Facundo Mémoli

CONTACT

Rutgers University
Department of Mathematics
Hill Center - Busch Campus
110 Frelinghuysen Road
Piscataway, NJ 08854-8019, USA.
Webpages: *Personal*: https://facundo-memoli.org/
Google Scholar: https://tinyurl.com/fm-google-scholar

Phone: +1-848-445-2390
Fax: +1-732-445-5530

E-mail: facundo.memoli@rutgers.edu
Group: https://ndag.github.io/

ACADEMIC APPOINTMENTS

Full Professor. Rutgers University. 2025 – present.
Full Professor. The Ohio State University. 2020 – 2024.
Associate Professor. The Ohio State University. 2016 – 2020.
Assistant Professor. The Ohio State University. 2013 – 2016.
Assistant Professor. The University of Adelaide. 2011 – 2013.
Postdoctoral fellow. Stanford University, Mathematics Department, 2005 – 2011.

EDUCATION

University of Minnesota, Minneapolis, Minnesota USA. PhD, 2005.
Universidad de la República, Montevideo, Uruguay. M. Sci, 2001.
Universidad de la República, Montevideo, Uruguay. Electrical Engineering degree, 2001.

GRANTS

- NSF #2301359. Multiparameter Topological Data Analysis.
  $199,989. 2023-2026. PI.
- NSF #2310412. Graph Analysis: Integrating Metric and Topological Perspectives.
  $299,985. 2023-2026. PI.
- BSF #2020124. The filling radius and Topological Data Analysis.
  $140,000. 2021-2025. PI.
- NSF # IIS-1901360. Through synapses to spatial learning: a topological approach.
  $435,000. 2019-2023 (NCE).[1] PI.
- NSF # CCF-1740761. TRIPODS: TGDA@OSU: Structure, Shape, and Dynamics in Data.
  $1.5M. 2017-2023 (NCE). PI.
- NSF # DMS-1547357. RTG: Algebraic Topology and Its Applications.
  $1.72M. 2016-2023 (NCE). Co-PI.
- NSF # CCF-1839356. TRIPODS+X:EDU: An MBI TGDA+Neuro for Undergraduates.
  $199,983. 2018-2021 (NCE). Co-PI.
- NSF # DMS-1723003. Topology of Functional Data on Random Metric Spaces, Graphs &Graphons.
  $180K. 2017-2020. PI.
- NSF # CCF-1839358. TRIPODS+X:RES: Thermodynamic Phases and Config. Space Topology.
  $300K. 2018-2022. Co-PI.
- NSF # DMS-1743943. CBMS Conference: Elastic Functional and Shape Data Analysis (EFSDA).
  $35,748. 2018. Co-PI.
- NSF # DMS-1613094. Conference on Topology, Geometry, and Data Analysis at OSU.
  $40,000. 2016-2017. Co-PI.
- NSF # CCF-1526513. Analyzing Complex Data with a Topological Lens.
  $399,999. 2015-2018. Co-PI.
- NSF # IIS-1422400. Robustness of spatial learning in flickering networks: the hippocampus.
  $230,176. 2014-2017. PI.

[1] No cost extension.

- ONR # N00014-09-1-0783. Metric Geometry and Category Theory for Data Fusion. $666,813. 2009-2011. Senior Personnel.
- ONR # N00014-10-1-0808. SIAM-IS 2010 workshop "Metric and Riemannian methods in Shape Analysis". $29,291. Co-PI.

VISITING POSITIONS AND FELLOWSHIPS

- ICERM - Brown University, Summer 2017.
- IMA - UMN, Fall 2013.

PAPERS IN JOURNALS

61. Mémoli F. and Zhou, L. Ephemeral persistence features and the stability of filtered chain complexes. *Journal of Computational Geometry.* 2024;15(2):258-328.
60. Arya S, Auddy A, Clark RA, Lim S, Mémoli F, Packer D. The Gromov-Wasserstein distance between spheres. *Foundations of Computational Mathematics.* 2024 Sep 16:1-56.
59. Mémoli F, Needham T. Comparison results for Gromov-Wasserstein and Gromov-Monge distances. *ESAIM: Control, Optimisation and Calculus of Variations.* 2024;30:78.
58. Lim S, Mémoli F. Classical multidimensional scaling on metric measure spaces. *Information and Inference: A Journal of the IMA.* 2024 Jun;13(2).
57. Gómez M, Mémoli F. Curvature sets over persistence diagrams. *Discrete & Computational Geometry.* 2024 Jul;72(1):91-180.
56. Mémoli F, Zhou L. Persistent homotopy groups of metric spaces. *Journal of Topology and Analysis.* 2024 Mar 22:1-62.
55. Dey T, Kim W, Mémoli F. Computing generalized rank invariant for 2-parameter persistence modules via zigzag persistence and its applications. *Discrete & Computational Geometry.* 2024;71(1):67-94.
54. Mémoli F, Stefanou A, Zhou L. Persistent cup product structures and related invariants. *Journal of Applied and Computational Topology.* 2024 Mar;8(1):93-148.
53. Kim W, Mémoli F. Persistence over posets. *Notices of the American Mathematical Society.* 2023 Sep;70(08).
52. Kim W, Mémoli F. Extracting persistent clusters in dynamic data via Möbius inversion. *Discrete & Computational Geometry.* 2024 Jun;71(4):1276-342.
51. Kim W, Mémoli F, Stefanou A. Interleaving by parts: Join decompositions of interleavings and join-assemblage of geodesics. *Order*. 2024 Aug;41(2):497-537.
50. Mémoli F, Munk A, Wan Z, Weitkamp C. The ultrametric Gromov-Wasserstein distance. *Discrete & Computational Geometry.* 2023 Dec;70(4):1378-450.
49. Lyu H, Mémoli F, Sivakoff D. Sampling random graph homomorphisms and applications to network data analysis. *Journal of machine learning research.* 2023;24(9):1-79.
48. Mémoli, F., Smith, Z, Wan, Z. The Gromov-Hausdorff distance between ultrametric spaces: its structure and computation. *Journal of Computational Geometry*. 2023; 14: 78-143.
47. Gómez M, Mémoli F. The Four Point Condition: An Elementary Tropicalization of Ptolemy's Inequality. *The American Mathematical Monthly.* 2024 Mar 15;131(3):187-203.
46. Lim S, Mémoli F, Smith Z. The Gromov-Hausdorff distance between spheres. *Geometry & Topology*. 2023 Dec 5;27(9):3733-800.
45. Mémoli F, Wan Z. Characterization of Gromov-type geodesics. *Differential Geometry and its Applications.* 2023 Jun 1;88:102006.
44. Adams H, Mémoli F, Moy M, Wang Q. The persistent topology of optimal transport based metric thickenings. *Algebraic & Geometric Topology.* 2024 Mar 18;24(1):393-447.
43. Lim S, Mémoli F, Okutan OB. Vietoris-Rips persistent homology, injective metric spaces, and the filling radius. *Algebraic & Geometric Topology.* 2024 Apr 12;24(2):1019-100.
42. Chowdhury S, Mémoli F. Distances and isomorphism between networks: stability and convergence of network invariants. *Journal of Applied and Computational Topology.* 2023 Jun;7(2):243-361.
41. Mémoli F, Needham T. Distance distributions and inverse problems for metric measure spaces. *Studies in Applied Mathematics.* 2022 Nov;149(4):943-1001.
40. Mémoli F, Wan Z, Wang Y. Persistent Laplacians: Properties, algorithms and implications. *SIAM Journal on Mathematics of Data Science.* 2022;4(2):858-84.

