH	Northeastern
2020 -	Luis Suarez Salas	MTH + CMSE (dual)	MSU
2019 -	Matt Piekenbrock *MSU Egr. Distinguished Fellow*	CS CMSE	Northeastern MSU
2017 - 2021	Danielle Barnes	CMSE	MSU
2016 - 2022	Dr. Luis Polanco	CMSE + MTH (dual)	MSU
2017 - 2020	Dr. Hitesh Gakhar *2020- MTH Postdoc @ U. of Oklahoma*	MTH	MSU
2018 - 2019	Julian Venegas *MSU Egr. Distinguished Fellow*	CMSE	MSU
2013 - 2015	Dr. Hamza Ghadyali *2018- AI Specialist @ SAS* *Co-advised w/ J. Harer*	MTH	Duke

Masters Advisees (**3**)

2019 - 2021	Astrid Olave *Co-advised w/ F. Gomez*	App. MTH	Nat. Univ. of Colombia
2016 - 2017	Harrison LeFrois	MTH	MSU
2014 - 2015	Luis Polanco *2016- CMSE+MTH PhD student @ MSU* *Co-advised w/ A. Angel*	MTH	Univ. of Los Andes

Thesis Committees (**17**)

Masters (*4*)

Astrid Arena Olave Herrera	MTH	Univ. Nacional de Colombia
Jose Maria Ibarra Rodriguez	MTH	CIMAT
Christopher Lloyd Sukhu	CMSE	MSU
Felipe Gonzalez-Casavianca	MTH	Univ. de los Andes

PhD (*13*)

Dezhou Li	MTH	Northeastern
Marco Antonio Contessoto	MTH	Universidade Estadual Paulista
Christopher Potvin	MTH	MSU
Nicole Hayes	MTH	MSU
Danika Van Niel	MTH	MSU
Chloe Lewis	MTH	MSU
Erik Amezquita	CMSE	MSU
Sarah J. Tymochko	CMSE	MSU
Sarah Klanderman	MTH	MSU
Erik Rybakken	MTH	NTNU
Hana Cho	MTH	MSU
Anna Yannakopoulos	CMSE	MSU
Chris Tralie	ECE	Duke

Undergraduate Research (**34**)

Summer 2023	**18** Research Mentees	MSRI-UP	SLMath
2018 - 2020	Noah Ankney *Honors thesis advisor*	Mathematics	MSU
2018 - 2019	Jared Babcock *2019- Msc. student @ GeorgiaTech*	Computer Science	MSU
Fall 2018	Noah Ankney	Mathematics REU Exchange	MSU
Fall 2018	Zach Mccullough	Mathematics REU Exchange	MSU
Fall 2018	Quinchen Song	Mathematics REU Exchange	MSU
Summer 2017	**8** Research Mentees	Summer @ ICERM	ICERM
2017 - 2018	Adam Huston	Professorial Assistant	MSU
2016 - 2018	Paul Soma	Professorial Assistant	MSU
Summer 2016	Charles Carroll	SURA *Summer Undergraduate Research Academy*	MSU
Summer 2016	Majed Arrfedi	EnSURE *Engineering Summer Undergraduate Experience*	MSU

Invited Speaker: Conferences, Workshops, Lectures and Colloquia

130. Colloquium, Department of Mathematics, Tufts University, March 2024.

129. Keynote speaker, TDA workshop at POSTECH, Korea, February 2024.

128. Special Session, Joint Mathematics Meeting, January 2024.

127. Colloquium, Department of Mathematics, UMass Boston, December 2023.

126. Keynote speaker, OURFA2M2 Conference, November 2023.

125. Special Session, International Congress on Industrial and Applied Mathematics, Tokyo, August 2023.

124. Seminar, Lawrence National Berkeley Lab, June 2023.

123. Seminar, Topos Institute, Berkeley, June 2023.

122. Seminar, Applied Topology, Mathematical Institute, University of Oxford, May 2023.

121. Colloquium, Department of Mathematics, University of Tennessee-Knoxville, April 2023.

120. 29th L. C. Sulski Memorial Lecture, Mathematics Association of America and College of the Holy Cross, April 2023.

