Harish Doraiswamy
(Updated: 1 November 2023)

Bangalore, India

Email: harish.doraiswamy@microsoft.com
https://www.harishd.com

Research Interests

Scientific visualization, computational topology, data management, spatial data analytics, visual analytics, GPU computing.

Education

2008 - 2013	Ph.D. (Computer Science and Engineering) Indian Institute of Science, Bangalore Advisor: Prof. Vijay Natarajan
2006 - 2008	Master of Engineering (Computer Science and Engineering) Indian Institute of Science, Bangalore Advisor: Prof. Jayant R. Haritsa **Gold Medalist**
2000 - 2004	Bachelor of Engineering (Computer Science and Engineering) Visveswaraiah Technological University BMS College of Engineering, Bangalore

Professional Experience

Sep. 2021 - Present	Principal Researcher Microsoft Research Lab India Pvt. Ltd.
Jan. 2016 - Aug. 2020	Research Scientist, Center for Data Science New York University
Jan. 2017 - May 2017	Adjunct Assistant Professor, Center for Data Science New York University
Sept. 2016 - Dec. 2016	Adjunct Course Advisor, Center for Data Science New York University
Oct. 2012 - Dec. 2015	Research Assistant Professor, Computer Science and Engineering Tandon School of Engineering, New York University
2004 - 2006	Software Engineer Huawei Technologies India Pvt. Ltd., Bangalore

Recognitions

Awards

1. *Best Demonstration Award* at ACM SIGMOD 2018 for the demo titled "Interactive Visual Exploration of Spatio-Temporal Urban Data Sets using Urbane".

2. *Most Reproducible Paper Award* at ACM SIGMOD 2017 for the paper "Data Polygamy: The Many-Many Relationships among Urban Spatio-Temporal Data Sets".

3. *Honorable Mention Demo* at ACM SIGMOD 2017 for the demo titled "Querying and Exploring Polygamous Relationships in Urban Spatio-Temporal Data Sets".

4. *Honorable Mention Paper* at the IEEE Intl. Conference on Data Science and Advanced Analytics, 2016 for the paper "Anonymizing NYC Taxi Data: Does It Matter?".

5. *Microsoft Research India PhD Fellowship* for 2010 (2010–2012).

6. *Infosys PhD Fellowship* for the academic year 2009-2010.

7. *Computer Society of India (Bangalore Chapter) Medal* for the best M.E. student in the Department of Computer Science and Automation by Indian Institute of Science, Bangalore, India.

8. *Best Perspective Seminar award* for presentation at the Perspective seminars (Student's Research Overviews) conducted by the Department of Computer Science and Automation in April, 2009.

Select Media Coverage

1. GCN. *Urban Pulse maps, analyzes use of urban spaces*, November 08, 2017.
   https://gcn.com/blogs/emerging-tech/2017/11/urban-pulse.aspx

2. Architectural Digest. *Urban Pulse Uses Social Media Data to Show Cities in a New Light*, September 25, 2017.
   https://www.architecturaldigest.com/story/urban-pulse-uses-social-media-data-to-show-cities-in-a-new-light

3. Curbed. *New program wants to improve cities with the power of tweets and Flickr uploads.*, Spetember 22, 2017.
   https://www.curbed.com/2017/9/22/16350214/urban-pulse-planning-design-cities-nyu

4. Technology Review - Germany. *Lauschangriff auf Müllwagen*, February 21, 2017.
   https://www.heise.de/tr/artikel/Lauschangriff-auf-Muellwagen-3606486.html

5. The New York Times. *Mapping the Shadows of New York City: Every Building, Every Block*, December 21, 2016.
   https://www.nytimes.com/interactive/2016/12/21/upshot/Mapping-the-Shadows-of-New-York-City.html

6. The Economist. *Listen to the music of the traffic in the city*, October 22, 2016.
   http://www.economist.com/news/science-and-technology/21709002-places-people-have-pulsesif-only-you-know-how-measure-them-listen

Publications

My research primarily focuses on the visual analysis of large data sets. This requires me to work in the intersection of big data visualization, databases, and data analysis. I thus publish in both, visualization as well as database venues. Most of my research has been published in **Tier I** venues[1] in these domains. These include *ACM Transactions on Graphics (TOG)*, *IEEE Transactions on Visualization and Computer Graphics (TVCG), ACM SIGCHI Conference on Human Factors in Computing (CHI)*, and *Computer Graphics Forum (CGF)* in the visualization domain, and *ACM International Conference on Management of Data (SIGMOD), International Conference on Very Large Databases (VLDB)*, and the *International Conference on Data Engineering (ICDE)* in the database domain. According to Google Scholar, my h-index is 24 and my work has received over 1800 citations as of 1 November 2023.