39. Mémoli F, Wan Z. On p-metric spaces and the p-Gromov-Hausdorff Distance. *p-Adic Numbers, Ultrametric Analysis and Applications.* 2022 Sep;14(3):173-223.
38. Cai C, Kim W, Mémoli F, Wang Y. Elder-rule-staircodes for augmented metric spaces. *SIAM Journal on Applied Algebra and Geometry.* 2021;5(3):417-54.
37. Kim W, Mémoli F. Generalized persistence diagrams for persistence modules over posets. *Journal of Applied and Computational Topology.* 2021 Dec;5(4):533-81.
36. Carlsson G, Mémoli F, Segarra S. Robust hierarchical clustering for directed networks: an axiomatic approach. *SIAM Journal on Applied Algebra and Geometry.* 2021;5(4):675-700.
35. Bauer U, Landi C, Mémoli F. The Reeb graph edit distance is universal. *Foundations of Computational Mathematics.* 2021 Oct 1:1-24.
34. Kim W, Mémoli F. Spatiotemporal persistent homology for dynamic metric spaces. *Discrete & Computational Geometry.* 2021 Oct;66:831-75.
33. Chowdhury S, Clause N, Mémoli F, Sánchez J, Wellner Z. New families of stable simplicial filtration functors. *Topology and its Applications.* 2020 Jul 1;279:107254.
32. Mémoli F, Okutan OB. Reeb posets and tree approximations. *Discrete Mathematics.* 2020 Feb 1;343(2):111658.
31. Chowdhury S, Mémoli F. The Gromov-Wasserstein distance between networks and stable network invariants. *Information and Inference: A Journal of the IMA.* 2019 Dec;8(4):757-87.
30. Hang H, Mémoli F, Mio W. A topological study of functional data and Fréchet functions of metric measure spaces. *Journal of Applied and Computational Topology.* 2019 Dec;3(4):359-80.
29. Mémoli F, Okutan OB. Quantitative simplification of filtered simplicial complexes. *Discrete & Computational Geometry.* 2021 Mar;65:554-83
28. Mémoli F, Singhal K. A primer on persistent homology of finite metric spaces. *Bulletin of mathematical biology.* 2019 Jul 15;81:2074-116.
27. Elchesen A, Mémoli F. The reflection distance between zigzag persistence modules. *Journal of Applied and Computational Topology*. 2019 Sep 9;3:185-219.
26. Frosini P, Mémoli F, Landi C. The Persistent Homotopy Type Distance. *Homotopy, Homology, and Applications*. 2019; 21(2): 231-259.
25. Chowdhury S, Mémoli F. A functorial Dowker theorem and persistent homology of asymmetric networks. *Journal of Applied and Computational Topology.* 2018 Oct;2:115-75.
24. Chowdhury S, Dai B, Mémoli F. The importance of forgetting: Limiting memory improves recovery of topological characteristics from neural data. *PloS* one. 2018 Sep 4;13(9):e0202561.
23. Martínez DH, Mémoli F, Mio W. The shape of data and probability measures. *Applied and Computational Harmonic Analysis.* 2020 Jan 1;48(1):149-81.
22. Chowdhury S, Mémoli F. Explicit geodesics in Gromov-Hausdorff space. *Electronic Research Announcements.* 2018 Jun 21;25:48-59.
21. Mémoli F, Sidiropoulos A, Sridhar V. Quasimetric embeddings and their applications. *Algorithmica.* 2018 Dec;80:3803-24.
20. Carlsson G, Mémoli F, Ribeiro A, Segarra S. Hierarchical clustering of asymmetric networks. *Advances in Data Analysis and Classification.* 2018 Mar;12:65-105.
19. Carlsson G, Mémoli F, Ribeiro A, Segarra S. Admissible hierarchical clustering methods and algorithms for asymmetric networks. *IEEE Transactions on Signal and Information Processing over Networks.* 2017 Feb 1;3(4):711-27.
18. Babichev A, Ji D, Mémoli F, Dabaghian YA. A topological model of the hippocampal cell assembly network. *Frontiers in computational neuroscience.* 2016 Jun 2;10:50.
17. Cosmo L, Rodola E, Albarelli A, Mémoli F, Cremers D. Consistent partial matching of shape collections via sparse modeling. *Computer Graphics Forum* 2017 Jan (Vol. 36, No. 1, pp. 209-221).
16. Carlsson G, Mémoli F. Classifying clustering schemes. *Foundations of Computational Mathematics.* 2013 Apr;13:221-52.
15. Dabaghian Y, Mémoli F, Frank L, Carlsson G. A Topological Paradigm for Hippocampal Spatial Map Formation Using Persistent Homology. *PLoS Computational Biology*. 2012 8(8): e1002581.
14. Mémoli F. Some properties of Gromov-Hausdorff distances. *Discrete & Computational Geometry.* 2012 Sep;48:416-40.
13. Le T, Mémoli F. Local scales on curves and surfaces. *Applied and Computational Harmonic Analysis.* 2012 Nov 1;33(3):401-37.