119. Conference: Mid-Atlantic Topology Conference, University of Pennsylvania, April 2023.

118. MAA-NAM Lecturer program: Keynote speaker, New Jersey Section Spring Meeting, March 2023.

117. Seminar, Algebraic and Geometric Topology, Department of Mathematics, Tulane University, March 2023.

116. Special Session, AMS Sectional Meeting, Georgia Institute of Technology, March 2023.

115. Colloquium, Department of Mathematics, Queens University, March 2023.

114. Colloquium, Department of Mathematics, Florida International University, March 2023.

113. Conference: Workshop on Computational Topology & Quantum Computing, Kigali, Rwanda, February 2023.

112. Workshop: Applications of Hodge Theory Networks, Banff International Research Station, February 2023.

111. Special Session, Joint Mathematics Meeting, January 2023.

110. Conference: Jornada de Topología y Probabilidad en análisis de datos, Universidad de la Republica, Uruguay, December 2022.

109. MAA-NAM Lecturer program: Keynote speaker, Southern California-Nevada Section Meeting, December 2022.

108. Colloquium, Department of Mathematics, University of Washington, November 2022.

107. Topology Seminar, Colorado State University, October 2022.

106. Colloquium, Department of Mathematics, Universidad Nacional de Colombia - Manizales, October 2022.

105. Conference: Algebraic Topology and Topological Data Analysis: A Conference in Honor of Gunnar Carlsson, Institute for Mathematics and its Applications (IMA), August 2022.

104. Keynote Speaker, LatMath: LatinX in the Mathematical Sciences Conference, UCLA-IPAM, July 2022.

103. Colloquium, MSRI-UP, Mathematical Sciences Research Institute (MSRI), June 2022.

102. Tutorial (4 hours), Topological Data Visualizaton Workshop, University of Iowa, May 2022.

101. Special Session, AMS Spring Western Sectional Meeting, May 2022.

100. MAA-NAM Lecturer program: Keynote speaker, Meeting of the Metro New York MAA, May 2022.

99. MAA-NAM Lecturer program: Keynote speaker, Spring Section Meeting of the Rocky Mountain MAA, April 2022.

98. MAA-NAM Lecturer program: Keynote speaker, Meeting of the Michigan MAA and MichMATYC, April 2022.

97. Colloquium, Department of Applied Mathematics and Statistics, Johns Hopkins University, March 2022.

96. MAA-NAM Lecturer program: Keynote speaker, joint meeting of the MAA-Florida Section and FTYCMA, February 2022.

95. Colloquium, Department of Mathematics, Universidad de los Andes, November 2021.

94. Algebra Seminar, Department of Mathematics, University of Iowa, November 2021.

93. Colloquium, Applied and Computational Mathematics, University of Chicago, October 2021.

92. Colloquium, Department of Mathematics, Lafayette College, October 2021.

91. Colloquium, Department of Mathematics, Indiana University-Purdue University Indianapolis, October 2021.

90. Topology Seminar, Northeastern University, October 2021.

89. Workshop, Thematic Einstein Semester on Geometric and Topological Structure of Materials, TU Berlin, September 2021.

88. Lathisms Lecture Series: Cafe con Leche, online, September 2021.

87. Keynote lecture, 18th Young Mathematics Conference (YMC 2021), The Ohio State University, online, August 2021.

86. Seminar, Centre for Topological Data Analysis, University of Oxford, online, June 2021.

85. Keynote lecture, 6th IEEE CVPR International Workshop on Differential Geometry in Computer Vision and Machine Learning (DiffCVML), online, June 2021.

84. Workshop, Hot Topics: Topological Insights in Neuroscience, Mathematical Sciences Research Institute (MSRI), online, May 2021.

83. Workshop, Topological Data Analysis - Theory and Applications, School of Mathematical and Statistical Sciences, Western University, CA, May 2021.