Refereed Papers

2023

1. A Case for Graphics-Driven Query Processing
   Harish Doraiswamy, Vikas Kalagi, Karthik Ramachandra, and Jayant R Haritsa
   Proceedings of the VLDB Endowment (PVLDB), 16(10), 2023, 2499–2511

2022

2. SPADE: GPU-Powered Spatial Database Engine for Commodity Hardware
   Harish Doraiswamy and Juliana Freire
   ICDE '22: Proc. Intl. Conf. on Data Engineering, 2022, 2669–2681

3. GALE: Globally Assessing Local Explanations
   Peter Xenopoulos, Gromit Chan, Harish Doraiswamy, Luis Gustavo Nonato, Brian Barr, and Claudio Silva
   Proceedings of Topological, Algebraic, and Geometric Learning Workshops, PMLR, 196, 2022, 322–331

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[1]Tier I conferences in these domains are very competitive and have high impact. Papers accepted here are fully reviewed and are valued as much as, if not more than leading journals.

4. UrbanRama: Navigating Cities in Virtual Reality
Shaoyu Chen, Fabio Miranda, Nivan Ferreira, Marcos Lage, Harish Doraiswamy, Corinne Brenner, Connor Defanti, Michael Koutsoubis, Luc Wilson, Ken Perlin, and Claudio Silva
IEEE Transactions on Visualization and Computer Graphics (TVCG), 28(12), 2022, 4685–4699

2021

5. The Case for Distance-Bounded Spatial Approximations
Eleni Tzirita Zacharatou, Andreas Kipf, Ibrahim Sabek, Varun Pandey, Harish Doraiswamy, and Volker Markl
CIDR'21: The biennial Conference on Innovative Data Systems Research, 2021

2020

6. Valuing Player Actions in Counter-Strike: Global Offensive
Peter Xenopoulos, Harish Doraiswamy, and Claudio Silva
BigData'20: Proc. 2020 IEEE International Conference on Big Data, 2020

7. TopoMap: A 0-dimensional Homology Preserving Projection of High-Dimensional Data
Harish Doraiswamy, Julien Tierny, Paulo J. S. Silva, Luis Gustavo Nonato, and Cláudio Silva
IEEE Transactions on Visualization and Computer Graphics (IEEE SciVis '20), 2020

8. A GPU-friendly Geometric Data Model and Algebra for Spatial Queries
Harish Doraiswamy and Juliana Freire
SIGMOD'20: Proc. 2020 ACM SIGMOD International Conference on Management of Data, 2020, 1875–1885

9. Urban Mosaic: Visual Exploration of Streetscapes Using Large-Scale Image Data
Fabio Miranda, Maryam Hosseini, Marcos Lage, Harish Doraiswamy, Graham Dove, and Cláudio Silva
CHI'20: Proc. SIGCHI Conf. on Human Factors in Computing, 2020, 1–15

10. Unwind: Interactive Fish Straightening
Francis Williams, Alexander Bock, Harish Doraiswamy, Cassandra Donatelli, Kayla Hall, Adam Summers, Daniele Panozzo, and Cláudio Silva
CHI'20: Proc. SIGCHI Conf. on Human Factors in Computing, 2020, 1–13

11. Adaptive Main-Memory Indexing for High-Performance Point-Polygon Joins
Andreas Kipf, Harald Lang, Varun Pandey, Raul Alexandru Persa, Christoph Anneser, Eleni Tzirita Zacharatou, Harish Doraiswamy, Peter Boncz, Thomas Neumann, Alfons Kemper
EDBT '20: Proc. Intl. Conf. on Extending Database Technology, 2020, 347–358