12. Mémoli F. Gromov-Wasserstein distances and the metric approach to object matching. *Foundations of computational mathematics.* 2011 Aug;11:417-87.
11. Mémoli F. A spectral notion of Gromov-Wasserstein distance and related methods. *Applied and Computational Harmonic Analysis.* 2011 May 1;30(3):363-401.
10. Ovsjanikov M, Mérigot Q, Mémoli F, Guibas L. One point isometric matching with the heat kernel. *Computer Graphics Forum* 2010 Jul (Vol. 29, No. 5, pp. 1555-1564).
9. Carlsson GE, Mémoli F. Characterization, stability and convergence of hierarchical clustering methods. *Journal of Machine Learning Research*. 2010 Apr 1;11(Apr):1425-70.
8. Chazal F, Cohen-Steiner D, Guibas LJ, Mémoli F, Oudot SY. Gromov-Hausdorff stable signatures for shapes using persistence. *Computer Graphics Forum*. 2009 Jul (Vol. 28, No. 5, pp. 1393-1403). Oxford, UK: Blackwell Publishing Ltd.
7. Singh G, Mémoli F, Ishkhanov T, Sapiro G, Carlsson G, Ringach DL. Topological analysis of population activity in visual cortex. *Journal of vision*. 2008 Jun 1;8(8):11-.
6. Moenning C, Mémoli F, Sapiro G, Dyn N, Dodgson NA. Meshless geometric subdivision. *Graphical models*. 2007 May 1;69(3-4):160-79.
5. Mémoli F, Sapiro G. A theoretical and computational framework for isometry invariant recognition of point cloud data. *Foundations of Computational Mathematics.* 2005 Jul;5:313-47.
4. Mémoli F, Sapiro G. Distance Functions and Geodesics on Submanifolds of $\mathbb{R}^d$ and Point Clouds. *SIAM Journal on Applied Mathematics.* 2005;65(4):1227-60.
3. Mémoli F, Sapiro G, Thompson P. Implicit brain imaging. *NeuroImage*. 2004 Jan 1;23:S179-88.
2. Mémoli F, Sapiro G, Osher S. Solving variational problems and partial differential equations mapping into general target manifolds. *Journal of Computational Physics.* 2004 Mar 20;195(1):263-92.
1. Mémoli F, Sapiro G. Fast computation of weighted distance functions and geodesics on implicit hypersurfaces. *Journal of computational Physics*. 2001 Nov 1;173(2):730-64.

Papers in Peer Reviewed Conferences and Workshops

34. *Ephemeral persistence features and the stability of filtered chain complexes*. With L. Zhou. SoCG 2023.
33. *A generalization of the persistent Laplacian to simplicial maps*. With A. Gülen, Z. Wan and Y. Wang. SoCG 2023.
32. *Meta-Diagrams for 2-Parameter Persistence*. N. Clause, T. Dey and B. Wang. SoCG 2023.
31. *Weisfeiler-Lehman meets Gromov-Wasserstein*. With S. Chen, S. Lim, Z. Wan and Y. Wang. ICML 2022.
30. *Computing Generalized Rank Invariant for 2-Parameter Persistence Modules via Zigzag Persistence and its Applications*. With W. Kim and T. Dey. SoCG 2022.
29. *Persistent Cup-Length*. With M. Contessotto, S. Stefanou and L. Zhou. 2021. SoCG 2022.
28. *The Reeb Graph Edit Distance is Universal*. With U. Bauer and C. Landi. SoCG 2020.
27. *Elder-rule-staircodes for Augmented Metric Spaces*. With C. Cai, W. Kim, and Y. Wang SoCG 2020.
26. *The Wassersein Transform*. With Z. Wan and Z. Smith. ICML 2019: The 36th International Conference on Machine Learning.
25. *Formigrams: Clustering Summaries of Dynamic Data*. With Woojin Kim. CCCG: The Canadian Conference on Computational Geometry, 2018.
24. *Persistent Path Homology of Asymmetric Networks* . With Samir Chowdhury. SODA 2018.
23. *Topological Analysis of Nerves, Reeb Spaces, Mappers, and Multiscale Mappers*. With T. Dey and Y. Wang. SOCG 2017.
22. *Improved error bounds for tree representation of metric spaces data.* With Samir Chowdhury and Zane Smith. NIPS 2016.
21. *Quasimetric embeddings and applications*. With Anastasios Sidiropoulos and Vijay Sridhar. ICALP 2016.
20. *Distances between directed networks and applications*. With Samir Chowdhury. ICASSP, 2016.
19. *Multiscale Mapper: A Framework for Summarization of Data and Maps*. With Tamal Dey and Yusu Wang. SODA 2016.
18. Metric Structures on Networks and Applications. With Samir Chowdhury. Allerton, 2015.
17. *Hierarchical Quasi-Clustering Methods for Asymmetric Networks*. With G. Carlsson, A. Ribeiro and S. Segarra. ICML 2014.

16. *Alternative Axiomatic Constructions for Hierarchical Clustering of Asymmetric Networks*. With Gunnar Carlsson, Alejandro Ribeiro, and Santiago Segarra. In IEEE Global Conference on Signal and Information Processing, 2013.
15. *Multiscale covariance fields, local scales, and shape transforms*. With. Diego Díaz and Washington Mio. In Geometric Science of Information, 2013.
14. *Hierarchical Clustering Methods and Algorithms for Asymmetric Networks*. In Asilomar Conference on signals, systems, and computers, 2013.
13. *Axiomatic construction of hierarchical clustering in asymmetric networks*. With Gunnar Carlsson, Alejandro Ribeiro, and Santiago Segarra. In Proc. Int. Conf. Acoustics Speech Signal Process, 2013.
12. *Some ideas for formalizing clustering methods*. With Gunnar Carlsson. In NIPS 2009 workshop "Clustering: Science or Art? Towards Principled Approaches".
11. *Multiparameter Hierarchical Clustering methods*. With Gunnar Carlsson. Proceedings of the 11th IFCS Biennial Conference and 33rd Annual Conference of the Gesellschaft für Klassifikation e.V., Dresden, March 13-18, 2009. Studies in Classification, Data Analysis, and Knowledge Organization Springer, Berlin-Heidelberg-New York.
10. *Spectral Gromov-Wasserstein distances for shape matching*. ICCV workshop on Non-Rigid Shape Analysis and Deformable Image Alignment (NORDIA'09), Kyoto, Japan. September 2009.
9. *Stability of Clustering methods*. With Gunnar Carlsson. Mathematisches Forschungsinstitut Oberwolfach Report No. 29/2008, "Computational Algebraic Topology".
8. *Gromov-Hausdorff distances in Euclidean spaces*. IEEE-CVPR, workshop on Non-Rigid Shape Analysis and Deformable Image Alignment (NORDIA'08), Alaska, June 2008.
7. *Topological Methods for the Analysis of High Dimensional Data Sets and 3D Object Recognition*. With Gunnar Carlsson and Gurjeet Singh. PBG 2007 (Point Based Graphics). Prague, Czech Republic, September 2007.
6. *On the use of Gromov-Hausdorff distances for Shape Comparison*. PBG 2007 (Point Based Graphics). Prague, Czech Republic, September 2007.
5. *Geometric Surface and Brain Warping via Geodesic Minimizing Lipschitz Extensions*. With Paul Thompson and Guillermo Sapiro. Proceedings of the First International Workshop on Mathematical Foundations of Computational Anatomy - Geometrical and Statistical Methods for Modelling Biological Shape Variability, MICCAI 2006. Copenhagen, Denmark, October 2006.
4. *Comparing Point Clouds*. With Guillermo Sapiro. Symposium on Geometric Processing, 2004. Nice, France.
3. *Distance Functions and Geodesics on Point Clouds*. With Guillermo Sapiro. In 2nd IEEE Workshop on Variational, Geometric and Level Set Methods in Computer Vision In Conjunction with the 9th IEEE International Conference in Computer Vision (ICCV'03), October 12, 2003, Nice, France.
2. *Solving Variational Problems and PDEs mapping into General Target Manifolds*. With Guillermo Sapiro and Stanley Osher. In 2nd IEEE Workshop on Variational, Geometric and Level Set Methods in Computer Vision In Conjunction with the 9th IEEE International Conference in Computer Vision (ICCV'03), October 12, 2003, Nice, France.
1. *Difusión Anisotrópica*. With Alvaro Pardo & Alejandro Ribeiro. IV Simposio Iberoamericano de Reconocimiento de Patrones (SIARP'99), La Habana, Cuba, 1999.