82. Seminar, Geometry, Algebra Mathematical Physics and Topology, Cardiff University (online), UK, March 2021.

81. Colloquium, Department of Mathematics, Northeastern University (online), February 2021.

80. RTG Colloquium, School of Mathematical and Statistical Sciences, Arizona State University (online), February 2021.

79. Topology, Geometry, and Data Analysis (TGDA) Seminar, The Ohio State University (online), January 2021.

78. Conference: Joint Mathematics Meeting, AMS Special Session on Combinatorial Approaches to Topological Structures and Applications, Online, January 2021.

77. Online seminar, One World Mathematics of Information, Data, and Signals (1W-MINDS) seminar, January 2021.

76. Workshop, Topological Data Analysis and Beyond, NeuRIPS Conference, December 2020.

75. Online seminar, Trends in Low-Dimensional Topology, September 2020.

74. Latin American Cyber-Colloquium of Mathematics, July 2020.

73. Plenary speaker, XXII International Symposium on Mathematical Methods Applied to Sciences (SIM-MAC), University of Costa Rica, February 2020.

72. Colloquium, Department of Mathematics, University of Louisiana at Lafayette, February 2020.

71. Topology Seminar, Department of Mathematical Sciences, Norwegian University of Science and Technology, January 2020.

70. Topology Seminar, Department of Mathematics, Wayne State University, January 2020.

69. Thematic Session on Recent Advances in Topological Data Analysis - Canadian Mathematical Society Winter Meeting, December 2019.

68. Minisymposium on Geometry and Topology in Data Analysis, International Congress on Industrial and Applied Mathematics, Valencia, Spain, July, 2019.

67. II Workshop on Topological Data Analysis, Universidade Estadual Paulista, Rio Claro, Brazil, June, 2019.

66. Research Experience for Undergraduates (REU), Department of Mathematics, Grand Valley State University, June, 2019.

65. Workshop: Topological Data Analysis, with Applications – School of Mathematical and Statistical Sciences, Western University, Canada, May 2019.

64. Local Invited Speaker: Annual Meeting of the Michigan MAA, April 2019.

63. Colloquium: Mexican National University (UNAM) – Mathematics Institute, Oaxaca, Mexico, March, 2019.

62. Conference: Joint Mathematics Meeting, AMS Special Session on Applied and Computational Topology, Baltimore, January, 2019.

61. Workshop: Topology and Neuroscience, EPFL (École Polytechnique Fédérale de Lausanne), Lausanne - Switzerland , November, 2018.

60. Theoretical Biology Seminar: Department of Mathematics, Penn State University, October, 2018.

59. Conference: The 10th Conference on Application of Algebraic Topology in Computer Science and Data Analysis (GETCO '18), September, 2018.

58. Workshop: Multiparameter Persistent Homology, Banff International Research Station (BIRS), August, 2018.

57. The Abel Symposium, Norwegian Mathematical Society, June 2018.

56. Online Topological Data Analysis Seminar, Centro de Investigacion de Matematicas (CIMAT), Guanajuato, Mexico, April 2018.

55. Keynote Speaker: Underrepresented Students in Topology and Algebra Research Symposium (USTARS 2018), Reed College, April, 2018.

54. Colloquium: Department of Mathematics, Reed College, April, 2018.

53. Workshop: Numerical Analysis and Approximation Theory meets Data Science, Banff International Research Station (BIRS), April, 2018.

52. Conference: Latinx in the Mathematical Sciences Conference, IPAM - UCLA, March, 2018.

51. Invited Speaker: XXVIII SNIDM - 28th National Week of Research and Teaching in Mathematics, Universidad de Sonora, Mexico, March, 2018.