2019

12. SONYC: A System for the Monitoring, Analysis and Mitigation of Urban Noise Pollution
Juan P. Bello, Cláudio Silva, Oded Nov, R. Luke DuBois, Anish Arora, Justin Salamon, Charles Mydlarz, and Harish Doraiswamy
Communications of the ACM (CACM), 62(2), 2019, 68–77

13. Shadow Accrual Maps: Efficient Accumulation of City-Scale Shadows over Time
Fabio Miranda, Harish Doraiswamy, Marcos Lage, Luc Wilson, Mondrian Hsieh, and Cláudio Silva
IEEE Transactions on Visualization and Computer Graphics (TVCG), 25(3), 2019, 1559–1574
Featured in the New York Times: Mapping the Shadows of New York City: Every Building, Every Block (online, December 21, 2016).

2018

14. Spatio-Temporal Urban Data Analysis: A Visual Analytics Perspective
Harish Doraiswamy, Juliana Freire, Marcos Lage, Fabio Miranda, and Cláudio Silva
IEEE Computer Graphics and Applications (CG&A), 38(5), 2018, 26–35

15. Time Lattice: A Data Structure for the Interactive Visual Analysis of Large Time Series
Fabio Miranda, Marcos Lage, Harish Doraiswamy, Charlie Mydlarz, Justin Salamon, Yitzchak Lockerman, Juliana Freire, and Cláudio Silva
Computer Graphics Forum (EuroVis '18), 37(3), 2018, 13–22

16. Interactive Visual Exploration of Spatio-Temporal Urban Data Sets using Urbane
Harish Doraiswamy, Eleni Tzirita Zacharatou, Fabio Miranda, Marcos Lage, Anastasia Ailamaki, Cláudio Silva, and Juliana Freire
SIGMOD '18: Proc. Intl. Conf. on Management of Data (Demo), 2018, 1693-1696
SIGMOD Best Demonstration Award.

17. TopoAngler: Interactive Topology-based Extraction of Fishes
Alexander Bock, Harish Doraiswamy, Adam Summers, and Cláudio Silva
IEEE Transactions on Visualization and Computer Graphics (IEEE SciVis '17), 24(1), 2017, 812–821

2017

18. GPU Rasterization for Real-Time Spatial Aggregation over Arbitrary Polygons
Eleni Tzirita Zacharatou, Harish Doraiswamy, Anastasia Ailamaki, Claudio Silva, and Juliana Freire
Proceedings of the VLDB Endowment (PVLDB), 11(3), 2017, 352–365

19. Querying and Exploring Polygamous Relationships in Urban Spatio-Temporal Data Sets
Yeuk-Yin Chan, Fernando Chirigati, Harish Doraiswamy, Cláudio Silva and Juliana Freire
SIGMOD '17: Proc. Intl. Conf. on Management of Data, 2017, 1643–1646
Honorable Mention Demo

20. Urban Pulse: Capturing the Rhythm of Cities
Fabio Miranda, Harish Doraiswamy, Marcos Lage, Kai Zhao, Bruno Gonçalves, Luc Wilson, Mondrian Hsieh, and Cláudio T. Silva
IEEE Transactions on Visualization and Computer Graphics (IEEE SciVis '16), 32(1), 2017, 791–800
Featured in the Economist: Listen to the music of the traffic in the city (print and online, October 22, 2016).
Invited to be presented at ACM SIGGRAPH 2017 in a special session on Visualization.

2016

21. Anonymizing NYC Taxi Data: Does It Matter?
Marie Douriez, Harish Doraiswamy, Cláudio Silva and Juliana Freire
DSAA '16: Proc. IEEE Intl. Conf. on Data Science and Advanced Analytics, 2016, 140–148
Honorable Mention Paper

22. Data Polygamy: The Many-Many Relationships among Urban Spatio-Temporal Data Sets
Fernando Chirigati, Harish Doraiswamy, Theodoros Damoulas, and Juliana Freire
SIGMOD '16: Proc. Intl. Conf. on Management of Data, 2016, 1011–1025
SIGMOD Most Reproducible Paper Award