Chapters in Books and overview papers

7. *Analysis of Dynamic Graphs and Dynamic Metric Spaces via Zigzag Persistence.* With Woojin Kim and Zane Smith. In proceedings of the 2018 Abel Symposium.
6. *Distances Between Datasets*. In "Modern Approaches to Discrete Curvature". Springer LNM. 2017.
5. *The Gromov-Wasserstein distance: a brief overview*. Axioms 3 (2014), pp. 335-341.
4. *The Gromov-Hausdorff distance: a brief tutorial on some of its quantitative aspects*. Actes des rencontres du CIRM, 3 no. 1: Courbure discrete : theorie et applications (2013), p. 89-96.
3. *Metric structures on datasets: stability and classification of algorithms*. Lecture Notes in Computer Science, 2011, Volume 6855/2011, 1-33. Proceedings of the 14th international conference on Computer analysis of images and patterns. Invited paper, CAIP 2011.

2. *Computing with Point Cloud Data*. With Guillermo Sapiro. In *Statistics and Analysis of Shapes (Modeling and Simulation in Science, Engineering and Technology)*. Hamid Krim and Anthony Yezzi, editors. Birkhäuser, May 2006.

1. *Variational Problems and PDEs on Implicit Surfaces*. With Marcelo Bertalmío, Li-Tien Cheng, Guillermo Sapiro & Stanley Osher. In *Geometric Level Set Methods in Imaging, Vision and Graphics*. S. Osher and N. Paragios, editors. Springer-Verlag, August 2002.

PREPRINTS

- *The Z-Gromov-Wasserstein distance*. With M. Bauer, M. Nishino, and T. Needham. 2024. https://arxiv.org/pdf/2408.08233.
- *Faster computation of degree-1 persistent homology using the reduced Vietoris-Rips filtration*. With M. Koyama, K. Turner and V. Robins. 2024. https://arxiv.org/abs/2307.16333.
- *Orthogonal Möbius Inversion and Grassmannian Persistence Diagrams* . With A. Gülen and Z. Wan. 2023. https://arxiv.org/abs/2311.06870.
- *The Generalized Rank Invariant: Möbius invertibility, Discriminating Power, and Connection to Other Invariants*. With N. Clause and W. Kim. 2024. https://arxiv.org/abs/2207.11591.
- *Geometry and Stability of Supervised Learning Problems*. With B. Vose and R. Williamson. 2024. https://arxiv.org/abs/2403.01660.
- *Geometric Bounds for Persistence*. With B. Coskunuzer and A. Balitskii. 2024. https://arxiv.org/pdf/2403.13980.
- *Extremal spherical polytopes and Borsuk's conjecture*. With M. Katz and Q. Wang. 2023. https://arxiv.org/abs/2301.13076.
- *Gromov-Hausdorff distances, Borsuk-Ulam theorems, and Vietoris-Rips complexes*. With H. Adams et al. PolyMath project. 2022. https://arxiv.org/abs/2301.00246.
- *Homology groups of the curvature sets of* S^1. With P. Eastwood, A. M. Ellison, M. Gómez. 2022. https://arxiv.org/abs/2209.04674.
- *Some results about the Tight Span of spheres*. With S. Lim, Z. Wan, and Q. Wang. 2021. https://arxiv.org/abs/2112.12646.
- *Motivic Clustering Schemes for Directed Graphs.* With G. Vituri. 2019. https://arxiv.org/pdf/2001.00278.pdf
- *Sketching and Clustering Metric Measure Spaces*. With K. Singhal and A. Sidiropoulos. January 2018. https://arxiv.org/abs/1801.00551
- *Stable Signatures for Dynamic Graphs and Metric Spaces via Zigzag Persistent Homology*. With W. Kim. December 2017. https://arxiv.org/abs/1712.04064 https://arxiv.org/abs/1711.04211.
- *Metric graph approximation of geodesic spaces*. With O. Okutan. September 2018. https://arxiv.org/abs/1809.05566
- *The Distortion of the Reeb Quotient Map on Riemannian Manifolds*. With O. Okutan. January 2018. https://arxiv.org/abs/1801.01562
- *A Distance Between Filtered Spaces Via Tripods*. April 2017. https://arxiv.org/abs/1704.03965
- *Persistent Clustering and a theorem of J.Kleinberg*. With Gunnar Carlsson. http://arxiv.org/abs/0808.2241. February 2008.
- *Local Scale Selection for Exploratory Visualization and Analysis of Massive Datasets*. With Gunnar Carlsson, Daniel Müellner, and Gurjeet Singh.