50. Conference: Geometry and Topology of Data, ICERM - Brown University, December, 2017.

49. Colloquium: Department of Mathematics, The University of Florida, October, 2017.

48. REU (Organizer and lecturer): SUMMER@ICERM2017 - Topological Data Analysis, ICERM - Brown University, Summer 2017.

47. Workshop: Topology of the Biomolecular World, American Institute of Mathematics, July 2017.

46. Conference: Meeting of the Acoustical Society of America, Boston, June 2017.

45. Conference: Applied and Computational Topology, Hausdorff Institute of Mathematics, Bonn, Germany, May 2017.

44. The Barret Memorial Lectures, University of Tennessee - Knoxville, May 2017.

43. Colloquium: Department of Computational and Applied Mathematics, Rice University, April 2017.

42. Conference: Fifteenth Annual Graduate Student Topology and Geometry Conference, Michigan State University, April 2017.

41. Michigan Institute for Data Science (MIDAS) Seminar Series, University of Michigan, February 2017.

40. Conference: Winter Conference on Geometry Topology and Applications, Florida International University, January 2017.

39. Blackwell-Tapia Conference, NIMBioS, University of Tennessee-Knoxville, October 2016

38. SIAM Central States Meeting, University of Arkansas, September 2016

37. Colloquium: Department of Mathematics, Universidad Nacional de Colombia, Colombia, August 2016

36. Colloquium: Department of Mathematics, Universidad Central, Colombia, August 2016

35. Workshop: Technological University of Munich, Germany, July 2016

34. Conference: SIAM imaging Mini Symposium on Topology and Geometry Across Scales, New Mexico, May 2016.

33. Workshop: Topology, Geometry and Data Analysis, The Ohio State University, May 2016.

32. Colloquium, Department of Mathematics, CINVESTAV, Mexico, May 2016.

31. Conference: British Applied Mathematics Colloquium, Mini Symposium on Applied and Computational Topology, Oxford, April 2016.

30. Colloquium, Department of Mathematics, Fudan University, China, April 2016.

29. Colloquium, Department of Mathematics, CIMAT, Mexico, January 2016.

28. Conference: Joint Mathematics Meeting, AMS Special Session on Applied and Computational Topology, Seattle, January 2016.

27. Conference: Annual meeting of the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS '15), October, 2015.

26. Topology seminar, Department of Mathematics, State University of New York at Albany, April 2015.

25. Colloquium, Department of Mathematics, University of Tennessee – Knoxville, February 2015.

24. Colloquium, Department of Mathematics - Data Science series, University of Rochester, January 2015.

23. Workshop: School on Topological Data Analysis and Stochastic Topology, CIMAT, Mexico, January 2015.

22. Colloquium, Department of Mathematics, State University of New York Polytechnic Institute, December 2014.

21. Topology seminar, Department of Mathematics, State University of New York at Albany, December 2014.

20. Colloquium, Department of Mathematics and Statistics, University of Nevada at Reno, November 2014.

19. Workshop: Mathematics of Data Analysis in Cybersecurity, ICERM - Brown University, October 2014.

18. Workshop: Persistent Homology for Biosciences, Michigan State University, October 2014.

17. Geometry and Topology seminar, North Carolina State University, September 2014.

16. Special seminar on Applied Algebraic Topology and Data, Universidad de los Andes, Colombia, June 2014.

15. (ATMCS 6) Algebra and Topology: Methods, Computation and Science, Pacific Institute of Mathematics, University of British Columbia, May 2014.

14. Workshop: Topological Data Analysis, Statistical and Applied Mathematical Sciences Institute (SAMSI), February 2014.

13. Workshop: Topological Data Analysis, IMA Thematic Year on Scientific and Engineering Applications of Algebraic Topology, Institute for Mathematics and its Applications (IMA), October 2013.

12. Topology seminar, Johns Hopkins University, October 2013.

11. Joint Stats Meeting 2013 - Stochastic Aspects of Topology, Montreal, Canada, August 2013.

10. SIAM Conference on Applied and Algebraic Geometry, Colorado State University, August 2013.

9. Workshop: Applied Topology, Bedlewo, Poland, July 2013.

8. XIX Colombian Congress of Mathematics, Universidad del Norte, Barranquilla, Colombia, July 2013.

7. 29th ACM Symposium on Computational Geometry - Workshop on Computational Topology and Data Analysis, Rio de Janeiro, Brazil, June 2013.