23. Extraction of Robust Voids and Pockets in Proteins
Raghavendra Sridharamurthy, Talha Bin Masood, Harish Doraiswamy, Siddharth Patel, Raghavan Varadarajan, and Vijay Natarajan
Mathematical Methods for Visualization in Medicine and Life Sciences
Lars Linsen, Hans-Christian Hege, and Bernd Hamann (Eds.)
Springer-Verlag, Mathematics and Visualization Series, 2016, 329–349
Cover Image

24. A GPU-Based Index to Support Interactive Spatio-Temporal Queries over Historical Data
Harish Doraiswamy, Huy T. Vo, Cláudio Silva, and Juliana Freire
ICDE '16: Proc. Intl. Conf. on Data Engineering, 2016, 1086–1097

2015

25. Topology-based Catalogue Exploration Framework for Identifying View-Enhanced Tower Designs
Harish Doraiswamy, Nivan Ferreira, Marcos Lage, Huy T. Vo, Luc Wilson, Heidi Werner, Muchan Park, and Cláudio T. Silva
ACM Transactions on Graphics (SIGGRAPH Asia '15), 34(6), 2015, 230:1–230:13

26. Urbane: A 3D Framework to Support Data Driven Decision Making in Urban Development
Nivan Ferreira, Marcos Lage, Harish Doraiswamy, Huy T. Vo, Luc Wilson, Heidi Werner, Muchan Park, and Cláudio Silva
VAST '15: Proc. IEEE Conf. on Visual Analytics Science and Technology, 2015, 97–104

27. Using Maximum Topology Matching to Explore Differences in Species Distribution Models
Jorge Poco, Harish Doraiswamy, Marian Talbert, Jeffrey Morisette, and Cláudio Silva
SciVis '15: Proc. IEEE Scientific Visualization Conf., 2015, 9–16

28. Exploring Traffic Dynamics in Urban Environments Using Vector-Valued Functions
Jorge Poco, Harish Doraiswamy, Huy. T. Vo, Joao L. D. Comba, Juliana Freire, and Cláudio Silva
Computer Graphics Forum (EuroVis '15), 34(3), 2015, 161–170

2014

29. Riding from Urban Data to Insight Using New York City Taxis
Juliana Freire, Cláudio Silva, Huy Vo, Harish Doraiswamy, Nivan Ferreira, and Jorge Poco
IEEE Data Engineering Bulletin, 37(4), 2014, 43–55

30. Using Physically Based Rendering to Benchmark Structured Light Scanners
Esdras Medeiros, Harish Doraiswamy, Matthew Berger, and Cláudio Silva
Computer Graphics Forum (Pacific Graphics '14), 33(7), 2014, 71–80

31. Using Topological Analysis to Support Event-Guided Exploration in Urban Data
Harish Doraiswamy, Nivan Ferreira, Theodoros Damoulas, Juliana Freire, and Cláudio Silva
IEEE Transactions on Visualization and Computer Graphics (IEEE SciVis '14), 20(12), 2014, 2634–2643

32. Genotet: An Interactive Web-based Visual Exploration Framework to Support Validation of
Gene Regulatory Networks
Bowen Yu, Harish Doraiswamy, Xi Chen, Emily Miraldi, Mario Luis Arrieta-Ortiz, Christoph Hafemeister,
Aviv Madar, Richard Bonneau, and Cláudio Silva
IEEE Transactions on Visualization and Computer Graphics (IEEE VAST '14), 20(12), 2014, 1903–1912

2013

33. An Exploration Framework to Identify and Track Movement of Cloud Systems
Harish Doraiswamy, Vijay Natarajan, and Ravi S. Nanjundiah
IEEE Transactions on Visualization and Computer Graphics (IEEE SciVis '13), 19 (12), 2013, 2896–2905

34. Topological Saliency
Harish Doraiswamy, Nithin Shivashankar, Vijay Natarajan, and Yusu Wang
Computers & Graphics, 37 (7), 2013, 787–799

35. Computing Reeb Graphs as a Union of Contour Trees
Harish Doraiswamy and Vijay Natarajan
IEEE Transactions on Visualization and Computer Graphics, 19(2), 2013, 249–262