Professional Service

- Associate Editor for Orbita Matematicae. A Math Journal of UMALCA (Union Matemática de América Latina y el Caribe) https://www.umalca.org/orbita-mathematicae/.
- Program Committee member. SoCG 2023 (Symposium on Computational Geometry). https://cs.utdallas.edu/SOCG23/socg.html.
- Math Research Communities on "Data Science at the Crossroads of Analysis, Geometry, and Topology", 2022. http://www.ams.org/programs/research-communities/mrc-22.
- Algebraic Topology and Topological Data Analysis: A conference in honor of Gunnar Carlsson, IMA, Minneapolis, August 2022. https://cse.umn.edu/ima/events/algebraic-topology-and-topological-data-analysis-conference-honor-gunnar-carlsson
- Conference "Bridging Applied and Quantitative Topology". May 2022. https://sites.google.com/view/applied-quantitative-topology/
- The Vietoris-Rips seminar. Bi-weekly online seminar 2021-2022. https://sites.google.com/view/aatrn-vr-seminar/home.
- Workshop on Algebraic Combinatorics and Category Theory in Topological Data Analysis. March 2022. https://sites.google.com/view/tda-alg-combi-cat/home.
- AAAI workshop on Optimal Transport and Structured Data Modeling. February 2022. https://ot-sdm.github.io/
- MBI workshop on Optimal Transport, Topological Data Analysis and Applications to Shape and Machine Learning. July 2020.
- ICIAM 2019. Organizer of mini-symposium on Geometric and Topological Data Analysis (w/ Yasu Hiraoka and Washington Mio).
- TGDA@OSU 2018 Summer School. Co-organizer. May 14-18, 2018. MBI-OSU.
- TGDA@OSU Workshop on Theory and Foundations of TGDA. Co-organizer. May 21-25, 2018. MBI-OSU.
- AMS Spring Central Sectional Meeting at OSU 2018. Special session on "Topology and Geometry in Data Analysis".
- Summer@ICERM 2017 co-organizer. Topic: Topological Data Analysis.
- AMS Sectional Meeting at NCSU 2016. Special session on "Geometry and Topology in Image and Shape Analysis".
- SIAM Imaging Science 2016. Mini-symposium on "Topology and Geometry Across Scales" Co-organizer.
- TGDA@OSU 2016. Conference Co-organizer.
- Topology and Geometry in Data Analysis OSU-Seminar. Co-organizer from 2013 onwards.
- Co-Organizer of Workshop: "Applications to Image Processing and Shape Analysis" at the SIAM Conference on Applied Algebraic Geometry 2013 (with Irina Kogan).
- Member of the Program Commitee for SMI 2011.
- Co-Organizer of Workshop: "Metric and Riemannian methods in shape analysis". SIAM Imaging Science conference, Chicago, April 12–14, 2010. (with Mario Micheli and Martin Reuter).
- Area chair for Asian Conference on Computer Vision (ACCV) 2010.
- Program committee member of Workshop on Non-Rigid Shape Analysis and Deformable Image Alignment (NORDIA), 2009 and 2010 (ICCV and CVPR).

Outreach activities

- Co-organizer of the graduate student conferences on Geometry, Topology in Data Analysis and Machine Learning and 2021) https://tgda.osu.edu/gtdaml2019/ and https://gtdaml.wixsite.com/2021.
- Co-organizer of the 8-week Summer@ICERM 2017 program on Topological Data Analysis.
- Mini-course on Network Data Analysis. CINVESTAV, Mexico, January 2017.
- OSU "Invitation to Mathematics" lecture series, February 2016.
- Minicourse on "Introduction Applied Algebraic Topology and Data Analysis". Universidade Estadual de Sao Paulo, UNESP, Rio Claro, October 2015.
- Minicourse on "Introduction Applied Algebraic Topology and Data Analysis". University of Science, VietNam National University, Ho Chi Minh City, August 2015.
- OSU "Invitation to Mathematics" lectures, April 9th and 16th, 2014.
- Minicourse on "Introduction to Mathematical Analysis Methods in Image Processing". University of Science, VietNam National University, Ho Chi Minh City, August 1st to 5th, 2011.
- Minicourse on "Object matching under invariances: a metric approach". CIMPA SCHOOL: Applied Mathematics and Engineering. Uruguay, 2010.

Other service

Grant review and panels for NSF, ISF, etc.

Reviewing

Journal of Applied and Computational Topology.
Probability Theory and Related Fields.
Algebraic and Geometric Topology.
Foundations of Computational Mathematics.
Journal of Mathematical Analysis and Applications.
Annals of Statistics.
Transactions on Algorithms.
Advances in Mathematics.
Journal of Discrete and Computational Geometry.
Topology and its applications.
Mathematics of Computation.
IEEE Signal Processing Letters.
SIAM Journal on Applied Algebra and Geometry.
PNAS.
Information and Inference.
IEEE Transactions on Image Processing.
Journal of Computational Physics.
Applied Mathematics Letters.
IEEE Transactions on Pattern Analysis and Machine Intelligence.
IEEE letters.
Advances on Data Analysis and Classification.
Journal of Machine Learning Research.
Conferences: ICML, NeurIPS, SoCG, CVPR, ICCV, SIGGRAPH.

Ph.D and MMS advising

Past

Aziz Gülen, Ph.D. student, OSU, 2020-2024. Now postdoc at Duke.
Nate Clause, Ph.D. student, OSU, 2020–2024. Now in industry.
Ling Zhou, Ph.D. student, OSU, 2018–2023. Now postdoc at Duke.
Mario Gomez, Ph.D. student, OSU, 2019–2023. Now postdoc at FSU.
Samir Chowdhury, Ph.D. student, OSU, 2014–2019. Now Postdoc at Stanford.
Zhengchao Wan, Ph.D student, OSU, 2017–2022. Now postdoc at UCSD.
Kun Jin, Ph.D. student, OSU, 2018–2021. Now with Samsung Research.

Woojin Kim, Ph.D. student, OSU, 2015–2020. Was Postdoc at Duke. Now TT at KAIST South Korea.
Sunhyuk Lim, Ph.D. student, OSU, 2014–2021. Now postdoc at MPI Leipzig.
Osman Okutan, Ph.D. student, OSU, 2016–2019. Now Postdoc at MPI Leipzig.
Kritika Singhal, Ph.D. student, OSU, 2017–2020. Now at Axtria.
Qingsong Wang, Ph.D. student, OSU, 2019–2022. Now postdoc at U. of Utah.
Guilherme Vituri, Ph.D student, UNESP-Rio Claro, Brazil, 2017–2020. Now in industry.
Marco Contessotto, Ph.D student, UNESP-Rio Claro, Brazil, 2017–2022.
Alexander Elchesesen, MMS student, OSU, 2015–2017. Ph.D U. of Florida. Now postdoc at CSU.
Xiao Zha, MMS student, OSU, 2017–2019.
Ying Yin, MMS student, OSU, 2017–2019. Now at Wolfram.

Current

Musashi Koyama, OSU and Australian National University, 2019–present.
Brantley Vose, Ph.D. student, OSU, 2021–present.

POSTDOC MENTORING

Yiqing Cai, postdoc, IMA, 2013. Now Data Scientist at Gro Intelligence.
Tom Needham, postdoc, OSU, 2016–2019. Now tenure track at FSU.
Anastasios Stefanou, postdoc, OSU, 2018–2021. Now tenure track at U. Bremen (Germany).
Ranthony Edmonds, postdoc, OSU, 2020–2023. Now at Duke.
Alexander McCleary, postdoc, OSU, 2021–2023. Now at Montana State.

