

Jose Perea

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Education

Stanford University Ph.D. in Mathematics - June 2011
Advisor: Gunnar Carlsson

Universidad del Valle B.Sc. in Mathematics - April 2006
Summa Cum Laude and *Valedictorian*
Advisor: Gonazalo Garcia

Research Interests

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

Employment History

Aug 2015 - Present [Michigan State University](#)
Assistant Professor
Department of Computational Mathematics, Science & Engineering
Department of Mathematics

Aug 2011 - Jul 2015 [Duke University](#)
Visiting Assistant Professor
Department of Mathematics

Spring 2014 [Institute for Mathematics and its Applications, University of Minnesota](#)
Member
Annual thematic program on scientific and engineering applications of algebraic topology.

Grants

- **Center for Business and Social Analytics (MSU)**
Seed Grant, Jan 2018 - Jul 2019 (coPI)
- **NSF**
Collaborative Grant, CDS&E - MSS, Award # DMS-1622301, Sept 2016 - Aug 2019 (PI)
- **DARPA**
Award # HR0011-16-2-0033, Aug 2016 - Sept 2018 (PI)

Honors and Awards

- 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 or 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 some applications

Publications

16. L. Polanco and J. A. Perea, *Coordinatizing Data With Lens Spaces and Persistent Cohomology*, to appear in [Proceedings of the 31st Canadian Conference on Computational Geometry](#), 2019.
15. J. A. Perea, E. Munch and F. A. Khasawneh, *Approximating Continuous Functions on Persistence Diagrams Using Template Functions*, [Preprint](#), [arXiv:1902.07190](#), 2019.
14. J. A. Perea, *Topological Time Series Analysis*, [Notices of the American Mathematical Society](#), vol. 66, no. 5, pp. 686-694, May 2019.
13. B. Xu, C. J. Tralie, A. Antia, M. Lin and J. A. Perea, *Twisty Takens: A Geometric Characterization of Good Observations on Dense Trajectories*, to appear in [Journal of Applied and Computational Topology](#), 2019.
12. J. A. Perea, *Sparse Circular Coordinates via Principal \mathbb{Z} -bundles*, to appear in [Proceedings of the 15th Abel Symposium](#), 2019.
11. J. A. Perea, *A Brief History of Persistence*, [Morfismos](#), vol. 23, no. 1, pp. 1-16, 2019.
10. J. L. Mike and J. A. Perea, *Geometric Data Analysis Across Scales via Laplacian Eigenvector Cascading*, [Preprint](#), [arXiv:1812.02139](#), 2018.
9. J. A. Perea, Book Review: *Elementary Applied Topology*, by Robert W. Ghrist, Create Space 2014, and *Persistence Theory: From Quiver Representations to Data Analysis*, Mathematical Surveys and Monographs, Vol. 209, American Mathematical Society, 2015. [Bulletin \(New Series\) of the American Mathematical Society](#), September 24, 2018.
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.
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.

[†] PhD student at time of initial submission.

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.
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.
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 ([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, *SWIPerS: Sliding Windows and 1-Persistence Scoring; Discovering Periodicity in Gene Expression Time Series Data*, [BMC Bioinformatics](#), vol. 16, no. 1, p. 257, 2015.
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

15. Jared Babcock, Undergraduate Research, Computer Science, Michigan State University, 2018 - present.
14. Noah Ankney, Undergraduate Research, Mathematics, Michigan State University, 2018 - present.
13. Julian Venegas, PhD Program - CMSE, Michigan State University, 2018 - present.
12. Zach Mccullough, Quinchen Song, Noah Ankney, Mathematics, Undergraduate Exchange Research Program, Fall 2018.
11. Joshua Mike, Postdoctoral Fellow, CMSE, Michigan State University, 2017 - present.
10. Danielle Barnes, PhD Program - CMSE, Michigan State University, 2017 - present.
9. Hitesh Gakhar, PhD Program - Mathematics, Michigan State University, 2016 - present.
8. Luis Polanco, PhD Program - CMSE, Michigan State University, 2016 - present.
7. Adam Huston, Undergraduate Professorial Assistant, Michigan State University, 2017 - 2018.
6. Paul Soma, Undergraduate Professorial Assistant , Michigan State University 2016 - 2018.
5. Harrison LeFrois, Ms. Sc. Program - Mathematics, Michigan State University, 2016 - 2017.
4. Charles Carroll, SURA (Summer Undergraduate Research Academy), Michigan State University, Summer 2016.
3. Majed Arrfedi, EnSURE (Engineering Summer Undergraduate Research Experience), Michigan State University, Summer 2016.

2. Luis Polaco, Masters Program - Mathematics, Universidad de los Andes (co-advised with Andres Angel), 2014 - 2015.
1. Hamza Ghadyali, Ph.D. Program - Mathematics, Duke University (co-advised with John Harer), 2013 - 2015.