36. Extraction of Robust Voids and Pockets in Proteins
Raghavendra Sridharamurthy, Harish Doraiswamy, Siddharth Patel, Raghavan Varadarajan,
and Vijay Natarajan
EuroVis '13: Proc. Eurographics Conf. Visualization (short paper), 2013, 67–71

2012

37. Output-Sensitive Construction of Reeb Graphs
Harish Doraiswamy and Vijay Natarajan
IEEE Transactions on Visualization and Computer Graphics, 18(1), 2012, 146–159

38. A Hybrid Parallel Algorithm for Computing and Tracking Level Set Topology
Senthilnathan Maadasamy, Harish Doraiswamy and Vijay Natarajan
HiPC '12: Proc. Intl. Conf. on High Performance Computing, 2012, 12.1–12.10

2007 – 2009

39. Efficient Algorithms for Computing Reeb Graphs
Harish Doraiswamy and Vijay Natarajan
Computational Geometry: Theory and Applications, 42, 2009, 606–616

40. Identifying Robust Plans through Plan Diagram Reduction
Harish D., Pooja N. Darera, Jayant R. Haritsa
Proceedings of the VLDB Endowment (VLDB '08), 1(1), 2008, 1124–1140

41. Efficiently Approximating Query Optimizer Plan Diagrams
Atreyee Dey, Sourjya Bhaumik, Harish D., Jayant R. Haritsa
Proceedings of the VLDB Endowment (VLDB '08), 1(2), 2008, 1325–1336

42. Efficient Output-Sensitive Construction of Reeb Graphs
Harish Doraiswamy and Vijay Natarajan
ISAAC '08: Proc. Intl. Symp. Algorithms and Computation, 2008, 557–568

43. On the Production of Anorexic Plan Diagrams
Harish D., Pooja N. Darera, Jayant R. Haritsa
VLDB '07: Proc. of 33rd Intl. Conf. on Very Large Data Bases, 2007, 1081–1092

Refereed Posters and Videos

1. Computing Reeb Graphs as a Union of Contour Trees
Harish Doraiswamy and Vijay Natarajan
Poster at IEEE Visualization, 2011

2. Constructing Reeb Graphs using Cylinder Maps
Harish Doraiswamy, Aneesh Sood, and Vijay Natarajan
ACM Symposium on Computational Geometry, Video / Multimedia track, 2010

Theses

1. Reeb Graphs: Computation, Visualization and Applications
Harish D.
Ph.D. Thesis, Indian Institute of Science (Bangalore), June 2012

2. SIGHT and SEER: Efficient Production and Reduction of Query Optimizer Plan Diagrams
Harish D.
M.E. Thesis, Indian Institute of Science (Bangalore), July 2008

Patents

1. Spatial Queries
Harish Doraiswamy and Juliana Freire
US Patent 11775602, 2023.

Technical Reports

1. A GPU-Powered Spatial Database Engine for Commodity Hardware: Extended Version
Harish Doraiswamy and Juliana Freire
arXiv:2203.14362 [cs.DB]

2. A GPU-friendly Geometric Data Model and Algebra for Spatial Queries: Extended Version
Harish Doraiswamy and Juliana Freire
arXiv:2004.03630 [cs.DB]

3. Extraction of Robust Voids and Pockets in Proteins
Raghavendra Sridharamurthy, Harish Doraiswamy, Siddharth Patel, Raghavan Varadarajan, and Vijay Natarajan
IISc-CSA-TR-2013-3, CSA, Indian Institute of Science

4. Efficient Generation of Approximate Plan Diagrams
Atreyee Dey, Sourjya Bhaumik, Harish D., Jayant R. Haritsa
TR-2008-01, DSL/SERC, Indian Institute of Science

5. Robust Plans through Plan Diagram Reduction
   Harish D., Pooja N. Darera, Jayant R. Haritsa
   TR-2007-02, DSL/SERC, Indian Institute of Science

6. Reduction of Query Optimizer Plan Diagrams
   Harish D., Pooja N. Darera, Jayant R. Haritsa
   TR-2007-01, DSL/SERC, Indian Institute of Science