TEACHING

Rutgers University. Mathematics of Data Science. Spring 2025.
The Ohio State University. Differential Geometry of Curves and Surfaces, 2024.
The Ohio State University. Topics on Optimal Transport in Data Science, 2023.
The Ohio State University. Riemannian Geometry, 2015, 2016, 2018, 2022.
The Ohio State University. Topics on Mathematical Phylogenetics, 2020.
The Ohio State University. Topics on Random Metric Spaces, 2019.
The Ohio State University. Topics and Optimal Transport in Machine Learning and Shape Analysis. 2018.
The Ohio State University. Topics on Network Data Analysis, 2016.
The Ohio State University. Scientific Computing, 2015.
The Ohio State University. Ordinary and Partial Differential Equations, 2014.
The Ohio State University. Metric Geometry and Shape Matching, 2014.
University of Adelaide, Australia. Introduction to Geometric Algorithms, 2011. Introduction to Machine Learning, 2012. Scientific computing, 2013. Puzzle Based Learning, 2013.
Universidad de la República, Uruguay. Object matching under invariances: a metric approach (graduate course), 2010.
Stanford University. Real Analysis, 2007. Shape Matching: A Metric Geometry Approach (graduate course), 2008.
Universidad de la República, Uruguay. Sampling Theory and Signal Processing, Analog and Digital Communication Systems, Image Processing, 1999 – 2002.

INVITED, KEYNOTE (∗), PLENARY (∗∗) AND COURSES (♯)

(♯) Minicourse on *Metric geometry and shape analysis*. MATRIX workshop "Applications of Topological Data Analysis to Mathematical Biology". MATRIX, University of Melbourne, Australia. November 2024.

The Gromov-Hausdorff distance between spheres. KAIST Math. department. Colloqium. October 2024.

The shape space determined by the Gromov-Wasserstein distance. Sungkyunkwan University. October 2024.

Spatiotemporal persistent homology for dynamic metric spaces. CRM Montreal. October 2024.

The exact determination of Gromov-type distances between spheres. CIRM-Luminy. May 2024.

The exact determination of Gromov-type distances between spheres. Ecole Polytechnique. May 2024.

The Gromov-Hausdorff distance between spheres. MPI-Leipzig. December 2023.

The Gromov-Hausdorff distance between spheres. UNESP-Sao Carlos, Brazil. November 2023.

The Gromov-Hausdorff distance between spheres. U. Pittsburg. Colloquium. October 2023.

Curvature sets and curvature measures over persistence diagrams. ICIAM. Tokyo. August 2023.

(∗∗) *The Gromov-Hausdorff distance between spheres*. TDA Week. Kyoto. August 2023.

(∗∗) *The Gromov-Hausdorff distance between spheres*. FoCM Workshop on Computational Geometry and Topology. June 2023.

Curvature Sets Over Persistence Diagrams. IMSI Workshop on "Randomness in Topology and its Applications". March 2023.

The Gromov-Hausdorff distance between spheres. UW-Madison Colloquium. February 2023.

La persistencia homológica de espacios métricos y su estabilidad. Universidad de la República, Uruguay. December 2022.

Gromov-type distances between spheres. Oberwolfach workshop on "Heat Kernels, Stochastic Processes and Functional Inequalities". November 2022.

Gromov-type distances between spheres. University of Bonn workshop on "From Dirichlet Forms to Wasserstein Geometry". October 2022.

(∗∗) *The Gromov-Hausdorff distance between spheres*. ATMCS 2022. Oxford. June 2022.

The ultrametric Gromov-Hausdorff distance. Banff workshop on "Geometry & Learning from Data". October 2021.

The Gromov-Wasserstein distance and distributional invariants of datasets. MPI-Leipzig seminar. September 2021.

Some Geometry Rigidity Results via Distance Distribution. SIAM Algebraic Geometry conference. August 2021.

The ultrametric Gromov-Hausdorff distance. AMS Sectional Meeting AMS Special Session "Graphs in Data Science". March 2021.

The ultrametric Gromov-Hausdorff distance. University of Minnesotta Data Science seminar. February 2021.

Vietoris-Rips Persistent Homology, Injective Metric Spaces, and The Filling Radius. Fields Institute workshop on Topological Data Analysis. June 2020.

(∗∗) *La distancia de Gromov-Wasserstein e invariantes distribucionales de conjuntos de datos.* Coloquio Uruguayo de Matemáticas. Universidad de la República. Uruguay. Montevideo. December 2019.

($*$) *Inverse problems in metric measure geometry.* NeurIPS workshop on Optimal Transport. Vancouver. December 2019.

The Gromov-Hausdorff distance between ultrametric spaces. FSU Topology seminar. November 2019.

The Gromov-Wasserstein distance and distributional invariants of datasets. SFB Colloquium. TU Munich. November 2019.

($\sharp$) *The shape space induced by the Gromov-Wasserstein distance.* Lecture series at Univertät Göttingen. October 2019.

The Gromov-Wasserstein distance and distributional invariants of datasets. MaD Seminar. NYU, September 2019.

Metric graph approximation of geodesic metric spaces. Summer Topology Conference. Johannesburg, South Africa. July 2019.

Metric graph approximation of geodesic metric spaces. UNESP, Brazil. June 2019

Stable invariants for Dynamic Metric Spaces. Conference on Geometric Data Analysis. University of Chicago. May 2019.

The Gromov-Wasserstein distance and distributional invariants of datasets. Oberwolfach workshop on " Statistical and Computational Aspects of Learning". May 2019.

Time Dependent Data, Persistence, and Stability. Worshop on "Topological Data Analysis, with Applications". University of Western Ontario. May 2019.

Metrics on the collection of dynamic shapes. Workshop on Shape Analysis, Stochastic Mechanics and Optimal Transport. BIRS-Banff. December 2018.

Stable Signatures for Dynamic Graphs and Dynamic Metric Spaces via Zigzag Persistence. Brazilian Topology Meeting. Niteroi. August 2018.

Stable Signatures for Dynamic Graphs and Dynamic Metric Spaces via Zigzag Persistence. Abel Symposium. Geiranger. June 2018.

(*) *Algebraic methods for characterizing dynamic networks*. OSU-USP joint Math conference. Sao Paulo. March 2018.

Stable signatures for dynamic metric spaces via persistent homology. Oberwolfach workshop on Statistics for Data with Geometric Structure. January 2018.

Analysis of dynamic networks via persistent homology. ICERM workshop on "Geometry and Topology of Data". December 2017.

The (persistent) topology of finite metric spaces. Florida State University. Math Department Colloquium. September 2017.