6. Special Session on Computational Topology, MathFest, Madison WI, August 2012.

5. School of Geometry, Universidad del Valle, Cali, Colombia, July 2012.

4. Special Session on Computational Topology, Joint Mathematics Meeting, Boston MA, January 2012.

3. SIAM Conference on Applied and Algebraic Geometry, North Carolina State University, October 2011.

2. (ATMCS 4) Algebra and Topology: Methods, Computation and Science, Münster, Germany, June 2010.

1. Colloquium, Department of Mathematics, Universidad del Valle, Colombia, August 2009.

Teaching Experience

Mini-Courses

2023 Summer	*Topological Data Analysis*	MSRI-UP 2023, SLMath
2021 November	*Topological Data Analysis*	EMALCA Peru 2021: Online
2019 March	*Data coordinatization with classifying spaces*	UNAM - Mathematics Institute, Oaxaca
2018 March	*Topological Time Series Analysis*	XXVIII SNIDM - Univ. de Sonora, MX
2017 Summer	*Topological Time Series Analysis*	SUMMER@ICERM2017 - Brown Univ.
2016 Summer	*Topological Time Series Analysis*	TU Munich
2015 Fall	*Topological Data Analysis*	The Ohio State Univ.
2015 Spring	*Eilenberg-MacLane Coordinates*	Duke Univ.
2014 Summer	*Some Applications of Topology to Data Analysis*	Univ. de Antioquia, Colombia

Course Instructor

Northeastern University

2023 Fall	MTH 2331	*Linear Algebra*
2023 Spring	MTH 7375	*Topics in Topology: Topological Methods for the Analysis of Data*
2022 Fall	MTH 5111	*Algebra I*
2021 Fall	MTH 7721	*Readings in Topology: Topological Data Analysis*

Michigan State University

2021 Spring	CMSE 201	*Introduction to Computational Modeling*
2020 Fall	CMSE 201	*Introduction to Computational Modeling*
2020 Spring	CMSE 890	*Special topics: Topological Methods for the Analysis of Data*
2019 Fall	MTH 996	*Topics in topology: Persistence, Fiber Bundles and Applications*
2018 Fall	MTH 890	*Directed (Graduate) Studies in Algebraic Topology*
2018 Fall	CMSE 890	*Foundations of Mathematical Reasoning*
2018 Spring	MTH 490	*Directed (Undergraduate) Studies in Algebraic Topology*
2017 Fall	MTH 461	*Metric and Topological Spaces*
2017 Spring	CMSE 802	*Methods in Computational Modeling*
2016 Fall	CMSE 802	*Methods in Computational Modeling*
2016 Spring	MTH 996	*Topics in Topology: Topological Data Analysis*

Duke University

2015 Spring	MTH 502	*Algebraic Structures II*
2013 Spring	MTH 401	*Intro to Abstract Algebra*

Stanford University

2010 Winter	MTH 51 (TA)	*Linear Algebra and Multivariable Calculus*
2010 Autumn	MTH 51M	*Introduction to MATLAB for Multivariate Mathematics*
2009 Autumn	MTH 215a (TA)	*Complex Analysis, Geometry and Topology (Qualifier)*
2008 Winter	MTH 113 (TA)	*Algebra and Matrix Theory*
2008 Autumn	MTH 51 (TA)	*Linear Algebra and Multivariable Calculus*
2007 Autumn	MTH 215a (TA)	*Complex Analysis, Geometry and Topology (Qualifier)*

Universidad del Valle

2006 Spring	*Multivariable Calculus*

Professional Service

Service to the Profession

Scientific and program committees:

2023 3rd Graduate Student Conference - Geometry and Topology meet Data Analysis and Machine Learning (GTDAML23).

2022 2nd Colombian Conference on Applied and Industrial Mathematics (MAPI2).

2020 (Partially online) ATMCS — Algebraic Topology: Methods, Computation, and Science.

2019 1st Graduate Student Conference - Geometry and Topology meet Data Analysis and Machine Learning (GTDAML19).