Open Source Software Systems

1. *TopoMap*. A dimensionality reduction technique which provides topological guarantees during the mapping process (C++). *https://github.com/harishd10/TopoMap*

2. *Raster Join*. Fast spatial aggregation queries using GPUs (C++, OpenGL). *https://github.com/ViDA-NYU/raster-join*

3. *Unwind*. A tool for unwarping bent volumetric scans of fishes (C++). *https://github.com/fwilliams/unwind*

4. *Urban Pulse*. Analyze and compare cities using urban data (C++, Java, JavaScript). *https://github.com/ViDA-NYU/urban-pulse*

5. *TDA using Contour Trees*. A generalized version of the contour tree code used in TopoAngler (C++). *https://github.com/harishd10/contour-tree*

6. *TopoAngler*. Interactive tool to extract fishes from CT scans (C++). *https://github.com/ViDA-NYU/Segmentangling*

7. *The Data Polygamy framework*. Scalable topology-based framework that automatically identifies relationships across large collections of spatio-temporal data sets (Java / Hadoop). *https://github.com/ViDA-NYU/data-polygamy*.

8. *MongoDB with STIG*. GPU-based spatio-temporal index (STIG) integrated into MongoDB. This index provides sub-second response times to queries over large spatio-temporal data sets and is orders of magnitude faster than commercial and open-source databases (C++, cuda). *https://github.com/harishd10/mongodb*.

9. *Genotet*. An interactive web-based visual exploration framework to support validation of gene regulatory networks (JavaScript). *https://github.com/ViDA-NYU/genotet*

10. *Cloud Exploration Framework*. A visual exploration framework to track and query cloud systems (Java). *https://github.com/harishd10/cloud-track*

11. *Recon*. A fast algorithm that computes the Reeb graph of a scalar function defined on a simplicial mesh. This is the fastest known algorithm for computing Reeb graphs (Java). *https://github.com/harishd10/recon*

12. *RobustCavities*. Web-portal for RobustCavities, a software which computes cavities in proteins robustly taking into account uncertainties in the atomic radii (C++, JavaScript). *http://vgl.serc.iisc.ernet.in/robustCavities/*

13. *libRG*. A library to compute Reeb graph of a scalar function defined on a simplicial mesh (C++). *http://vgl.serc.iisc.ernet.in/software/software.php?pid=001*

Talks / Seminars

Keynote Presentations and Invited Talks

1. *Building a GPU-powered Spatial Query Engine*, Dept. of Computer Science and Automation, Indian Institute of Science, Bangalore, India, September 2022.

2. *Interactive Visual Analysis of Large Urban Data*, The School of Applied Mathematics, Fundação Getulio Vargas, Rio de Janeiro, Brazil, February 2020.

3. *Interactive Visual Analysis of Large Urban Data*, Qatar Computing Research Institute, Doha, Qatar, May 2019.

4. *Real-Time Spatial Aggregation to support Interactive Visual Exploration of Large Urban Data*, Dept. of Computer Science, Federal Fluminense University, Niterói, Brazil, September 2018.

5. *Interactive Visual Analysis of Large Urban Data using Urbane*, Dept. of Computer Science and Automation, Indian Institute of Science, Bangalore, India, August 2018.

6. *Interactive Visual Analysis of Large Urban Data*, Microsoft Research India, Bangalore, India, July 2018.

7. *The Shape of Urban Data: What does it tell about a City?* Peruvian Symposium on Computer Graphics and Imaging (SCGI 2017), Arequipa, Peru, November 2017.

8. *Urban Pulse: Capturing the Rhythm of Cities*, IEEE TVCG Special Session on Advances in Data Visualization at SIGGRAPH 2017, Los Angeles, USA, August 2017.

9. *The Shape of Urban Data: What does it tell about a City?*, **Keynote** at the 2nd International Workshop on Smart Cities and Urban Analytics (UrbanGIS), October 2016.

10. *Data Polygamy: The Many-Many Relationships among Urban Spatio-Temporal Datasets*, AWS re:Invent 2016, November 2016.