Persistent homology of asymmetric networks. Encontro Regional de Topologia 2017. Sao Paulo State, Brazil. October 2017.

Persistent homology of asymmetric networks. Banff workshop on "Topological Data Analysis: Developing Abstract Foundations". August 2017.

Persistent Homology of Asymmetric Networks. Foundations of Computational Mathematics Conference. Workshop on "Computational Geometry and Topology". Barcelona, July 2017.

Persistent homology of asymmetric networks. Workshop on Geometry and Shape Analysis in Biological Sciences. Institute for Mathematical Sciences. National University of Singapore. June 2017.

Persistent Homology of Asymmetric Networks. CNA/Ki-Net Workshop: Dynamics and Geometry from High Dimensional Data. CMU. March 2017.

Multiscale Covariance Fields and Shape Characterization in Euclidean Spaces. Workshop on "Mathematics of Shapes and Applications". Institute for the Mathematical Sciences. National University of Singapur. July 2016.

Multiscale Mapper: Topological Summarization Via Codomain Covers. SIAM Imaging Science workshop on "Topology and Geometry Across Scales". May 2016.

Multiscale Covariance Fields and Shape Characterization in Euclidean Spaces. SIAM Imaging Science workshop on "Theoretical and Computational Aspects of Geometric Shape Analysis ". May 2016.

The shape space defined by the Gromov-Wasserstein distance. Pattern Theory Seminar. Brown University. March 2016.

Hierarchical clustering on asymmetric networks. IAS-Rutgers-UPenn Workshop on Topology: Identifying Order in Complex Systems, IAS, November 2015.

Persistent Homology of Finite Metric Spaces and its Stability. Encontro Regional de Topologia de Sao Paulo. UFSCar and UNESP, Sao Carlos, SP, October 2015.

The shape space defined by the Gromov-Wassestein distance. Seminario de Geometria, Mathematics Department, Universidade de Sao Paulo. October, 2015.

A spectral notion of distance between shapes. Center for Nonlinear Analysis Seminar, CMU. April 30th, 2015.

The shape space defined by the Gromov-Wassestein distance. Geometry seminar, Mathematics Department, Penn State. April 29th, 2015.

The classification of clustering schemes.. The geometry luncheon seminar, Mathematics Department, Penn State. April 29th, 2015.

Hierarchical clustering on asymmetric networks. Institute for Advanced Study. The Hong Kong University for Science and Technology. Workshop "Functoriality in Data analysis". April 13–17th, 2015.

Persistence Diagrams of Metric Measure Spaces . Hausdorff Institute for Mathematics. University of Bonn. New Trends in Optimal Transport. March 2–6, 2015.

The shape space defined by the Gromov-Wasserstein distance. Erwin Schroedinger Institute. Infinite-dimensional Riemannian geometry with applications to image matching and shape analysis: week 4, The Geometry of Optimal Trasnport. February 2–6, 2015.

The shape space defined by the Gromov-Wasserstein distance. European Research Council workshop on Optimal Transportation. Scuola Normale Superiore di Pisa. October 27–31, 2014.

Metric geometry and Data Analysis. Southeast Geometry Symposium. Knoxville, Tennessee. October 23rd, 2014.

The shape space defined by the Gromov-Wasserstein distance. University of Bologna. July 16th, 2014.

A spectral notion of distance between shapes. MBI. ICIAM Scientific Workshop. May 15-16, 2014.

The shape space defined by the Gromov-Wasserstein distance. University of Georgia Geometry Seminar. March 21st, 2014.

Classifying Clustering Schemes. IMA workshop "Topological Systems: Communication, Sensing, and Actuation". March 5th, 2014.

Curvature sets over persistence diagrams. SAMSI. LDHD program (low dimensional structure in high dimensional data). February 3-7, 2014.

Curvature sets over persistence diagrams. IMA-UMN. Topological Data analysis. October, 2013.

The Gromov-Wasserstein distance and lower bounds. Luminy, France. CIRM, October, 2013.

Curvature sets over persistence diagrams. University of Bremen, Germany. Applied and Computational Topology. July 2013.

Curvature sets over persistence diagrams. Bedlewo, Poland. Applied Topology. July 2013.

The shape space defined by the Gromov-Wasserstein distance
Workshop on Geometry and Statistics in bioimaging: manifolds and stratified spaces. 8-12 October 2012 at Sandbjerg Estate, Sonderborg, Denmark.

Persistence homology and metric geometry.
Banff workshop on Topological Data Analysis and Machine Learning Theory, October 14–19, 2012.

Metric Geometry and Persistent Homology.
ATMCS 2012 (Algebraic topology methods in computer science). Edinburgh, July 2012.

Lower Bounds for the Gromov-Hausdorff distance Using Persistent Topology.
SIAM Conference an Applied Algebraic Geometry. Raleigh, North Carolina. October 6–9th, 2011.

The Classification of Clustering Schemes .
NICTA, SML seminar series. September 29th, 2011. NICTA, Canberra.

(∗∗) *Metric Geometry in Data Analysis*.
CAIP 2011: 14th International Conference of Computer Analysis of Images and Patterns. Sevilla, Spain, August 29-31,

The classification of clustering schemes.
Dagstuhl seminar on Mathematical and Computational Foundations of Learning Theory. Schloss Dagstuhl, Germany, July 17–22, 2011.

Some properties of Gromov-Hausdorff distances.
Shape Focused Research group meeting. Organized by Darryl Holm. Imperial College. London, UK. May 2011.

The Gromov-Wasserstein distance and object matching.
Center for Nonlinear Science seminar series, CMU Mathematics department, October 12th, 2010.

Metric geometry in shape analysis.

AMS 2010 Fall Western Section Meeting, UCLA, October 9th, 2010.

Metric geometry in shape matching.
NCSU, Electrical Engineering Department. Rayleigh, North Carolina, September 16th, 2010.

Some metric geometry ideas for object matching.
ACCV 2010, area chair Colloquium. National Institute of Informatics, Tokyo, Japan, September 1st, 2010.

(∗) *Metric Geometry for object matching*.
NORDIA-CVPR 2010 workshop. San Francisco, USA. June 18, 2010.

(∗∗) *Stability of Persistence Homology signatures arising from Vietoris-Rips simplicial constructions*.
Data Topology (Topología de Datos). Santiago de Compostela, Spain. May 21–22, 2010.

Spectral Gromov-Wasserstein Distances for Shape Matching and the Role of Scale.
SIAM IS 2010 workshop on "Local Scales: Theory and Applications". Chicago, April 14, 2010.

Characterization, stability and convergence of hierarchical clustering schemes.
University of Washington, Statistics Department. Seattle, Washington, February 8th, 2010.