2019 Special session on topological data analysis and machine learning, 18th IEEE International Conference on Machine Learning and Applications (ICMLA)

(Co)Organized conferences

2023 REU - MSRI Undergraduate Program (MSRI-UP): Topological Data Analysis, SLMath/MSRI.

2023 3rd Graduate Student Conference - Geometry and Topology meet Data Analysis and Machine Learning (GTDAML23), Northeastern University.

2022 American Mathematical Society - *Mathematical Research Communities* (MRCs): Data Science at the Crossroads of Analysis, Geometry, and Topology. *Note: selected through a competitive proposal review cycle; originally scheduled for 2021, but delayed to 2022 due to COVID-19.*

2021 2nd Graduate Student Conference - Geometry and Topology meet Data Analysis and Machine Learning (GTDAML21), University of Wisconsin-Madison.

2021 Workshop on Topological Data Analysis, Institute for Mathematical and Statistical Innovation, University of Chicago.

2020 Workshop: Optimal Transport, Topological Data Analysis and Applications to Shape and Machine Learning, MBI, The Ohio State University.

2019 Applied Mathematical Modeling with Topological Techniques, ICERM/Brown University.

2019 1st Graduate Student Conference - Geometry and Topology meet Data Analysis and Machine Learning (GTDMAL19), The Ohio State University.

2018 Thematic session on Topological Data Analysis, First Colombian Conference of Applied and Industrial Mathematics - MAPI1, Bogota - Colombia.

2018 Thematic session on Topological Data Analysis, Joint meeting of the Colombian Mathematical Society and the Mexican Mathematical Society.

2017 REU - Summer@ICERM2017: Topological Data Analysis, ICERM/Brown University.

2017 SIAM Conference on Applied and Algebraic Geometry, Mini-symposium on Applied and Computational Topology.

2017 Third School on Topological Data Analysis and Stochastic Topology, Abacus and CINVESTAV, Mexico.

2015 First School on Topological Data Analysis and Stochastic Topology, CIMAT, Mexico.

Proposal review panels:

2022 NSF Ad hoc reviewer BSC division

2022 NSF Division of Mathematical Sciences (DMS) MPS-Ascend fellowship

2018 NSF Division of Mathematical Sciences (DMS)ad hoc reviewer

2017 NSF Computational and Data-Enabled Science and Engineering - Mathematical Sciences and Statistics (CDS&E-MSS)

2016 NSF Computational Mathematics

Referee: Journals and peer-reviewed conferences

15th Abel Symposium 2018
18th IEEE ICMLA 2019
Acta Mathematica Hungarica
Advances in Data Analysis and Classification
AMS MathSciNet
Applied and Numerical Harmonic Analysis
Foundations of Computational Mathematics
Homology Homotopy & Applications
IEEE Letters
Information Fusion
Integracion
Journal of Applied and Computational Topology
Journal of Computational Geometry
Journal of Computational Chemistry
SoCG 2020, SoCG 2018, SoCG 2016
SODA 2015
Transactions of the American Mathematical Society
Pattern recognition letters

Physica D

Referee: Book projects

Cambridge University Press

Departmental and University Service

Northeastern University

| 2022 - | Interdisciplinary PhD program | University |
| 2022 - | Faculty hiring committee | Dpt. of MTH |

Michigan State University

2019-2021	CMSE Frontiers Workshop Committee	Dpt. of CMSE
2019-2021	CMSE Undergraduate Studies Committee	Dpt. of CMSE
2019	CMSE Department chair hiring committee	Dpt. of CMSE
2017-2019	Engineering Research Committee	Col. of Eng
2017	Faculty (CMSE/STT) hiring committee	Dpt. of CMSE
2015-2017	Coordinator for weekly Applied Math Seminar	M Dpt. of MTH
2016	Internal CMSE ad-hoc committee on data science degree	Dpt. of CMSE
2016-2017	Chair - CMSE Colloquium series committee	Dpt. of CMSE
2016	Faculty (Data Science) hiring committee	Dpt. of CMSE
2015	Faculty (Data Science) hiring committee	Dpt. of CMSE

References

Provided upon request.