11. *Data Polygamy: The Many-Many Relationships among Urban Spatio-Temporal Data Sets*, Dept. of Computer Science and Automation, Indian Institute of Science, Bangalore, India, September 2016.

12. *Riding from Urban Data to Insight Using New York City Taxis*, Dept. of Computer Science and Automation, Indian Institute of Science, Bangalore, India, August 2015.

13. *Identifying and Exploring Traffic Patterns using the NYC Taxi Data*, Workshop on Big Data for Social Policy, Fields Institute, Toronto, CA, April 2015.

14. *Topology of Level Sets: Representation, Computation and Applications*, Dept. of Mathematics, Universidade Federal do Ceará, Fortaleza, Brazil, February 2014.

15. *Reeb Graph: Computation, Visualization and Applications*, Dept. of Computer Science, University of California, Irvine, USA, November 2011.

Conference Presentations

16. *A Case for Graphics-Driven Query Processing*, Talk at VLDB 2023, Vancouver, Canada, August 2023.

17. *SPADE: GPU-Powered Spatial Database Engine for Commodity Hardware*, Talk at ICDE 2022, Kuala Lumpur, Malaysia, May 2022.

18. *A GPU-friendly Geometric Data Model and Algebra for Spatial Queries*, Talk at ACM SIGMOD 2020, Portland, USA, June 2020.

19. *Urban Pulse: Capturing the Rhythm of Cities*, Talk at IEEE SciVis, Baltimore, USA, October 2016.

20. *Anonymizing NYC Taxi Data: Does It Matter?*, Talk at IEEE DSAA, Montreal, Canada, October 2016.

21. *A GPU-Based Index to Support Interactive Spatio-Temporal Queries over Historical Data*, Talk at ICDE, Helsinki, Finland, May 2016.

22. *Topology-based Catalogue Exploration Framework for Identifying View-Enhanced Tower Designs*, Talk at SIGGRAPH ASIA, Kobe, Japan, November 2015.

23. *Exploring Traffic Dynamics in Urban Environments Using Vector-Valued Functions*, Talk at EuroVis, Cagliari, Italy, May 2015.

24. *Using Topological Analysis to Support Event-Guided Exploration in Urban Data*, Talk at IEEE SciVis, Paris, France, November 2014.

25. *An Exploration Framework to Identify and Track Movement of Cloud Systems*, Talk at IEEE SciVis, Atlanta, USA, October 2013.

26. *Computing Reeb Graphs as a Union of Contour Trees*, Talk at IEEE SciVis, Seattle, USA, October 2012.

27. *Efficient output-sensitive construction of Reeb graphs*, Talk at the Intl. Symp. Algorithms and Computation, Gold Coast, Australia, December 2008.

Research Funding

1. *DARPA*. Streamlining Model Design, Comparison and Curation.
   PI: Juliana Freire; Co-PIs: Enrico Bertini, Kyunghyun Cho, **Harish Doraiswamy**, and Cláudio T. Silva.
   US$ 3.8 million. March 2017.

Teaching and Mentoring

Courses

- *Introduction to Urban Data Science*, Mini Course during the Summer School on Data Science held at The School of Applied Mathematics, Fundação Getulio Vargas, Rio de Janeiro, Brazil, February 2020.

- *Topics in Data Science: Topological Data Analysis and Graph Signal Processing* (DS-GA 3001) *(with Luis Gustavo Nonato)*, NYU CDS, Spring 2017.

Invited Lectures

- *Spatio-Temporal Query Processing*, Big Data, NYU Tandon School of Engineering, Fall 2019, Spring 2020.

- *Spatio-Temporal Query Processing*, Big Data, NYU CDS, Spring 2015, 2016.

Mentoring

- *Fabio Miranda*, Ph.D. student, 2015 – 2018.

- *Fernando Chirigati*, Ph.D. student, 2014 – 2018.

- *Eleni Tzirita Zacharatou*, Summer Intern, 2016.

- *Nivan Ferreira*, Ph.D. student, 2013 – 2015.

- *Jorge Poco*, Ph.D. student, 2013 – 2015.

- *Marie Douriez*, Summer Intern, 2015.

- *Yunzhe Jia*, Master's thesis, Spring 2015.