Invited Speaker: Conferences, Workshops, Lectures and Colloquia

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

20. *Mini-course: Data coordinatization with classifying spaces*, Instructor, **National University of Mexico - Mathematics Institute, Oaxaca**, March, 2019.
19. *Directed Studies in Algebraic Topology* - MTH 490, Instructor, **Michigan State University**, Spring 2018.
18. *Mini-course: Topological Time Series Analysis*, Instructor, XXVIII SNIDM - 28th National Week of Research and Teaching in Mathematics, **Universidad de Sonora, Mexico**, March, 2018.
17. *Foundations of Mathematical Reasoning* - CMSE 890(3), Co-Instructor, **Michigan State University**, Fall 2018.
16. *Metric and Topological Spaces* - MTH 461, Instructor, **Michigan State University**, Fall 2017.
15. *Mini-course: Topological Time Series Analysis*, Instructor, SUMMER@ICERM2017, **ICERM-Brown University**, Summer 2017.
14. *Methods in Computational Modeling* - CMSE 802, Instructor, **Michigan State University**, Spring 2017.
13. *Methods in Computational Modeling* - CMSE 802, Instructor, **Michigan State University**, Fall 2016.
12. *Mini-course: Topological Time Series Analysis - Theory and Practice*, Instructor, **TU Munich**, Summer 2016.
11. *Special Topics in Topology- Topological Data Analysis* - MTH 996: Instructor, **Michigan State University**, Spring 2016.
10. *Mini-course: Topological Data Analysis*, Instructor, **The Ohio State University**, Fall 2015
9. *Mini-course: Eilenberg MacLane Coordinates*: Instructor (joint with John Harer), **Duke University**, Spring 2015.
8. *Algebraic Structures II* - MTH 502: Instructor, **Duke University**, Spring 2015.
7. *Mini-course: Some Applications of Topology to the Analysis of Data*, II Escuela Colombiana de Matemáticas, **Universidad de Antioquia**, Summer 2014.
6. *Intro to Abstract Algebra* - MTH 401: Instructor, **Duke University**, Spring 2013.

5. *Introduction to MATLAB for Multivariate Mathematics* - MTH 51M: Instructor, **Stanford University**, Fall 2010.
4. *Complex Analysis Geometry and Topology* - MTH 215a: (Graduate level class) TA, **Stanford University**, Fall 2009 and Fall 2007.
3. *Linear Algebra and Multivariable Calculus* - MTH 51: TA several times, **Stanford University**.
2. *Algebra and Matrix Theory* - MTH 113: TA, **Stanford University**, Winter 2008.
1. *Multivariable Calculus*: Instructor, **Universidad del Valle**, Colombia, Spring 2006.

Professional Service

Conferences Organized

1. Thematic session on Topological Data Analysis, First Colombian Conference of Applied and Industrial Mathematics - MAPII, Bogota - Colombia, August 2018.
2. Thematic session on Topological Data Analysis, Joint meeting of the Colombian Mathematical Society and the Mexican Mathematical Society, May 2018.
3. Summer@ICERM2017: Topological Data Analysis, ICERM/Brown University - Summer 2017.
4. SIAM Conference on Applied and Algebraic Geometry, Mini-symposium on Applied and Computational Topology, July 2017.
5. Third School on Topological Data Analysis and Stochastic Topology, Abacus and CINVESTAV, Mexico - January 2017.
6. First School on Topological Data Analysis and Stochastic Topology, CIMAT, Mexico - January 2015..

Service to the Profession

1. 2018 NSF (DMS) ad hoc proposal reviewer
2. 2017 NSF panel on CDS&E-MSS
3. 2016 NSF panel on Computational Mathematics
4. Journal reviewer for Pattern Recognition Letters, ADAC, SoCG 2016 proceedings, Information Fusion, Applied and Numerical Harmonic Analysis, SoCG 2016, Physica D, IEEE Letters, SODA 2015, Homology Homotopy & Applications, Foundations of Computational Mathematics.
5. Book chapter reviewer.
6. Book project reviewer.

Departmental Service

1. CMSE chair search committee, Department of CMSE, 2019
2. Engineering Research Committee, 2017 - 2019
3. CMSE/STT hiring committee, Department of CMSE, 2017
4. Coordinator for Applied Math Seminar, Department of Mathematics, Fall 2015 - Spring 2017.
5. Internal CMSE ad-hoc committee on data science degree, 2016
6. Chair Colloquium series committee, Department of CMSE, 2016 - 2017
7. Data Science hiring committee, Department of CMSE, 2016
8. Data Science hiring committee, Department of CMSE, 2015
9. Thesis and Graduate committees, Department of Mathematics

References

Provided upon request.