Gromov-Wasserstein stable signatures for object matching and the role of persistence.
Workshop on Recent Advances on Topological and Geometric Data Analysis. Institut des Systemes complexes. Paris, France, July 8–10, 2009.

A spectral notion of Gromov-Wasserstein distances.
Applied analysis seminar, Yale University, October 12, 2009.

Gromov-Wasserstein distances for object matching.
ENS-Cachan, CMLA. Paris, France, June 18th, 2009.

Gromov-Wasserstein distances for shape matching and connections with other approaches. CEREMADE, Paris-Dauphine, June 16, 2009.

Shape Matching using L^p-Gromov-Hausdorff distances.
Computer Science department seminar, John Hopkins University. April 27, 2009.

Some metric geometry ideas for shape matching.
Annapolis Shape Meeting. Organized by Laurent Younnes, Peter Michor and David Mumford. Annapolis, MD. April 20–22, 2009.

A metric geometry approach to object matching.
Workshop on Data Analysis using Computational Topology and Geometric Statistics. BIRS station, Banff, Canada. March 8–13, 2009.

L^p-Gromov-Hausdorff distances for Shape Comparison.
Applied Math. Colloquium, UCLA, October 29th, 2008.

Stability of Clustering Methods.
Workshop on Computational Algebraic Topology. Mathematisches Forschungsinstitut Oberwolfach. Oberwolfach, Germany, July 2008.

L^p-Gromov-Hausdorff distances for Shape Comparison.
Workshop on Geometry and Statistics of Shapes, Hausdorff Institute of Mathematics, University of Bonn, Germany, June 2008.

L^p-Gromov-Hausdorff distances for Shape Comparison.
Geometric Modeling and Industrial Geometry Group seminar, Vienna University of Technology (TU Wien), Vienna, Austria, June 17th 2008.

Isometry invariant shape characterization.
Workshop on 3D Shape Characterization, University of Konstanz, Germany Dec. 18, 2007.

Two tools for multidimensional data analysis: Mapper and metric training.
DARPA Topological Data Analysis meeting. San Diego, December 11th, 2007.

Some ideas for the Comparison of Shapes given as Point Cloud Data.
Applied Math. Group seminar at Stanford University, February 16th 2007.

(∗) *Qualitative Analysis of Evoked data from V1.*
International Symposium "Vision by Brain and Machines". Montevideo, Uruguay, November 13-17, 2006.

Analysis of Visual Cortex Data.
DARPA Topological Data Analysis meeting, Santa Barbara, May 9, 2006.

Some idea for comparing shapes under invariances.
DDMA Speaker Series. Los Alamos National Laboratory, New Mexico, April 13, 2006.

Comparing Point Clouds: Theory and Algorithms.
SIAM Conference on Imaging Science, Salt Lake City, Utah, May 3 - 7, 2004.

PDEs on and Between Manifolds for Image Science Applications.
SIAM Conference on Imaging Science, Salt Lake City, Utah, May 3 - 7, 2004.

Distance Functions on submanifolds of $\mathbb{R}^d$ and Point Clouds.
SIAM 50th Anniversary and Annual Meeting, Philadelphia, Pennsilvania, July 8 - 12, 2002.

Conference and Workshop Presentations

Improved Error Bounds for Tree Representations of Metric Spaces.. ITA 2017. February 2017.

Hierarchical clustering methods on asymmetric networks.
ITA 2016, San Diego, CA, February 2016.

Multiscale Mapper: A framework for topological summarization.
SODA 2016, Arlington, VA, January 2016.

Informational robustness of the hippocampal spatial map.
SACNAS 2015, Washington DC.

Metric Structures on Networks and Applications. With Samir Chowdhury. Allerton, 2015.

Some properties of Gromov-Hausdoff distances.
Eighth International Conference on Mathematical Methods for Curves and Surfaces. Oslo, June 28-July 3, 2012.

Stability of Persistent Homology Invariants.
55th Australian Mathematical Society Meeting. Wollongong, 26–29th September 2011.

A study of spectral methods for surface and data matching from the Gromov-Wasserstein point of view.
Seventh International Conference on Curves and Surfaces. Avignon, France. June 24 - 30, 2010.

Spectral Gromov-Wasserstein distances for shape matching .
Workshop on Non-Rigid Shape Analysis and Deformable Image Alignment (NORDIA) ICCV'09. Kyoto, Japan. September 27th, 2009.

Informational Robustness of the Hippocampal Spatial Map: Topological Analysis.
Workshop on Methods of Information Theory in Computational Neuroscience, CNS 2009 (Computational Neuroscience). Berlin, Germany, July 22, 23.

Gromov-Hausdorff stable signatures for shapes using persistence.
Symposium on Geometry Processing 2009 (SGP). Berlin, Germany, July 15-17, 2009.

Topological stability of the hippocampal spatial map.
COSYNE 2009. Salt Lake city, Utah, February 26–March 1st, 2009.

Gromov-Hausdorff distances in Euclidean Spaces.
Workshop on Non-Rigid Shape Analysis and Deformable Image Alignment (NORDIA) CVPR'08. Alaska, June 27th, 2008.

Topological Structure of Population Activity in Primary Visual Cortex.
With Gunnar Carlsson, Dario Ringach, Guillermo Sapiro and Gurjeet Singh.
COSYNE 2008. Salt Lake City, Utah, February 28th-March 2nd, 2008.

On the use of Gromov-Hausdorff distances for Shape Comparison.
PBG 2007 (Symposium ion Point Based Graphics). Prague, Czech Republic, September 2-3, 2007.

Topological Methods for the Analysis of High Dimensional Data Sets and 3D Object Recognition.
PBG 2007 (Symposium ion Point Based Graphics). Prague, Czech Republic, September 2-3, 2007.

Comparing Point Clouds.
SGP 2004 (Symposium in Geometric Processing). Nice, France, July 8-10, 2004.

Solving Variational Problems and PDEs mapping into General Target Manifolds.
In 2nd IEEE Workshop on Variational, Geometric and Level Set Methods in Computer Vision In Conjunction with the 9th IEEE International Conference in Computer Vision. Nice, France, October 12, 2003.

PARTICIPATION IN RESEARCH PROGRAMS

Semester at IMA-UMN: Scientific and Engineering applications of Algebraic Topology. 2013.
Summer School on "Optimal Transportation: Theory and Applications". Grenoble, France, 2009.
Multiscale Geometry and Analysis in High Dimensions. IPAM, UCLA, 2004.
Graduate Summer School in Mathematics in Brain Imaging. IPAM), UCLA. 2004.
Geometrically Based Motions. IPAM, UCLA. 2001.
Mathematics in Multimedia. IMA, University of Minnesota, 2000.