Teaching Assistant

- *Computer Graphics* (E0 271), Dept. of CSA, IISc., August 2010.

- *Computer Graphics* (E0 271), Dept. of CSA, IISc., August 2009.

- *Database Management Systems* (E0 261), Dept. of CSA, IISc., August 2007.

Professional Service

Organizing committee

- International Workshop on Smart Cities and Urban Analytics (UrbanGIS), Redondo Beach, USA, November 2017.

- International Workshop on Smart Cities and Urban Analytics (UrbanGIS), San Francisco, USA, October 2016.

Program committee member

- Intl. Conf. on Data Science and Management of Data (CODS-COMAD), Bangalore, India, January 2024.

- SIBGRAPI Conf. on Graphics, Patterns and Images (SIBGRAPI), Rio Grande, Brazil, November 2023.

- IEEE Workshop on Topological Data Analysis and Visualization, Melbourne, Australia, October 2023.

- Intl. Conf. on Very Large Data Bases (VLDB), Demo Track, Vancouver, Canada, August 2023.

- IEEE Workshop on Topological Data Analysis and Visualization, Oklahoma City, USA, October 2022.

- SIBGRAPI Conf. on Graphics, Patterns and Images (SIBGRAPI), Natal, Brazil, October 2022.

- Intl. Conf. on Very Large Data Bases (VLDB), Demo Track, Sydney, Australia, September 2022.

- Intl. Conf. on Very Large Data Bases (VLDB), Sydney, Australia, September 2022.

- Intl. Conf. on Data Science and Management of Data (CODS-COMAD) - Young Researchers' Symposium Track, Bangalore, India, January 2021.

- Symposium on Large Data Analysis and Visualization (LDAV), Salt Lake City, USA, October 2020.

- Intl. Conf. on Very Large Data Bases (VLDB), Tokyo, Japan, September 2020.

- IEEE VIS, Vancouver, Canada, October 2019.

- Symposium on Large Data Analysis and Visualization (LDAV), Vancouver, Canada, October 2019.

- Workshop on Human-In-the-Loop Data Analytics (HILDA), Amsterdam, Netherlands, July 2019.

- Intl. Conf. on Data Engineering (ICDE), Macau SAR, China, April 2019.

- Symposium on Large Data Analysis and Visualization (LDAV), Berlin, Germany, October 2018.

- Workshop on Visual Analytics, Information Visualization and Scientific Visualization (WVIS), Rio de Janeiro, Brazil, October 2017.

- Intl. Conf. on Very Large Data Bases (VLDB), Rio De Janerio, Brazil, August 2018.

- Intl. Conf. on Management of Data (SIGMOD), Chicago, USA, May 2017.

- Workshop on Human-In-the-Loop Data Analytics (HILDA), Chicago, USA, May 2017.

- Intl. Conf. on Data Engineering (ICDE) - Industrial Track, San Diego, USA, April 2017.

- Indian Conf. on Computer Vision, Graphics and Image Processing (ICVGIP), Guwahati, India, December 2016.

- EuroVis 2016 (short papers), Groningen, the Netherlands, June 2016.

- EuroVis 2015 (short papers), Cagliari, Italy, June 2015.

- AAAI workshop on 'AI for Cities', Austin, USA, January 2015.

- Indian Conf. on Computer Vision, Graphics and Image Processing (ICVGIP), Bangalore, India, December 2014.

- SIBGRAPI Conf. on Graphics, Patterns and Images (SIBGRAPI), Rio De Janerio, Brazil, August 2014.

Conference reviewer
- IEEE VIS (accepted papers published in *IEEE TVCG*)

- EuroVis: EG/VGTC Conference on Visualization (accepted papers published in *CGF*)

- IEEE Pacific Visualization Symposium

Journal reviewer
- The VLDB Journal (VLDBJ)

- IEEE Transactions on Visualization and Computer Graphics (TVCG)

- Computers & Graphics

- Computer Graphics Forum (CGF)

- IEEE Transactions on Knowledge and Data Engineering (TKDE)

- IEEE Transactions on Big Data (TBD)

- IEEE Transactions on Sptial Algorithms and Systems (TSAS)

References
On request.